The Impact of School Food Environment Policies on Child Dietary Intake and BMI and Future Cardiometabolic Outcomes in the United States

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Introduction: Promising school food environment policies include providing fresh fruits and vegetables (F&V provision) and competitive food restrictions on sugar-sweetened beverages (SSB restriction). Yet, the impact of these policies on diet and BMI in children and future cardiometabolic disease (CMD) outcomes is not established.

Methods: We used a comparative risk assessment model to estimate the effects of F&V provision and SSB restriction on diet and BMI in US children age 5-18 yrs. We used national data from NHANES 2009-12 on baseline BMI and intakes of fruits, vegetables, and SSBs; impacts of these policies on diet from meta-analyses of interventions; and estimated effects of dietary changes on BMI from trials and cohorts. We also estimated the effects of these school policies on CMD in current US adults if such policies had been implemented in their childhood, based on meta-analysis of long-term within-person correlations of childhood and adult diets, meta-analyses of diet and CMD, and data on national CMD deaths. Model inputs were stratified by age, sex, and race, where appropriate. Point estimates and 95% uncertainty intervals were derived from probabilistic sensitivity analyses using 1000 Monte Carlo simulations.

Results: F&V provision would increase overall fruit intake in children by ~14-21% and would not significantly increase vegetable intake (Table). SSB restriction would decrease overall SSB intake by ~6-11% and BMI (kg/m²) by 0.2-0.3%. Among these dietary factors, reducing SSBs had the largest estimated impact on CMD (2418 deaths averted/year), followed by providing fruits (2121) and vegetables (165). If US adults had been exposed to both policies, an estimated 4703 CMD deaths/year would be averted, representing 0.67% of all CMD deaths.

Conclusions: Specific US school food environment policies involving F&V provision and SSB restriction would modestly improve diet and BMI in children, and could prevent up to 0.7% of all CMD deaths.

Disclosures: K.L. Rosettie: None. R. Micha: None. J.L. Peñalvo: None. F. Cudhea: None. D. Mozaffarian: G. Consultant/Advisory Board; Modest; ad hoc consulting for DSM. H. Other; Modest; chapter royalties from UpToDate.

Funding: No
Does Pokemon Go Help Players be More Active? An Evaluation of Pokemon Go and Physical Activity

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Objective: Pokémon Go is a location-based augmented reality game for mobile devices. Leveraging GPS and camera on the smartphone, Pokémon Go requires the player to travel around an area capturing animated creatures. This study aimed to evaluate physical activity associated with Pokémon Go.

Methods: We recruited 167 iPhone users who had played Pokémon Go in July 2016. Study participants provided screenshots of their daily “steps” reported on their iPhone Health app between June 15, 2016 and Jul 31, 2016. The primary outcome measures were average daily “steps” and % of days > 10,000 steps/day before and after playing Pokémon Go.

Results: Of 167 volunteers, the mean age were 26±6 years. The average daily steps was 5678±2833 (median 5718 [IQR 3675-7279]) before the participants played Pokémon Go and this number increased to 7654± 3616 (median 7232 IQR [5041-9744]) after they started playing the game. On average, we observed an increase of 1976 (95% CI 1494-2458, p<0.001) in daily steps (Figure). Additionally, participants were more likely to achieve 10,000 steps/day goal after playing Pokémon Go (15.3% before vs. 27.5% after; OR 2.06, 95% CI 1.70-2.50).

Results from subgroup analyses also showed significant increased level of physical activity after Pokémon Go. Participants who spent more time playing (2-2.5 hours/day 2861 more steps, 95% CI 1884-3837; >2.5 hours/day 2238 more steps, 95% CI 1008-3467), overweight/obese (3031 more steps, 95% CI 2132-3929), or with a lower baseline physical activity level (lowest quartile, 2,899 more steps, 95% CI 2030-3767) had the largest increase after the initiation of the game.

Conclusion: We observed a significant increase in physical activity associated with Pokémon Go. Games like Pokémon Go may provide an alternative way to encourage exercise, especially among young adults with low baseline physical activity levels and/or overweight/obesity.


Funding: No

Funding Component:

03

High Neighborhood Incarceration Rate is Associated With Poor Cardiovascular Risk Profiles in Non-incarcerated Black Individual

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Introduction: Over 7 million Americans are current or former prisoners. Blacks are imprisoned at rates 4 to 10 times greater than Whites. While personal incarceration history is associated with greater all-cause mortality and incident cardiovascular disease (CVD), the impact of high neighborhood rates of incarceration on CVD risk in non-incarcerated individuals is unknown.

Hypothesis: High neighborhood incarceration rate, defined as the upper quartile, is associated with poor individual CVD risk profile.
Methods: A total of 1368 subjects from the Atlanta area (mean age 49 ± 10 years, 62% female [n=850], 41% Black [n=560]) were recruited from two community cohorts. Zip codes were used to link neighborhood incarceration and crime rates to individual pooled risk scores (ASCVD), risk factors for CVD including hypertension, dyslipidemia and impaired fasting glucose (IFG), and biomarkers including high-sensitivity C-reactive protein (hsCRP) and the homeostatic model assessment for insulin resistance (HOMA-IR).

Results: High neighborhood incarceration rate was associated with high ASCVD risk score (OR=1.41, 95% CI=1.02, 1.95), hypertension (OR=1.48, 95% CI=1.05, 2.07) and dyslipidemia (OR=1.45, 95% CI=1.04, 2.04), after controlling for relevant demographic, socioeconomic and behavioral covariates. Tests for interaction with race were significant: Black individuals living in areas with high incarceration rates were more likely to have hypertension (OR=1.63, 95% CI=1.03, 2.58), dyslipidemia (OR=1.80, 95% CI=1.15, 2.83), IFG (OR=1.77, 95% CI=1.04, 3.03), and elevated HOMA-IR (OR=2.04, 95% CI=1.20, 3.47); Whites were more likely to have an elevated hsCRP (OR=1.81, 95% CI=1.02, 3.22).

Conclusions: In conclusion, high neighborhood incarceration rate is associated with a worse CVD risk profile; this effect was more pronounced in Blacks. Neighborhood exposure to increased incarceration rates, particularly in Black communities, represents an additional health disparity that warrants further investigation.


Funding: No

Funding Component:

04

Racial Disparities in Cardiovascular Health Behaviors are Partially Explained by Socioeconomic, Psychosocial and Environmental Factors: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Introduction: There are known racial differences in cardiovascular health behaviors, including smoking, physical activity, and diet quality. A better understanding of factors that explain these differences may suggest novel intervention targets for reducing disparities in cardiovascular disease.

Objective: To examine whether socioeconomic, psychosocial and environmental factors mediate racial differences in health behaviors.

Methods: We studied 3,028 Black or White CARDIA participants who were enrolled at age 18-30 years in 1985-86 and completed the 30 year follow-up visit in 2015-2016. Health behaviors included smoking (current, former ≤ 12 months, never smoker/quit >12 months), physical activity (inactive, active but not meeting guidelines, meeting guidelines), and a surrogate for healthy eating using fast food and sugar-sweetened beverage consumption (frequency per week ≥ 2, some but < 2, none). Each behavior was assigned a value of 0 for
poor, 1 for intermediate or 2 for ideal and summed to calculate an overall health behavior score for each participant (range 0-6). The race difference (β) in health behavior score was estimated using linear regression. Formal mediation analyses computed the proportion of the total effect of race on health behavior score explained by socioeconomic, psychosocial, and environmental factors (see Table footnote).

**Results:** Blacks had a lower health behavior score than Whites in crude analyses (mean difference: -1.04, p<0.001). After adjustment for sex, age and field center, socioeconomic factors mediated 50.5% of the association between race and the health behavior score, psychosocial factors 26.8% and environmental factors 9.0% (p<0.05 for all). Joint associations mediated 58.1% of the race-health behavior score association.

**Conclusions:** Observed racial differences in the health behavior score are predominately mediated by socioeconomic factors, which appear to play a stronger explanatory role than psychosocial and environmental factors.


Funding: No

**Funding Component:**

04

**Risk Development in Young Adults (CARDIA) Study**

Kara M Whitaker, David R. Jacobs Jr., Univ of Minnesota, Minneapolis, MN; Kiarri N. Kershaw, Northwestern Univ, Chicago, IL; John N. Booth III, Univ of Alabama at Birmingham, Birmingham, AL; David C. Goff Jr., Univ of Colorado, Aurora, CO; Donald M. Lloyd-Jones, Northwestern Univ, Chicago, IL; Ryan T. Demmer, Columbia Univ, New York, NY; Catarina I. Kiefe, Univ of Massachusetts Medical Sch, Worcester, MA

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Conclusions: Observed racial differences in the health behavior score are predominately mediated by socioeconomic factors, which appear to play a stronger explanatory role than psychosocial and environmental factors.


Funding: No

Funding Component:

04

Racial Disparities in Cardiovascular Health Behaviors are Partially Explained by Socioeconomic, Psychosocial and Environmental Factors: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

Kara M Whitaker, David R. Jacobs Jr., Univ of Minnesota, Minneapolis, MN; Kiarri N. Kershaw, Northwestern Univ, Chicago, IL; John N. Booth III, Univ of Alabama at Birmingham, Birmingham, AL; David C. Goff Jr., Univ of Colorado, Aurora, CO; Donald M. Lloyd-Jones, Northwestern Univ, Chicago, IL; Ryan T. Demmer, Columbia Univ, New York, NY; Catarina I. Kiefe, Univ of Massachusetts Medical Sch, Worcester, MA

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Conclusions: Observed racial differences in the health behavior score are predominately mediated by socioeconomic factors, which appear to play a stronger explanatory role than psychosocial and environmental factors.
Association of 25-Year Body Mass Index Trajectories Throughout Early Adulthood With Nonalcoholic Fatty Liver Disease in Middle Age: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Background: Nonalcoholic Fatty Liver Disease (NAFLD) has increased in parallel with obesity, is a risk factor for cirrhosis and liver cancer, and has few effective treatments. Identifying modifiable risk factors for NAFLD development is essential to effectively design prevention programs. We tested whether trajectories of body mass index (BMI) change throughout early adulthood were associated with risk of prevalent NAFLD in midlife independent of current BMI.

Methods: Participants from the CARDIA study, a prospective multicenter population-based biracial cohort of adults (baseline age 18-30 years), underwent BMI measurement at exam years 0, 2, 5, 7, 10, 15, 20, and 25. At Year 25 (Y25, 2010-2011), liver fat was assessed by computed tomography. NAFLD was identified after exclusion of other causes of liver fat (alcohol/hepatitis). Latent mixture modeling was used to identify 25-year trajectories in BMI percent (%) change relative to baseline BMI over time. Multivariable logistic regression models were used to assess associations between BMI trajectory group and prevalent NAFLD with adjustment for baseline or current Y25 BMI.

Results: Among 4,423 participants, we identified 4 distinct trajectories of BMI %change: stable BMI (26.2% of the cohort, 25-year mean BMI Δ=0.7 kg/m$^2$), mild increase (46.0%, BMI Δ=5.2 kg/m$^2$), moderate increase (20.9%, BMI Δ=10.0 kg/m$^2$), and extreme increase (6.9%, BMI Δ=15.1 kg/m$^2$) (Figure). NAFLD prevalence at Y25 was higher with increasing BMI trajectory: 4.1%, 9.3%, 13.0%, and 17.6% (p-trend <0.0001). At baseline, 34.6% of participants had overweight or obesity. After adjustment for confounders, trajectories of greater BMI increase were associated with greater NAFLD prevalence independent of baseline or current Y25 BMI (Figure).

Conclusion: Weight gain throughout adulthood is associated with greater prevalence of NAFLD in midlife independent of baseline or current BMI. These findings highlight weight maintenance throughout adulthood as a potential target for primary prevention of NAFLD.
Body Mass Index Growth Trajectories During Childhood and Adult Obesity Risk

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Background: Obesity measures track from childhood to adulthood. However, information is limited regarding the relationship between body mass index (BMI) growth trajectories during childhood and adult obesity risk. We hypothesize that BMI growth rates at different childhood age windows have influences on adult obesity, independent of absolute BMI values. Methods: The longitudinal study cohort consisted of 2,732 adults (1,772 whites and 960 blacks; 1,226 males) who had BMI measured at least 4 times from childhood (4-19 years) to adulthood (20-51 years). A random-effects mixed model was used to construct growth curves of BMI from childhood to adulthood in race-sex groups. Model-estimated linear growth rates (kg/m²/year) in BMI at different childhood ages, calculated by using the first derivatives of the growth curves, were linked to adult obesity (BMI>=30) in multivariable regression models, adjusted for adult age, race, sex, adult smoking and alcohol drinking, and childhood BMI levels. Results: BMI from childhood to adulthood fit cubic growth curves; linear and nonlinear curve parameters differed significantly between race-sex groups. BMI levels showed race and sex differences from age 15 years onwards. Obese adults had significantly higher BMI levels than non-obese adults from childhood to adulthood. Differences in linear and nonlinear slope parameters of BMI between obese and non-obese groups were all significant (p<0.001). The association patterns of childhood BMI growth trajectories with adult obesity were similar in all race-sex groups. In the total sample, the association between childhood BMI growth rate and adult obesity was peaked at age 17 (odds ratio=5.7 and 95% confidence interval=4.7-6.8) as shown in the figure. Conclusions: These observations indicate that adult obesity originates in early life with different longitudinal BMI trajectory profiles. Puberty is a crucial period for the development of obesity in later life, which has implications for obesity prevention beginning in childhood.

Disclosures: T. Zhang: None. B. Xi: None. C. Li: None. L. Bazzano: None. J. He: None. P. Whelton: None. W. Chen: None. S. Li: None.
Background: The association of weight gain from early to middle adulthood with a wide range of health outcomes later in life has not been systematically examined.

Methods: We included 93,873 women from the Nurses’ Health Study and 25,374 men from the Health Professionals Follow-up Study who recalled weight at early adulthood (18 years in women, 21 years in men) and reported current weight in middle adulthood (55 years). Beginning from 55 years old, we prospectively followed them for incident cases of type 2 diabetes, hypertension, cardiovascular disease, cancer, three other medical conditions, and all-cause mortality. Among 51,185 women and 17,694 men who were at least 64 years of age in 2010, we also considered “healthy aging”, defined as no diagnosis of 11 major chronic diseases and no major cognitive impairment, physical impairment, or mental health limitations.

Results: On average, female participants gained 12.55 kg (interquartile range: 14.36 kg) of body weight and males gained 9.68 kg (interquartile range: 11.19 kg) from early to middle adulthood. During a median follow-up of 18 years in women and 14 years in men, we documented 9360 incident cases of type 2 diabetes, 37,298 of hypertension, 9220 of cardiovascular disease, 20,222 of cancer (including 9458 of obesity-related cancers), 7438 of symptomatic cholelithiasis, 2702 of severe osteoarthritis, 31,960 of cataract extraction, and 27,250 deaths. In multivariate models, compared to those maintained stable weight (weight change <2.5kg), participants who gained 20+ kg had increased risks of: diabetes (hazard ratio [HR, 95%CI], 10.93[9.65–12.39] in women, 8.19[6.41–10.46] in men), hypertension (2.24[2.15–2.34] in women, 2.11[1.91–2.33] in men), cardiovascular disease (1.87[1.72–2.04] in women, 1.72[1.40–2.11] in men), obesity-related cancers (1.53[1.41–1.66] in women, 1.27[0.95–1.69] in men), and mortality (1.43[1.37–1.50] in women, 1.34[1.18–1.51] in men); they had decreased odds of healthy aging (odds ratio [OR, 95%CI], 0.36[0.32–0.40] in women and 0.50[0.43–0.57] in men). In a meta-analysis combing both sexes, the increase in risk associated with each 10 kg weight gain was 71% for type 2 diabetes, 27% for hypertension, 17% for cardiovascular disease, 31% for symptomatic cholelithiasis, 15% for obesity-related cancers, 9% for severe osteoarthritis, 5% for cataract extraction, and 9% for mortality; for the same weight gain the odds of healthy aging was 28% lower.

Conclusions: Our data provide strong evidence that weight gain from early to middle adulthood is associated with substantially increased risk of major chronic diseases and mortality, and overall decreased odds of aging with good health and well-being among women and men.


Funding: No

Funding Component:

08

Preterm Delivery and Maternal Cardiovascular Risk Factor Trajectories across the Life Course

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Introduction: Preterm delivery (<37 weeks) predicts 2 to 3-fold greater risk of cardiovascular disease in mothers. Development of subclinical cardiovascular risk in these women prior to and following pregnancy is not well understood.

Hypothesis: Women who deliver preterm have
an adverse cardiovascular health profile even prior to pregnancy.

Methods: Linked data from the population-based, longitudinal HUNT study (1984-2008) and the Medical Birth Registry of Norway (1967-2012) yielded clinical measurements and pregnancy outcomes for 23,179 parous women. Women had up to 3 measurements of body mass index, waist circumference, blood pressure, non-fasting lipids and glucose, and high-sensitivity C-reactive protein (hs-CRP) during a follow-up period between 20 years before first birth to 41 years after first birth. We used mixed effects linear spline models, adjusting for age, pre-pregnancy smoking, education, and time since last meal, to compare risk factor trajectories for women with preterm versus term/postterm first births.

Results: Women with a preterm first birth (n=1,402, 6%) had significantly higher triglyceride (Figure 1 A) and glucose levels prior to pregnancy. They also experienced steeper increases in systolic and diastolic blood pressure, non-HDL cholesterol, triglycerides, and hs-CRP from first birth to age 50 compared to women who delivered at term/post-term (Figure 1 A,B). Measures of adiposity were similar throughout the life course.

Conclusions: These results are consistent with the hypothesis that preterm birth is an early marker of cardiometabolic impairment. A history of preterm birth may predict high cardiovascular risk well before the development of traditional risk factors.


Funding: Yes

Funding Component: Founders Affiliate (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont)

09

The Association Between Waist-Hip Ratio with Long-Term Cardiovascular Events in Patients with Coronary Artery Disease: A Population-Based Historical Cohort Study

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Background: Central obesity leads to increased cardiovascular events. However, it is unknown whether the same occurs in individuals with established coronary artery disease (CAD). We
ascertained whether patients with established CAD and central obesity, as defined as an elevated waist-to-hip ratio (WHR), have an increased risk of major adverse cardiovascular events (MACE) than patients without central obesity.

**Methods:** We included consecutive patients referred to cardiac rehabilitation because of prior CAD events or procedures between the years 2002 and 2012 with complete clinical and WHR data. All follow-up was ascertained using the Rochester Epidemiology Project in Olmsted County, a population-based, record linkage system that consists of complete data on all residents. Patients were classified in sex-specific tertiles of WHR (low tertile=referent). We defined MACE as a composite outcome of individuals sustaining an acute coronary syndrome (myocardial infarction or unstable angina), coronary revascularization (coronary artery bypass grafting or percutaneous coronary intervention), ventricular arrhythmias, stroke or death from any cause. Sex-specific Cox proportional hazard models were adjusted for age, smoking and history of heart failure.

**Results:** Our cohort included 1529 patients (74% males) with mean age ± SD of 63.1±12.5 years. Mean BMI was 29.9±5.5 kg/m² and 28.9±6.1 kg/m² for males and females, respectively (p=0.005) and mean WHR was 0.98±0.08 cm for men and 0.86 ±0.08 for females (p<0.001). Eighty-eight percent of males and 57% of females were classified as having central obesity (p<0.001). Median follow-up was 5.7 years and 415 patients had an event: myocardial infarction (92), unstable angina (92), coronary artery bypass surgery (47), percutaneous coronary intervention (180), ventricular arrhythmia (11), stroke (48) and 154 died. Some had more than one event. BMI did not predict MACE (HR=1.01 95% CI: 0.98,1.04; p=0.41 for females; HR 0.99 95% CI: 0.97,1.01;p=0.56 for males). After adjustment, a high WHR tertile remained a significant predictor for MACE for females (overall p-value= 0.007), but not for males (p=0.12). The adjusted risk of MACE for females in the highest WHR tertile was almost 2-fold higher (HR=1.85 95% CI: 1.16,2.94; p=0.01). This relationship persisted after further adjustment by BMI (HR=1.75 95% CI: 1.07,2.87; p=0.03), while BMI continued unrelated to MACE after adjusting for potential confounders. **Conclusions:** WHR is associated with a higher risk of MACE among females but not in males with CAD. We did not observe an obesity paradox when assessing the association between BMI and MACE in CAD patients.

Disclosures: **J.R. Medina-Inojosa:** None. **J.A. Batsis:** None. **M. Supervia:** None. **V.K. Somers:** None. **R. Thomas:** None. **C. Grimes:** None. **S. Jenkins:** None. **F. Lopez-Jimenez:** None.

Funding: No

**Funding Component:**

10

**Metabolically Healthy Obesity Over 25 Years in the Coronary Artery Risk Development in Young Adults (CARDIA) Study: Race and Sex Differences**

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**Background:** Obesity is heterogeneous condition with phenotypic variation. Metabolically healthy obese (MHO) may represent an unstable phenotype which changes over time. MHO duration, or the length of time in MHO, is not well characterized. The purpose is to quantify MHO duration over 25 years and explore possible race/sex differences.

**Methods:** Young adults (baseline ages 18-30
yrs) from CARDIA were included if they were non-obese at baseline, developed obesity (BMI ≥30 kg/m²) at any follow-up exam (yrs 7, 10, 15, 20 and 25), and had complete data for metabolic status, age, race and sex (n=702). MHO was defined as obese (BMI ≥30 kg/m²) and having either 0 or 1 risk factor of the following: ≥SBP/DBP 130/85 mmHg; glucose ≥100 mg/dL; triglycerides (≥150 mg/dL); and HDL-C (men <40, women <50 mg/dL). Obese individuals with ≥2 risk factors were classified as metabolically unhealthy obese (MUO). MHO duration (yrs) and obesity duration (yrs) were estimated for subsequent time-points; and a duration sum was calculated for the follow-up period. For two time-points in which a person remained MHO and obese, a duration for that period was assigned. If they transitioned to MUO or non-obese, then the midpoint of the time period was estimated as MHO duration (yrs). MHO duration was also expressed as the percentage (%) of the total obesity duration. Multivariable adjusted ANCOVA was used to compare MHO duration (%) between race and sex groups (black men, white men, black women and white women), adjusting for baseline age, baseline BMI status (normal weight or overweight). Results: The eligible CARDIA sample was 55% black, 71% women and had a mean (± SD) baseline age of 25.0 ± 3.7 yrs. Duration of obesity was 12.3 ± 6.8 yrs, MHO duration (yrs) was 6.2 ± 5.4 yrs (range: 0 years to 19 yrs), and MHO duration (%) was 51.9 ± 34.8%. After adjusting for age and baseline BMI, MHO duration (% mean ± SE) was significantly higher in women compared to men within race (black women n=292: 56.3 ± 2.0% vs. black men n=91: 43.3 ± 3.6%, p=0.001; white women n=206: 56.1 ± 2.4% vs. white men n=113: 39.7 ± 3.2%, p <0.0001). No significant differences were found between race groups within gender (black men vs. white men or black women vs. white women). Conclusion: MHO status is a transient phenotype accounting for only approximately half of obesity duration. Women have longer MHO duration compared to men, but differences by race were not apparent. Future research is needed to explore possible modifiable predictors and/or determinants of longer MHO duration in order to maintain a healthy cardiometabolic phenotype, even in the presence of obesity.


Funding: No

Funding Component:

11

Associations of Gluten Intake With Type 2 Diabetes Risk and Weight Gain in Three Large Prospective Cohort Studies of US Men and Women


Background: Gluten-free diets have grown in popularity, but evidence is lacking regarding gluten intake and long-term health. Methods: In Nurses’ Health Study (NHS, n=69,276), NHSII (n=88,610), and the Health Professionals Follow-Up Study (HPFS, n=41,908), we estimated gluten intake using a validated food-frequency questionnaire collected every 2-4 years. Incident T2D was defined as physician diagnosed diabetes and confirmed with supplementary information. Results: Gluten intake (mean ± standard deviation) was 5.83±2.23, 6.77±2.50, and 7.06±2.76 grams/day in NHS, NHSII, and HPFS, respectively, and strongly correlated with intakes of carbohydrate sources, especially refined grains, starch, and cereal fiber (Spearman correlation coefficients > 0.6). During 4.24 million years of follow-up, 15,947 T2D cases were confirmed. An inverse association between gluten intake
and T2D risk was observed in all three cohorts after multivariate adjustment (table), and hazard ratio (HR, 95% confidence intervals [95%CI]) comparing extreme quintiles was 0.80 (0.76, 0.84; P<0.001). The associations were slightly attenuated after further adjusting for cereal fiber (HR[95%CI]= 0.87 [0.81, 0.93]), but not other carbohydrate components. Among participants without major chronic diseases and aged <65 years, changes in gluten intake were not significantly associated with weight gain in multivariate adjusted model: 4-year weight change (95%CI, lb) was 0.08 (-0.06, 0.22; P=0.25) in NHS, -0.05 (-0.18, 0.08; P=0.43) in NHSII, and 0.36 (-0.24, 0.96; P=0.24) HPFS for each 5 grams increase in gluten intake. **Conclusions:** Our findings suggest that gluten intake may not exert significant adverse effects on the incidence of T2D or excess weight gain. Limiting gluten from diet is thus unlikely to facilitate T2D prevention and may lead to reduced consumption of cereal fiber or whole grains that help reduce diabetes risk.

**Disclosures:** G. Zong: None. B. Lebwohl: None. F. Hu: None. L. Sampson: None. L. Dougherty: None. W. Willett: None. A. Chan: None. Q. Sun: None.

**Funding:** No

**Funding Component:**

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**Whole Blood DNA Methylation Signatures of a Mediterranean-style Dietary Pattern**

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**Introduction:** Mediterranean-style dietary patterns (MSDPs) have been associated with lower risk of cardiometabolic diseases, but the underlying biological mechanisms are poorly understood. To date, little is known in humans of the relationship between MSDPs and epigenetics. We hypothesized that adherence to a MSDP is associated with DNA methylation, an important epigenetic modification. **Methods:** We conducted a cross-sectional study of 3,563 Framingham Heart Study participants (median age 59 years, 55% women). We excluded participants with heavy alcohol use. Whole-blood derived DNA methylation of 480,000 cytosine-phosphate-guanine dinucleotides (CpGs) was assessed using the Illumina HumanMethylation450 BeadChip. A MSDP score was created based on nine dietary components, including fruits, vegetables, legumes, nuts, whole grains, fish, red meat, alcohol, and ratio of monounsaturated fatty acids to saturated fatty acids. Food intake was assessed by a validated food frequency questionnaire. Our study sample was randomly split into separate discovery/replication groups (n=1,788 and n=1,775) by pedigrees. We tested the association of CpG methylation with the MSDP score using linear mixed model, adjusted for sex, age, and energy intake (as well as family structure, imputed leukocyte composition, and technical variables). CpGs identified in discovery at FDR<0.05 were taken forward for replication. We then tested the significance (Bonferroni corrected α 0.05) of the identified CpGs after additional adjustment for smoking, physical activity, and BMI in whole study sample. **Results:** One CpG, cg05575921 in the **AHRR** gene, was associated with MSDP score in the discovery sample (P=3.3x10^-10) and replicated in the replication sample (P=3.6x10^-8). In whole
study sample, higher MSDP score was associated with greater methylation of cg05575921 after adjustment for sex, age, energy intake, smoking, physical activity, and BMI ($P=4.5\times10^{-3}$). Higher fruit and whole grain intake was also associated with higher methylation level of cg05575921 ($P=3.8\times10^{-7}$ and $5.1\times10^{-8}$, respectively) and legume intake was associated with higher methylation level of cg17333223 (annotated to the NBA2 gene, $P=1.3\times10^{-7}$). In contrast, fruit intake was associated with lower methylation of cg07035242 (annotated to the UBIAD1 gene, $P=2.0\times10^{-7}$). These patterns persisted in the replication and in whole study sample. **Conclusions:** These data demonstrate a unique whole blood DNA methylation signature of a MSDP score and some of its individual components. The differentially methylated genes may represent therapeutic targets for prevention or treatment of cardiometabolic diseases. Future work is needed to explore the underlying mechanisms.


Funding: No

Funding Component:

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**Adherence to Various Dietary Patterns and Risk of Recurrent Coronary Heart Disease and Mortality in the REasons for Geographic and Racial Differences in Stroke (REGARDS) Study**


**Background:** We have shown that the Southern dietary pattern, characterized by added fats, fried foods, organ and processed meats, and sugar-sweetened beverages, is associated with a greater risk of incident CHD in REGARDS, a national, population-based, longitudinal cohort. We sought to determine if the Southern pattern, other dietary patterns, and the Mediterranean diet score were associated with CHD events and mortality in REGARDS participants who previously reported CHD.

**Methods:** REGARDS enrolled white and black adults aged ≥45 years between 2003-2007. Data were analyzed from 3,562 participants with CHD at baseline. Participants completed an FFQ at baseline, from which 5 dietary patterns were derived through factor analysis (Table). The Mediterranean diet score was calculated for each participant. Expert-adjudicated CHD events included myocardial infarction and CHD death. Cox proportional hazards regression was used to model the association of the dietary patterns and score with CHD events and death, adjusting for sociodemographics, lifestyle factors, energy intake, anthropometrics, and medical conditions.

**Results:** Over 7 years of follow-up, there were 581 recurrent CHD events and 1,098 deaths. In fully-adjusted analyses, the highest quartile of adherence to the alcohol/salads pattern and highest group of the Mediterranean diet score were associated with lower risk of recurrent CHD compared to the lowest quartile/group (HR: 0.76; 95% CI: 0.59 – 0.98, HR: 0.78; 95% CI: 0.62 – 0.98, respectively). The highest quartile of adherence to the Southern pattern was associated with higher mortality (HR: 1.57; 95% CI: 1.28 – 1.91), while the highest group of the Mediterranean diet score was associated with lower mortality (HR: 0.80; 95% CI: 0.68 – 0.95).

**Conclusions:** While the Southern dietary pattern was not related to risk of recurrent CHD, it was associated with higher mortality in REGARDS participants with existing CHD. Greater adherence to a Mediterranean diet was associated with lower risk of recurrent CHD and mortality.
Diet Quality and Cardiovascular Disease Risk in Postmenopausal Women With Type 2 Diabetes: the Women’s Health Initiative

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Introduction
Both type 2 diabetes (T2D) and cardiovascular disease (CVD) are known to be influenced by dietary intake, however there is little evidence from large and well characterized cohort studies regarding the relationship between popular dietary patterns and CVD risk in populations with T2D. Understanding how common diet scores associate with CVD risk may provide better nutrition recommendations, education, and targeted interventions in the population with T2D. **Hypothesis**
We hypothesize that high diet quality as represented by higher scores on four different a priori diet indices is associated with a lower risk of developing CVD in postmenopausal women with T2D.

**Methods**
We analyzed data of 6031 postmenopausal women with type 2 diabetes from the Women’s Health Initiative (WHI) cohort with no history of CVD at baseline. Dietary intake was assessed by a validated WHI food frequency questionnaire. Diet scores for four different diet patterns were calculated: Mediterranean (aMed), Dietary Approaches to Stop Hypertension (DASH), Paleolithic diet, and American Diabetes Association dietary recommendations (ADA). Multivariate Cox proportional hazards regression was used to estimate the hazard ratio of incident coronary heart disease (CHD) and stroke during study follow up for each dietary pattern score, adjusting for demographic, lifestyle and clinical measures.

**Results**
Over 21 years of follow up 11.2% (675/6031) of women developed CHD and 6.7% (408/6031) had a stroke. There was a strong, monotonic inverse association between higher aMed, DASH, and ADA diet scores and risk of incident CHD and stroke; and no association between the Paleolithic dietary pattern score and CHD or stroke (Table 1).

**Conclusions**
There are multiple dietary avenues to lower CVD risk in a population with T2D via the aMed, DASH, and ADA diets; whereas there was no evidence the Paleolithic diet score is associated with CVD risk in a population with T2D.
The Impact of Suboptimal Diet on Cardiovascular Disease Mortality in the United States


Introduction Poor dietary habits are an established risk factor to cardiovascular disease (CVD). Yet, the impact of suboptimal diet on CVD mortality in the US has not been systematically evaluated. Objective To quantify the effect of suboptimal intake of 11 dietary factors (fruits, vegetables, nuts, whole grains, processed meat, sugar-sweetened beverages, seafood omega-3 fatty acids, polyunsaturated fatty acids, trans fatty acids, fiber, sodium) on CVD mortality by age and sex in the US in 2015. Methods Using the Global Burden of Disease study analytic framework, we conducted a comparative risk assessment analysis to estimate the number of CVD deaths attributable to 11 dietary factors in the US. We obtained data on intake of each dietary factor from the National Health and Nutrition Examination Survey. Etiologic effect sizes of each dietary factor on CVD endpoints were obtained from the most recent meta-analyses of prospective observational studies. Optimal level of intake was determined based on the level associated with the lowest risk of mortality in cohort studies. Results In 2015, suboptimal diet accounted for 222,100 (95% UI: 189,500-252,800) CVD deaths among men and 193,400 (95% UI: 161,100-226,100) CVD deaths among women in the US. Low intake of nuts (100,460 [59,690-148,480] CVD deaths; 11.6% of CVD deaths), low intake of vegetables (99,530 [45,370-161,100]; 11.5%), low intake of whole grains (89,670 [(52,300-132,980], 10.4%) and high intake of sodium (77,260 [22,760-169,690], 9%) were the leading dietary risk factors for CVD mortality in the US (Figure). Conclusion Our results highlights the need for implementation for evidence-based policies to promote the intake of cardioprotective dietary factors in particular nuts, vegetables, and whole grains in the US.

Effect of Long-Term Selenium Supplementation on Mortality: Results From a Multiple-Dose Randomised Controlled Trial

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Background: Selenium (Se) is an essential trace element that is incorporated into...
selenoproteins with a wide range of health effects. The concentration of selenoproteins plateaus at plasma Se concentrations ~125 µg/L, however, and it is unclear whether Se supplementation is beneficial above this plateau. **Methods:** In a double-blind, randomized, controlled trial of Se supplementation and mortality in Denmark, a population of moderately-low Se status, 491 men and women, 60-74 years of age, were treated with 100, 200, or 300 µg Se/d as Se-enriched yeast or placebo-yeast. From 2008-2009, active treatment was provided for 5 years and post-treatment follow-up for 10 additional years. During 6,871 person-years of follow-up, there were 158 deaths (31 during active treatment and 127 after treatment cessation). **Results:** The hazard ratio (95% confidence interval [CI]) for all-cause mortality comparing 300 µg Se/d to placebo was 1.62 (0.66 to 3.96) after 5 years of treatment and 1.59 (1.02 to 2.46) over the entire follow-up. Se doses of 100 and 200 µg/d non-significantly decreased mortality during the intervention period but their effects vanished after treatment cessation. The effects on cancer and cardiovascular mortality were similar but less precise than on all-cause mortality. **Conclusions:** A dose of 300 µg/d of Se (as high-Se yeast) taken for five years in a country with moderately-low Se status increased all-cause mortality 10 years later. Lower doses showed a non-significant reduction in mortality which dissipated after treatment discontinuation. Total Se intake (diet plus supplements) over 300 µg/d should be avoided.

**Disclosures:** M. Rayman: None. K.H. Winther: None. R. Pastor-Barriuso: None. F. Cold: None. M. Thvilum: None. S. Stranges: None. E. Guallar: None. S. Cold: None.

**Funding:** No

**Funding Component:**

**Association of Race and Sex with Cardiovascular Disease and Non-Cardiovascular Disease Mortality: The REasons for Geographic and Racial Differences in Stroke study**

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**Introduction:** Black Americans have higher rates of cardiovascular disease (CVD) mortality compared with whites. Differences in sociodemographic, psychosocial, CVD, and other risk factors may explain increased mortality risk. **Methods:** We analyzed data from 29,015 REasons for Geographic and Racial Differences in Stroke study participants to determine factors that may explain the higher hazard ratio for CVD and non-CVD mortality in blacks compared with whites. Cause of death was adjudicated by trained investigators. Within age-sex sub-groups, we used Cox proportional hazards regression with progressive adjustment to estimate black:white hazard ratios. **Results:** Overall, 41.0% of participants were black, and 54.9% were women. Over a mean follow-up of 7.1 years (maximum 12.3 years), 5,299 participants died (1,797 CVD and 3,502 non-CVD deaths). Among participants < 65 years of age, the age and region adjusted black:white hazard ratio for CVD mortality was 2.28 (95% CI: 1.68-3.10) and 2.32 (95% CI: 1.80-3.00) for women and men, respectively, and for participants ≥ 65 was 1.54 (95% CI: 1.30-1.82) and 1.35 (95% CI: 1.16-1.57) for women and men, respectively (Table). The higher black:white hazard ratios for CVD mortality were no longer statistically significant after multivariable adjustment, with the largest attenuation occurring with sociodemographic and CVD risk factor adjustment. Among participants < 65 years of age, the age and region adjusted black:white hazard ratios for non-CVD mortality were 1.51 (95% CI: 1.24-
1.85) and 1.76 (95% CI: 1.46-2.13) for women and men, respectively, and for participants ≥ 65 was 1.12 (95% CI: 1.00-1.26) and 1.34 (95% CI: 1.20-1.49) for women and men, respectively. The higher black:white hazard ratios for non-CVD mortality were attenuated after adjustment for sociodemographics.

Conclusions: Black:white differences are larger for CVD than non-CVD causes of death. The increased CVD mortality for blacks compared with whites is primarily explained by sociodemographic and CVD risk factors.

Disclosures: G.S. Tajeu: None. M.M. Safford: C. Other Research Support; Significant; Amgen, Inc. G. Consultant/Advisory Board; Modest; Amgen, Inc. G. Howard: None. R.M. Tanner: None. P. Muntner: B. Research Grant; Significant; Amgen, Inc.

Funding: No

Funding Component:

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Spatiotemporal and Demographic Trends in Cardiovascular Disease in the US Elderly Based on 108 Million Hospitalization Records

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BACKGROUND The US population is rapidly aging, with concurrent increases in chronic disease burdens, particularly CVD. Yet, to-date, the spatial, temporal, and demographic distributions and trends in CVD incidence in the US elderly have not been characterized in detail using data with full coverage of this population.

OBJECTIVE To characterize trends, 1991-2004, in CVD hospitalizations among US elderly, by single year of age/sex/race/county/state using records from US Centers for Medicare and Medicaid (CMS), which provide full coverage of the US population aged 65+. METHODS We abstracted 108,357,431 hospitalization records compiled by CMS indicating CVD in any of 10 diagnosis codes, and tabulated total cases of CVD by sex, single year of age, state and calendar year (1991-2004). CVD incidence rates were calculated using stratum-specific population data from the US Census in conjunction with CMS records. We characterized distributions of CVD cases by single year of age for the US and further by state and calendar year, determining the sex-specific age at which the largest number of incident CVD cases were registered (peak age).

RESULTS CVD hospitalization rates increased from 1991-2004 for women aged 65-90 and men aged 65-80, but declined in the oldest-old. In 1991, CVD hospitalization rates for women aged 75 were 48 per 100,000 population, rising to 70 per 100,000 in 2004; men aged 75 had rates of 66 per 100,000 in 1991 versus 87 per 100,000 in 2004. Nationally, peak age of CVD hospitalizations increased 1991-2004, from 77 to 83 years of age for women and from 70 to 77 years of age for men. Men and women in Southern states had among the lowest peak ages of CVD in the nation in 1991 as well as 2004. (Figure) Trends by race/CVD subtype are forthcoming. CONCLUSIONS Emerging national trends and regional heterogeneity in CVD hospitalization rates and peak age of CVD hospitalization in the US elderly emphasize the need for targeted population-level policy/interventions to reduce CVD burdens and promote healthy aging.
State-level Disparities in Health Loss Due to Cardiovascular Causes: Results of the Global Burden of Disease 2015 Study

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Introduction: Reducing cardiovascular (CVD) health disparities is a major policy goal in the United States but comprehensive and comparable estimates of CVD disease burden do not exist. The GBD2015 study developed a method to estimate disability-adjusted life-years (DALYs) lost to CVD for each state.

Hypothesis: We assessed the hypothesis that health loss due to CVD is no longer declining in the United States.

Methods: We used death certificates, health surveys, commercial databases, and published literature to estimate CVD death rate and prevalence. Our analyses corrected for use of non-specific causes of death, readmission rates, and variation in the use of ICD codes. Models were run separately by age, sex, state, cause, and year. Disability weights were derived from large-scale surveys of the public. Uncertainty intervals (UI) were estimated using 1000 draws from the posterior distribution of each model.

Results: In the U.S. in 2015, 13.63 million DALYs were lost due to CVD (95% UI 13.1-14.2), which accounted for 15.4% (95% UI 14.1-16.9%) of total DALYs for the United States. From 1990-2015, the annualized rate of change for CVD DALYs (per 100,000 persons) was -1.2%, but for 2010-2015, this rate was 0.5%. The smallest annualized rate of change for CVD DALYs (per 100,000, age-standardized) from 1990-2015 was observed in Oklahoma (-1.1%) while the largest change was in New York (-2.6%). For only 2010-2015, this rate declined in most states but increased in Idaho, Indiana, Mississippi, and Maine by 0.02-0.47%. Ischemic heart disease was the predominant cause of health loss for all states.

Conclusions: The decline in CVD burden has slowed in all states, with rates rising in several states. Further efforts are needed to understand state-level factors influence changing rates of CVD burden.
**Background:** Electronic health records (EHRs) are an increasingly valuable data source for monitoring population health. However, EHR data are rarely shared across health system borders, limiting their utility to researchers and policymakers. The Guideline Advantage™ (TGA) program, a joint initiative by the American Heart Association (AHA), American Cancer Society, and American Diabetes Association, brings together data from EHRs across the country to support disease prevention and management efforts in the outpatient setting.

**Methods:** We analyzed TGA EHR data from >70 clinics comprising 281,837 adult patients from 2010 to 2015. We used the first available measure per patient for each calendar year to characterize trends in the proportion of patients in “ideal”, “intermediate”, and “poor” CVH categories for blood pressure (BP), body mass index (BMI) and smoking. Total cholesterol and fasting glucose values were not reported to TGA. Thus, we used low-density lipoprotein (LDL) and hemoglobin A1c (A1c) treatment guidelines to classify patients into CVH categories for the respective metrics.

**Results:** Patients were an average of 50 years old, and 57.4% were female. Of records with complete data on race, 70.9% of patients were white. Over 6 years of observation, we documented increases in the proportion of patients at ideal levels for BP, smoking, LDL, and A1c, but decreases in the proportion of patients at an ideal level for BMI (Figure).

**Conclusions:** TGA data provide a large-scale perspective of outpatient CVH, yet we acknowledge limitations associated with using EHR data to assess trends in CVH. Specifically, EHR data entry is clinically-driven - BP and BMI values are likely to be updated at each visit for each patient, while smoking status, LDL, and A1c are not. Our analysis lays the groundwork for EHR analyses as these data become less siloed and more accessible to stakeholders.

**Figure.** Trends in CVH from 2010 to 2015: The Guideline Advantage™

**Disclosures:** R. Foraker: None. S. Patel: None. Y. Khan: None. M. Bauman: None. J. Bower: None.

**Funding:** No

**Funding Component:**

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**Years of Life Lost from Cardiovascular Disease Mortality Among Hispanics**

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**Background:** Hispanics face a disproportionate burden of cardiovascular disease (CVD) risk factors yet paradoxically experience lower death rates as compared to their non-Hispanic white (NHW) counterparts. Years of life lost (YLL) is a more precise measure of premature mortality.

**Hypothesis:** We hypothesize there will be heterogeneity in the YLL due to CVD between Hispanic subgroups.

**Methods:** We used data from the National Center for Health Statistics Mortality file to compare deaths for Hispanic (n=832,550) subgroups and NHWs (n=7,770,145) <75 years of age from 2003 to 2012. We identified all CVD deaths and by subtype (i.e. ischemic, cerebrovascular, hypertensive and heart failure) using the underlying cause of death (ICD-10: I00-I78, I20-I25, I60-I69, I11, I13 and I50, respectively). YLL was calculated by age categories standardizing with 2000 U.S. Census population. Population estimates were calculated using linear interpolation from 2000 and 2010 U.S. Census.

**Results:** After standardization, 11.4 year-losses per 1000 people due to CVD for NHWs and 8.2 per 1000 for Hispanics. Overall, Hispanics had
lower YLL compared to NHWs and Puerto Ricans had higher losses among Hispanic subgroups. Most Hispanics had higher YLL for cerebrovascular disease than NHWs (Hispanics 1.1 times higher, Puerto Rican 1.2 times higher and Mexican 1.3 times higher) (Figure).

**Conclusions:** Premature mortality from CVD varies greatly by Hispanic subgroups. These findings suggest the importance of disaggregating CVD mortality by Hispanic subgroup and using more sensitive measures of premature death in public health analyses.

Disclosures: **F. Rodriguez:** None. **K. Hastings:** None. **J. Hu:** None. **L. Palaniappan:** None.

Funding: No

**Funding Component:**

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**Geographic Proximity of Automated External Defibrillators to Out-of-hospital Sudden Deaths in Wake County, North Carolina**

**Brittany M. Bogle,** Golsa Joodi, Ross Simpson, Univ of North Carolina-Chapel Hill, Chapel Hill, NC

**Introduction:** Survival rates for out-of-hospital sudden cardiac arrest are substantially improved by access to automated external defibrillators (AEDs) prior to Emergency Medical Services (EMS) arrival. However, AED use may be inhibited if their locations are unknown or far from the bystander. **Objectives:** We sought to classify out-of-hospital sudden death (OHSD) event locations, ascertain if bystanders utilized AEDs prior to EMS arrival, and calculate the distance to the nearest AED. **Methods:** From 2013 to 2015, we screened all EMS-reported out-of-hospital deaths aged 18-64 within Wake County, North Carolina to identify OHSDs. We geocoded event locations from EMS records and classified them as residential, commercial, public, or unknown using US Postal Service Residential Delivery Indicator, EMS narratives, and web searches. AED locations and installation dates, registered by law, were obtained from North Carolina Department of Health and Human Services. We used EMS narratives to determine AED use prior to EMS arrival. Walking distance between coordinates of an OHSD location and every AED installed prior to the death date was estimated using the Great-Circle distance. **Results:** Of 434 adjudicated OHSDs, 390 (90%) were residential, 31 (7%) were commercial, and 11 (2.5%) were public. Of commercial locations, 12 (39%) occurred in hotels. Of public locations, 6 (46%) occurred in parking lots or parks. Wake County had 168 registered AEDs during the study period. The mean distance from OHSD to closest AED was 3.2 km (95% CI: 3.0-3.5 km). Only 20 (4.6%) of OHSDs were within 500 meters of an AED; the closest AED was 77 meters from an OHSD. Bystanders used AEDs prior to EMS arrival twice. **Conclusions:** While potentially lifesaving, AEDs are not placed optimally with respect to OHSD locations and are rarely utilized by bystanders, even in non-residential spaces. Public health strategies should be considered that incentivize optimal AED placement to witnessed cardiac arrest locations.

Disclosures: **B.M. Bogle:** None. **G. Joodi:** None. **R. Simpson:** None.

Funding: No

**Funding Component:**
Background: Metabolites associated with betaine and choline metabolism and the gut-microbiota-dependent metabolite trimethylamine N-oxide (TMAO) have been linked to the risk of cardiovascular disease (CVD). However, the relationship between plasma concentrations of other gut microbiota-related metabolites and major CVD endpoints remains unclear.

Objectives: To evaluate the association between gut microbiota-related metabolites and risk of incident CVD and the potential modifying effect of Mediterranean diet (MedDiet) interventions.

Methods: We designed a case-cohort study nested within the PREDIMED trial. We used liquid chromatography–tandem mass spectrometry to measure plasma gut microbiota-related metabolites. A score including the sum of quartile values of 8 metabolites was constructed (TMAO, betaine, choline, phosphocholine, alphaglycerophosphocholine, proline, hydroxyproline, allantoin). The primary outcome was a composite of myocardial infarction, stroke, and cardiovascular death.

Blood samples from a randomly selected PREDIMED sub-cohort (n=751) and all available incident CVD cases (n=229) after 4.8-y of follow-up were included in the analysis. We used weighted Cox regression models to estimate multivariable-adjusted hazard ratios (HR) and their 95% confidence intervals (CI). Models were adjusted for age, sex, BMI, family history of premature heart disease, and smoking, physical activity (metabolic equivalent tasks in min/d), hypertension, dyslipidemia, diabetes and was stratified by intervention group.

Results: Baseline plasma concentrations of choline and hydroxyproline were associated with higher CVD risk independent of traditional risk factors, while no significant association
between plasma concentrations of TMAO and CVD was found. The HRs comparing extreme quartiles (lowest quartile as the reference) were 1.72 (95% CI: 1.05, 2.81; P for trend=0.01) and 1.65 (95% CI: 1.03, 2.65; P for trend =0.04), respectively. The microbiota metabolite score was associated with a 2.13-fold higher risk of CVD across extreme quartiles (95% CI: 1.32, 3.43; P for trend <0.001) and a 1.99-fold higher risk of stroke (95% CI: 1.08, 3.65; P for trend=0.02). Baseline betaine/choline ratio was inversely associated with CVD. Compared to participants with a score below the median and randomized to the Mediterranean diet, the HR of developing CVD was 2.56 (95% CI: 1.59, 4.11) for participants with a gut microbiota score above the median and randomized to the control group.

Conclusions: Plasma gut microbiota-related metabolites were associated with an increased risk of CVD in a Mediterranean population at high cardiovascular risk, independent of traditional CVD risk factors.


Funding: No

Funding Component: 24

**Childhood Risk Factor Patterns Predict Adult Type 2 Diabetes Better Than Single Childhood Risk Factor Measures: The International Childhood Cardiovascular Cohort (i3C) Consortium**

**Tian Hu**, Alan Sinaiko, Univ of Minnesota, Minneapolis, MN; Elaine Urbina, Cincinnati Children’s Hosp, Cincinnati, OH; Olli Raitakari, Univ of Turku, Turku, Finland; Jessica Woo, Cincinnati Children’s Hosp, Cincinnati, OH; Lydia Bazzano, Tulane Univ, New Orleans, LA; Julia Steinberger, Univ of Minnesota, Minneapolis, MN; Trudy Burns, Univ of Iowa, Iowa City, IA; Markus Juonala, Univ of Turku, Turku, Finland; Alison Venn, Menzies Inst for Medical Res, Univ of Tasmania, Hobart, Australia; Stephen Daniels, Univ of Colorado, Denver, CO; Ronald Prineas, Wake Forest Univ, Winston-Salem, NC; Terence Dwyer, Univ of Oxford, Oxford, United Kingdom; Costan Magnussen, Menzies Inst for Medical Res, Univ of Tasmania, Hobart, Australia; David Jacobs Jr, Univ of Minnesota, Minneapolis, MN

**Background:** Childhood risk factors predict adult onset type 2 diabetes mellitus (T2DM). We developed a novel statistical approach using risk factor patterns to improve prediction.**Methods:** The cohort included 5269 individuals from the Bogalusa Heart Study, Cardiovascular Risk in Young Finns Study, Childhood Determinants of Adult Health Study, Childhood Cohort Studies in Minneapolis and Cincinnati, and the Muscatine Study. All had 2+ childhood measures of risk factors between ages 3 and 20 in 1970s-90s and reported whether they had T2DM between ages 21 and 63 in 2011-16. We established sex-specific polynomial age patterns to represent standard growth curves for each risk factor and computed the residual from this standard for each observation within ages 3-20. Residuals were regressed on age within each person to get a personal intercept and slope, and then 9 patterns were formed as intercept tertiles crossed with slope tertiles within each intercept tertile. T2DM associations with risk factors were assessed by using either the first childhood measurement or childhood patterns of body mass index (BMI), systolic blood pressure (SBP), and height (HT), with covariates age at first visit, sex, race, and study.**Results:** Mean age at first measure was 9.2 (SD 3.3) y, 41% male, 85%
white, 12% black, with 2-19 repeats of childhood risk factor measures. Risk factor patterns tended to diverge from each other by mid-childhood and measured adult risk factor values were well predicted, diverging widely across the childhood patterns (not shown). After mean follow-up of 29.0 (SD 8.1) y, 282 (5.4%) participants self-reported T2DM. T2DM was predicted by the model including first measures of BMI (positive), SBP (positive), and HT (inverse), but the corresponding pattern model improved prediction probability by 55% (Table). Conclusion: These findings show the value of using multiple risk factor measurements during childhood and the potential for developing risk factor pattern charts to be used as clinical standards for predicting adult T2DM risk.


Funding: No

Funding Component:

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The Impact of Excess Body Weight on Cardiovascular Disease Mortality From 1990 to 2015 and Drivers of Change at the State-Level in the United States

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Introduction: Maintaining a healthy weight is a key step toward ideal cardiovascular health and achieving AHA 2020 goals. State-level estimates of excess body weight and its impact on cardiovascular disease (CVD) mortality are necessary to inform interventions and track progress.

Objective: To systematically quantify CVD deaths attributable to high body mass index (BMI) by age, sex, and state between 1990 and 2015.

Methods: We synthesized 118 surveys (12,972,378 person-years) to characterize the population distribution of BMI by age, sex, and state from 1990-2015. We used a hierarchical mixed-effects linear regression to quantify and adjust for bias in self-reported height and weight data. Using the Global Burden of Disease analytic framework, we estimated CVD deaths attributable to high BMI in five-year increments from 1990 to 2015. We also quantified the contribution of changes in population structure, background mortality rate, and risk exposure to overall changes in CVD mortality.

Results: In 2015, 173,180 (95% uncertainty interval: 130,890-218,620) CVD deaths were attributable to high BMI in the US: 70.4% from ischemic heart disease, 11.6% from hypertensive heart disease, 9.7% from hemorrhagic stroke and 8.2% from ischemic stroke. Mississippi had the highest attributable death rate (65.6 per 100,000 [51.6-80.3]), whereas Colorado had the lowest (23.4 [17.1-30.6]) (Figure). While the prevalence of excess body weight increased in all states from 1990-2015, reductions in background mortality rate offset increases in risk exposure (Figure). As a result, over the past 25 years the death rate attributable to high BMI increased in only 3 states (annual percent change: OK [0.53%], AL [0.17%], AK [0.08%]). The 3 states with the greatest annual decrease in attributable death rate were MN (-1.52%), NH (-1.47%), and MA (-1.45%).
Conclusions: Our results highlight the need for implementation of evidence-based interventions at the state-level to reduce the prevalence and disease burden of high BMI in order to meet AHA 2020 goals.

Disclosures: **M.B. Reitsma**: None. **A. Afshin**: None.

Funding: No

Funding Component: 25

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Introduction: Maintaining a healthy weight is a key step toward ideal cardiovascular health and achieving AHA 2020 goals. State-level estimates of excess body weight and its impact on cardiovascular disease (CVD) mortality are necessary to inform interventions and track progress.

Objective: To systematically quantify CVD deaths attributable to high body mass index (BMI) by age, sex, and state between 1990 and 2015.

Methods: We synthesized 118 surveys (12,972,378 person-years) to characterize the population distribution of BMI by age, sex, and state from 1990-2015. We used a hierarchical mixed-effects linear regression to quantify and adjust for bias in self-reported height and weight data. Using the Global Burden of Disease analytic framework, we estimated CVD deaths attributable to high BMI in five-year increments from 1990 to 2015. We also quantified the contribution of changes in population structure, background mortality rate, and risk exposure to overall changes in CVD mortality.

Results: In 2015, 173,180 (95% uncertainty interval: 130,890-218,620) CVD deaths were attributable to high BMI in the US: 70.4% from ischemic heart disease, 11.6% from hypertensive heart disease, 9.7% from hemorrhagic stroke and 8.2% from ischemic stroke. Mississippi had the highest attributable death rate (65.6 per 100,000 [51.6-80.3]), whereas Colorado had the lowest (23.4 [17.1-30.6]) (Figure). While the prevalence of excess body weight increased in all states from 1990-2015, reductions in background mortality rate offset increases in risk exposure (Figure). As a result, over the past 25 years the death rate attributable to high BMI increased in only 3 states (annual percent change: OK [0.53%], AL [0.17%], AK [0.08%]). The 3 states with the greatest annual decrease in attributable death rate were MN (-1.52%), NH (-1.47%), and MA (-1.45%).

Conclusions: Our results highlight the need for implementation of evidence-based interventions at the state-level to reduce the prevalence and disease burden of high BMI in order to meet AHA 2020 goals.

Disclosures: **M.B. Reitsma**: None. **A. Afshin**: None.

Funding: No

Funding Component: 26
Validity of Cardiovascular Data From Electronic Data Research Networks: The Multi-Ethnic Study of Atherosclerosis (MESA) and HealthLNK

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Background:
Understanding the validity of data from electronic clinical data research networks compared to population-based CVD cohorts, the gold standard for epidemiological research, is essential for conducting epidemiological research across large, diverse populations more efficiently.

Methods:
We linked individual-level data from MESA with HealthLNK, a 2006-2012 database of electronic health records (EHRs) from 6 major Chicago hospitals. To evaluate for correlation and bias for blood pressure (BP) and BMI between HealthLNK and in-person MESA examinations, we used Pearson Correlation Coefficients and Bland-Altman plots. Median BMI and BP values between 2006-2008 in HealthLNK were compared to MESA exam 4 and between 2009-2012 were compared to MESA exam 5. Using diagnoses in MESA as the gold standard, we also calculated the performance of HealthLNK queries for hypertension (HTN) and obesity using ICD9 codes alone and with the addition of clinical data.

Results:
Of the 1164 MESA participants at the Chicago field center, 802 participants had data in HealthLNK. There was a high correlation between BMI in MESA and HealthLNK (0.94). HealthLNK only slightly underestimated BMI by 0.5 kg/m² (Figure). The correlation was lower for systolic BP and diastolic BP (0.3 and 0.4, respectively). Compared to MESA, HealthLNK significantly overestimated SBP and DBP by 6.5 and 3.6 mmHg, respectively. Using ICD9 codes alone, the sensitivity and specificity for HTN were 62.2% and 72.7% and for obesity were 28.1% and 97.4%. The addition of BP and medications to ICD9 codes increased sensitivity and decreased specificity for HTN to 73.2% and 53.2%. The addition of BMI increased sensitivity and decreased the specificity for obesity to 64.3% and 95.4%.

Conclusion:
Significant disagreement between risk factor status and BP exists between HealthLNK and MESA, while BMI is highly correlated. Identifying areas of concordance and discordance informs our understanding of the strengths and limitations of using EHR data for epidemiological research.


Funding: No

Funding Component:

27

Volume and Density of Calcium in the Ascending Thoracic Aorta, When Present, Predict Incident Coronary Heart Disease Beyond Coronary Artery Calcium: the Multi-Ethnic Study of Atherosclerosis

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Introduction: Coronary artery calcium (CAC) volume and density differentially predict coronary heart disease (CHD) beyond traditional CVD risk factors. Whether similar associations exist for ascending thoracic aortic calcium (ATAC) volume and density are unknown. We hypothesized that ATAC volume and density predict CHD independent of the pooled cohort equations (PCE) and CAC.

Methods: The Multi-Ethnic Study of Atherosclerosis followed 6,814 participants free of clinical CVD at recruitment. Cardiac CT was performed at baseline. For this analysis, only those with prevalent ATAC were included (necessary for evaluation of density). Cox regression was used to estimate associations of ATAC volume and density with incident CHD (fatal/non-fatal MI and cardiac arrest), with adjustment for the PCE and CAC volume and density. The incremental predictive value of ATAC volume and density was evaluated by area under receiver operating characteristic curves (AUC).

Results: Of the total cohort, 233 (3.4%) had prevalent ATAC. In these participants, 29 CHD events occurred over 10.3 years. After simultaneous adjustment for the PCE, ATAC and CAC volumes and densities, ATAC alone was associated with CHD, with one standard deviation (SD) higher natural log ATAC volume associated with a 76% greater risk [HR 1.76 (95% CI 1.07-2.87)], and one SD lower ATAC density associated with a 57% lower risk [0.43 (0.26-0.71)]. The PCE, CAC volume and CAC density were not significantly associated with CHD. A model containing the PCE, CAC volume and density had an AUC of 0.584 (0.467-0.701) for incident CHD prediction. Adding ATAC volume and density to the model improved the AUC to 0.703 (0.588-0.817) (see table).

Conclusions: ATAC was uncommon in a cohort free of baseline clinical CVD. However, when ATAC was present, both ATAC volume and density were independently associated with incident CHD. Furthermore, in these participants, the PCE and CAC poorly discriminated incident CHD, and ATAC volume and density substantially improved risk prediction.


Funding: No

Funding Component:

28

Orthostatic Hypotension is Associated With 20-year Cognitive Decline and Incident Dementia: the Atherosclerosis Risk in Communities (ARIC) Study

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Background: Orthostatic hypotension (OH) has been associated with incident cardiovascular disease and all-cause mortality, but few studies have examined long-term associations with cognitive decline and dementia

Hypothesis: OH will be associated with greater cognitive decline and risk of incident dementia

Methods: We prospectively analyzed 11503 participants who attended visit 1 (1987-1989) of the ARIC study and had no history of coronary heart disease or stroke. OH was defined as a
drop in systolic blood pressure (BP) >=20 mmHg or a drop in diastolic BP >=10 mmHg upon standing from a supine position. Dementia was ascertained using cohort surveillance, telephone contact with the participant or their proxy, or a comprehensive cognitive and neurologic exam in 2011-2013. Cognition was measured via three neuropsychological tests administered in 1990-1992, 1996-1998, and 2011-2013 that were summarized using a Z score. We used adjusted Cox regression and linear mixed models. 

Results: At visit 1 (mean age 54 years, 57% female, 27% black) 6% of participants had OH. In adjusted models, persons with OH at baseline were 40% more likely to develop dementia than those without OH (HR: 1.40, 95%CI: 1.13, 1.73; Table). Associations were significantly larger in persons with hypertension (p-value for interaction=0.023). Persons with OH compared to those without had significantly more cognitive decline over 20 years (difference: -0.12, 95% CI: -0.23, -0.02; Table).

Conclusions: OH assessed in midlife was independently associated with incident dementia and cognitive decline over 20 years. Although typically considered a transient mechanism, these data suggest that OH, or the underlying disease conditions manifesting as OH, persist over time. Whether OH is a marker of vulnerability beyond that of standard hypertension measures, or whether repeated transient exposure to hypotension reduces perfusion to the brain sufficiently to lead to long-term cerebral dysfunction is an important area for further research.

Disclosures: A. Rawlings: None. S. Juraschek: None. G. Heiss: None. T. Hughes: None. M.

Meyer: None. E. Selvin: None. A. Sharrett: None. B. Windham: None. R. Gottesman: None.

Funding: No

Funding Component:

29

Olfactory Function and Neurocognitive Outcomes in Old Age: the Atherosclerosis Risk in Communities Neurocognitive Study (ARIC-NCS)

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Introduction: Impairment in the sense of smell is associated with plaques and tangles in the olfactory region of the brain, which connects to the hippocampus where neuropathologic changes related to mild cognitive impairment (MCI) and dementia due to Alzheimer’s disease are first sited. Olfactory impairments may thus be a marker for poor cognitive function and MCI. We assessed olfaction and cognitive function in 6055 White and Black men and women aged 60-99 years. Methods: Sense of smell was measured in ARIC-NCS participants (2011-2013) by the 12-item Sniffin’ Sticks screening test (score range: 0-12, median: 10). A clinically validated threshold (smell score <6) defined olfactory impairment (OI). A multidimensional neuropsychological assessment (10 tests) ascertained performance in domains of memory, language, executive function/processing speed, and global cognition. For relative comparisons across the tests, raw cognitive test scores were standardized to z scores and averaged to yield
domain scores. Following review of neuropsychological assessments, medical history, cerebral magnetic resonance imaging, and physical examinations, MCI was classified by a neurologist and neuropsychologist, and adjudicated by a third reviewer. Multivariable linear regression estimated the mean difference in domain-specific z scores among participants with and without OI. Logistic regression was used to quantify the prevalence odds of MCI in participants with vs. those without OI. Models were adjusted for age, sex, race, education, ARIC study center, hypertension, diabetes, smoking, and ApoE4. Race and sex were explored as effect modifiers.

Results: The participants’ mean age was 76 years; 41% were male and 23% Black. The prevalence of olfactory impairment was 14%. Compared to participants with no OI, those with OI had a statistically significantly lower mean z score across all cognitive domains [memory: Beta= -0.37 (95% confidence interval [CI]: -0.45, -0.30); language: Beta= -0.39 (95% CI: -0.46, -0.33); executive function/processing speed: Beta= -0.24 (95% CI: -0.32, -0.17); global cognition: Beta= -0.34 (95% CI: -0.41, -0.26). Effect modification by race was observed in the domain of language. Blacks with OI had a greater mean difference in language z score compared to Blacks without OI (Beta= -0.57 (95% CI: -0.70, -0.44)). OI was associated with MCI in Whites, but not Blacks: white participants with OI had greater odds of MCI (Odds Ratio [OR] =1.76, 95% CI: 1.40, 2.21). Sex did not modify these associations. Conclusions: Compared to average cognitive aging (annual rate of decline of 0.04-0.05 standard deviation units/year) relatively large differences in standardized cognitive domain scores are observed between those with and without olfactory impairment among older adults. An impaired sense of smell may serve as a readily accessible early marker of neurodegeneration.


Funding: No

Funding Component:

30

Carotid Artery Stiffness and Decline in Cognitive Function Among Women With, or at Risk for, HIV Infection

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Background Vascular stiffness is associated with aging and cognitive impairment in populations without HIV infection. HIV is also associated with increased vascular stiffness. The objective of this study was to examine the association of baseline carotid artery stiffness with progression of cognitive decline among women with, or at risk for, HIV infection, and to determine whether HIV modified this association. Methods We used available baseline carotid stiffness and serial cognitive assessments from 2004 to 2015 in the Women’s Interagency HIV Study, a longitudinal cohort study of women with, or at risk for, HIV. Baseline measurements of carotid stiffness (distensibility) were determined from B-mode carotid artery ultrasound. Serial neurocognitive testing including Trail Making Tests A and B (TRLA, TRLB) and the Symbol Digit Modalities Test (SDMT) was conducted over a median 8.5 years of follow-up. Linear mixed effects models were used to determine associations of baseline measures of carotid stiffness with progression of cognitive decline, with time operationalized as participant age. Models were adjusted by HIV serostatus and demographic, behavioral, and cardiometabolic factors. Results Among 1732 women (1244 HIV+; 488 HIV-) median age at...
baseline was 41 (IQR 34-47), and the majority were non-Hispanic black (60%) or Hispanic (28%). Greater baseline distensibility, indicating less carotid stiffness, was associated with lower cognitive decline over time in SDMT (β = 0.006 per $10^{-6} \times \text{Newton}^{-1} \times \text{meter}^2$, $p < 0.001$), TRLA (β = -0.01; $p = 0.04$), and TRLB (β = -0.05; $p = 0.002$), depicted in the figure. Longitudinal associations did not differ by HIV status ($p_{	ext{interaction}} \geq 0.13$).

**Conclusions** Less baseline carotid stiffness was associated with slower progression of cognitive decline in women with, or at risk for, HIV infection, independent of potential confounders. Targeting of cardiovascular risk factors could prevent cognitive decline regardless of HIV serostatus.


**Funding:** No

**Funding Component:**

**31**

**Cardiovascular Health at Young and Middle Ages and Dementia in Older Age - The Chicago Heart Association Detection Project in Industry Study**

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**Background:** Data are sparse regarding the association of cardiovascular health (CVH) in younger/middle age with the diagnosis of dementia later in life. **Methods:** We used linked data from the Chicago Heart Association Detection Project in Industry Study assessed in 1967-73 with fee-for-service Medicare claims and National Death Index data from 1991-2010. Participants were ≤65 years old in 1991 and Medicare eligible during 1991-2010. Baseline CVD risk factors included blood pressure, cholesterol, BMI, smoking, and diabetes. Participants were classified into four strata: favorable levels of all factors, 0 factors high but 1+ elevated, 1 high, and ≥2 high risk factors. ICD-9 codes were used to identify date of first dementia diagnosis. We used competing Cox models to estimate hazards for dementia in Medicare data after age 65 with competing event of all-cause mortality prior to dementia diagnosis. Covariates included baseline age, race, sex, and education attainment. **Results:** This study included 4,273 females and 8,381 males, 10.3% Black, baseline ages 18-48. Dementia was diagnosed in 5.1% of study participants. The prevalence of dementia diagnosis increased with increasing CVH burden from 3.4% to 6.4%. During 1991-2010 in Medicare, the average time from age 65 to the first dementia diagnosis was 7.7 years. Greater CVH in younger age was associated with a reduced risk of being diagnosed with dementia in later life. Hazards ratios of experiencing dementia in those with baseline favorable levels, 0 RF high, and 1 only high RF were lower by 36%, 29%, and 28% respectively as compared to those with 2+ high-risk factors (see Table - Model 1). Similar trends were observed
when deaths were treated as competing events although the association was attenuated (Model 2). Patterns were similar when stratified by sex or race. **Conclusions:** Having a favorable CVH profile at younger age is associated with lower risk of dementia in older age. Improvements in CVH in younger age may translate to increased independence and quality of life later in life.

Disclosures: **T.T. Vu:** None. **D.M. Lloyd-Jones:** None. **C. Schiman:** None. **L. Liu:** None. **L. Zhao:** None. **K. Liu:** None. **Y. Shih:** None. **J.F. Fries:** None. **M.L. Davigluc:** None. **N.B. Allen:** None.

Funding: No

Funding Component:

**32**

**Racial Differences in Cardiorespiratory Fitness Between African and Caucasian Americans: A Meta-analysis**

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**Introduction:** Cardiorespiratory fitness (CRF) is an independent risk factor for cardiovascular disease (CVD). Recent data suggests that African Americans (AA) have reduced levels of CRF compared to Caucasian Americans (CA). However, this viewpoint has not been widely accepted and it is unclear whether racial differences in CRF may be of a large enough magnitude to increase the risk of CVD. **Methods:** A literature review was conducted for studies comparing CRF levels between AA and CA adults. Studies were eligible for inclusion if CRF was assessed by an exercise test (submaximal or maximal), CRF was compared between AA and CA adults, examined an adult study population, and was published in a peer-reviewed journal. Potential studies were excluded if the sample included children or adolescents, the sample size was less than 15 participants in each racial group, or the study evaluated participants who had significant health conditions. Meta-analyses were performed comparing CRF between AAs and CAs in two analyses: 1) all studies compared using metabolic equivalents (METs) and 2) restricted only to studies that quantified CRF by directing measuring maximal oxygen consumption (considered the gold standard). Both fixed effects and random effects models were fit to these data. Because of the heterogeneity only results from the random effects models are reported. Analyses were performed using R (version 3.1, R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/) and the rmeta package (version 2.6). **Results:** There were 27 studies (n=131,084) that met the criteria for the meta-analysis (23 studies excluded). In both the analyses for METs (27 studies, Summary effect: 0.91, CI: 0.8 to 1.0) and directly measured VO$_2$ max (16 studies, Summary effect: 3.2, CI: 2.1 to 4.3) as the criteria for CRF, AA had lower fitness compared to CA adults. **Conclusions:** The present study suggests that AAs have lower CRF compared to CAs based on epidemiological studies and clinical trials whether directly measured using indirect calorimetry or maximal METs estimated from exercise testing. A difference of 0.91 METs is associated with ~13.7% higher risk of CVD based on previous epidemiological data. Thus, lower CRF in AA adults may represent a health disparity risk factor and interventions to improve CRF in sedentary AAs may be warranted.

Funding: No

Funding Component:

33

**Handgrip Strength is Associated With Insulin Resistance in US Adolescents: Experience in NHANES 2011-2014**

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**Background:** Handgrip strength is a measure of muscular strength and body fitness. It has been shown that handgrip strength is associated with cardiometabolic risk in adult population. We hypothesized that handgrip strength is associated with insulin resistance measures in children and adolescents. **Methods:** The sample included 1,023 adolescents (50.4% boys and 49.6% girls) aged 12-19 years who participated in the National Health and Nutrition Examination Surveys (NHANES) 2011-2014 and did not take any antidiabetic medications. The sum of the maximum handgrip strength from both hands, standardized to age- and sex-specific z-scores, was used. Fasting plasma glucose, serum insulin, and calculated Homeostatic model assessment of insulin resistance (HOMA-IR) were used as insulin resistance measures. Serum insulin levels and HOMA-IR were log-transformed before further analyses. General linear models were used for data analyses. **Results:** After adjustment for age, race, sex, and body mass index, handgrip strength was inversely associated with serum insulin levels (P<0.0001) and HOMA-IR (P=0.0002). The associations tended to be stronger in boys than in girls such that the inverse associations of handgrip strength with insulin levels and HOM-IR were significant in boys (P<0.0001 for both) but not in girls (P>0.35), though interaction terms between handgrip strength and sex were not significant (P>0.36). There was no association between handgrip strength and plasma glucose levels (P=0.50). **Conclusion:** These results suggest that handgrip strength is associated with insulin sensitivity in adolescents, which indicates that increasing muscular strength and body fitness may have beneficial effects in early stage prevention of insulin resistance and type 2 diabetes.

Disclosures: **S. Li**: None. **R. Zhang**: None. **L. Zheng**: None. **W. Chen**: None.

Funding: No

Funding Component:

34

**Cardiorespiratory Fitness Response to Short Term Supervised Exercise Training Predicts Age Related Cardiorespiratory Fitness Decline Over Long Term Follow up**

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**Introduction:** Substantial heterogeneity exists in the cardiorespiratory fitness (CRF) change response to short-term supervised exercise training and its long-term prognostic implication is not well understood. Here, we evaluated the association between the short-term training related changes in CRF and CRF levels 10 years later.
Methods: STRRIDE trial participants that were originally randomized to exercise training for 8 months and participated in the 10-year follow-up visit were included. CRF levels were measured at baseline, post-training (8 months), and 10-year follow-up as peak oxygen uptake (VO₂, ml/kg/min) using the maximal treadmill test. Participants were stratified into low, moderate, and high CRF response (CRF-R) groups according to the training-regimen specific tertiles of CRF change from baseline to post-training. Adjusted linear regression models were used to determine the association between short-term change in CRF with training and CRF levels at 10-year follow-up.

Results: The study included 80 participants (age = 52 years, 35% women). There was no significant difference in the baseline characteristics of the CRF-R groups. At 10-year follow-up, high CRF-R group had the lowest decline in CRF compared with moderate or low CRF-R groups (-0.005 vs. -2.6 vs. -3.6 ml/kg/min, p = 0.009, Figure). This was largely related to the differential age-related changes in peak oxygen pulse across the three groups (0.58 vs. -0.23 vs. -0.86 ml/beat, p = 0.02) with no difference in the peak heart rate change. In adjusted analysis, high CRF-R was significantly associated with higher CRF levels at follow-up independent of the exercise intervention and other baseline characteristics [High vs. Low (ref) CRF-R: Std β = 0.25; p = 0.004]

Conclusion: CRF change in response to short-term training is a significant predictor of age-related CRF decline over long-term follow-up. Thus, training responsiveness may identify individuals at risk for exaggerated CRF decline with aging and associated incidence of cardiovascular diseases.


Funding: No

Funding Component:

35

In Singleton Born at Term, Lower Gestational Age is Associated with Lower Cardiorespiratory Fitness Levels Through Adolescence to Young Adulthood: The Northern Ireland Young Hearts Project (NIYHP)

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Decreases in the mean gestational age of term deliveries have been reported over the past decade in several developed countries, linked to increases in the rates of planned births by labour induction and/or pre-labour caesarean sections. In contrast to the effects of pre-term birth, the extent to which lower gestation age within the at-term range (i.e. 37 to 42 weeks) affects individuals’ cardiorespiratory fitness (CRF) health is largely unknown, however. We therefore examined the association between gestational age, accounting for other important perinatal covariates (obtained from the NI Child Health Services’ records), and CRF (VO₂max) as measured through adolescence to young adulthood in 842 (51.5% female) participants in the NIYHP (all singletons born at term, 98% of whom with birth weight greater than 2.5 kg). Participants’ mean levels of CRF were 45.6 ± 4.8, 43.7 ± 6.8 and 32.9 ± 9.8 ml/kg/min at the ages of 12, 15 and 22 years, respectively. With the use of GEE analyses adjusted for age, sex, socio economic status, birth weight z-scores (relative to UK’s 1990 reference), breast-feeding practices and duration, maternal age at child’s
birth and delivery mode, we found that each week increase in gestational age was associated with 0.44 ml/kg/min (95% CI 0.13 to 0.75) higher levels of CRF throughout the whole longitudinal period (p=0.005). Further adjustments for participants’ height, body fatness and maturational level throughout the longitudinal period only attenuated this association slightly [to 0.38 ml/kg/min (95% CI 0.12 to 0.65), p=0.005]. There were no significant interactions between gestational age and sex or participants’ age at the time of CRF assessment, indicating that the decreases in CRF over time were similar across the different gestational ages, with those born early term displaying consistently lower levels throughout the longitudinal period. Finally, each week increase in gestation age was associated with lower risk of poor CRF through adolescence to young adulthood as defined according to current age and sex-specific health-reference values of VO$_2$max: RR=0.89 (95% CI 0.81 to 0.97), p=0.008. These findings suggest that lower gestational age, even within the at-term range, may be a key determinant of poorer CRF as each additional week conferred benefits. This aspect may have been neglected by the oversimplistic characterisation of individuals born at-term as a homogeneous group and may have public health and clinical implications for policies around planned deliveries, given the current trends.

Disclosures: I. Ferreira: None. P.T. Gbatu: None. C. Boreham: None.

Funding: No

Funding Component:

36

Fitness and Reclassification of Risk for Incidence of Heart Failure: The Veterans Exercise Testing Study

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Abstract

Background. It is well-established that fitness is inversely associated with cardiovascular and all-cause mortality, but little is known regarding the association between cardiorespiratory fitness (CRF) and incidence of heart failure (HF).

Methods. CRF was determined in 21,080 US Veterans (mean age 58.3 ± 11) free of HF at baseline from the Veterans Affairs Medical Centers in Washington, DC and Palo Alto, CA, and followed for a mean of 12.3±7.4 years. Subjects were classified by quintiles of fitness based on age-specific peak metabolic equivalents (METs) achieved. Participants were followed for incidence of HF, determined through review of computerized medical records. Multivariable Cox models were used to determine the association between incidence of HF and clinical and exercise test variables. Reclassification characteristics of fitness relative to standard clinical risk factors were determined using the category-free net reclassification improvement index (NRI), and the integrated discrimination improvement.

Results. During the follow-up, 1902 subjects (9%) developed HF, with an average annual incidence rate of 7.4 events per 1,000 person-years. When fitness status was considered as a binary variable (Unfit/Fit), low fitness was the strongest predictor of risk for HF among clinical and exercise test variables (HR 1.91, 95% CI 1.74-2.09, p<0.001). In a fully adjusted model with the least fit group as the reference, there was a graded and progressive reduction in risk for HF as fitness level was higher. Risks for developing HF were 36%, 41%, 67%, and 76%
lower among increasing quintiles of fitness compared to the least fit subjects (p<0.001) (Figure). Adding CRF to standard risk factors resulted in an NRI of 0.37 (p<0.001).

**Conclusion.** CRF is strongly and inversely associated with future incidence of HF, and significantly reclassifies risk for HF. Reducing the growing burden of HF by improving fitness provides an additional impetus for health care providers to recommend physical activity.


Funding: No

Funding Component:

37

The Association of Cardiorespiratory Fitness and Ideal Cardiovascular Health in the Aerobics Center Longitudinal Study

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**PURPOSE:** To examine the cross-sectional association between cardiorespiratory fitness (CRF) and ideal cardiovascular health (CVH) in middle-aged adults.

**METHODS:** The association between CRF and ideal CVH score was examined in 11,590 adults (8,865 men, 2,725 women) from the Aerobics Center Longitudinal Study. CRF was measured as duration in minutes from a maximal treadmill test. The AHA’s ideal CVH score was calculated on a 14 point scale using data on smoking status, BMI, physical activity (MET-min/wk), healthy diet, total cholesterol, blood pressure, and fasting plasma glucose recorded between 1987 and 1999. Participants were grouped into categories of inadequate (0-4), average (5-9), and optimum (10-14) based on their CVH score.

Three CRF groups were created from age- and sex-specific quintiles based on the previously established cutpoints of treadmill time: low, moderate, and high CRF. We used general linear and logistic regression models adjusted for age, sex, and year of examination to evaluate the association of CRF with ideal CVH score.

**RESULTS:** The mean CVH score for men was 8.4 ± 2.2 and 9.7 ± 2.0 for women. Approximately 33% of men and 57% of women had optimum CVH, while only a small proportion of participants had inadequate CVH (5.1% M, 1.4% F).

Treadmill time was moderately correlated (p<0.0001) with CVH score in both men (r=0.56) and women (r=0.50). CRF explained 16% and sex 18% of the variance in CVH score (both p<0.0001). Our adjusted model found that participants in the optimum CVH category had 20% and 43% higher CRF levels than those in the average and inadequate CVH groups (p<0.0001), respectively (Figure 1). The adjusted odds (95% CI) of having optimum CVH were 14.0 (11.0-17.8) and 3.1 (2.4-4.0) times greater for high CRF and moderate CRF, respectively, compared to low CRF (p<0.0001).

**DISCUSSION:** Higher levels of cardiorespiratory fitness are associated with better cardiovascular health profiles in both men and women. Thus, improving fitness represents a strategy to improve cardiovascular and public health.
Glucose Levels and Brain Gray Matter Volume in Middle-aged Adults: Findings From the Coronary Artery Risk Development in Young Adults CARDIA Study

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Background: Type II diabetes has been widely linked to a higher risk of dementia. Some studies have also shown relationships between diabetes and magnetic resonance imaging (MRI) markers of exacerbated brain aging and neurocognitive pathology, such as gray matter (GM) volume atrophy. However, data on the earlier impacts of glucose levels on GM volume in younger subjects are scarce. Objective: We assessed the cross-sectional relationship of fasting glucose levels and GM volume measured at middle-age. Methods: Data come from the brain MRI sample of the CARDIA study, a biracial community-dwelling cohort of middle-aged adults (n=709, mean age=50 (SD=3.5)). We used multivariable linear regression models and adjusted for potential confounders, including several cardiovascular and metabolic factors (hypertension, body mass index, smoking, history of vascular disease, and hypercholesterolemia). Results: Higher fasting glucose levels were associated with smaller total GM volume (-1 mL (95%CI= -0.16, -0.04) smaller GM volume per each 1 mg/dL increase in glucose levels). In analyses exploring the normal (<100 mg/dL), pre-diabetic (≥100, <126 mg/dL), and diabetic glucose ranges (≥126 mg/dL), we found that subjects with diabetic glucose levels had -14 mL smaller GM (95%CI= -21.50, -5.61; p=0.001) than subjects with normal glucose levels; subjects with pre-diabetic levels were not significantly different from those with normal levels (p for trend for the glucose-range categories =0.08).

Conclusion: Results suggest that important relationships between glucose levels and smaller GM can already be detected at middle-age. These associations were particularly pronounced in the diabetic glucose ranges. Findings strengthen the links between vascular factors and brain health and emphasize the importance of studying the earlier stages of these links to improve our understanding of the course of brain diseases and to identify optimal time-windows for prevention and treatment strategies.


Funding: No

Funding Component: 39

Statin Use is Associated with Elevated Serum Glucose and Incidence of Type 2 Diabetes in US Veterans

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Background: While some but not all trial data have suggested a slightly elevated risk of type 2 diabetes (T2D), limited data are available on the relation of statin use with glycemia among US veterans. Objective: To test the hypothesis that treatment with a statin is associated with elevated serum glucose and a higher risk of T2D among US veterans. Methods: We studied 549,143 US veterans with electronic health records from 1998 to 2016. We used the VA Corporate Data Warehouse to obtain information on glucose (fasting and non-fasting). Statin use was captured using the pharmacy database. T2D was defined as having at least one inpatient diagnosis or at least 2 outpatient diagnoses of T2D using ICD 9 codes 250.xx, or the use of hypoglycemic agents. We addressed confounding by indication using propensity score (included 444 variables/interactions) for receiving statin and inverse probability weighting in the Cox regression. Results: The mean age was 60±12.8 y; 94.3% were men; 77.1% were white; and 15.4% were black. In this cohort, simvastatin was the most prescribed statin (84%) followed by lovastatin (7%). During a median follow-up of 4.4 years, 130,819 new cases of T2D occurred. Among 418,847 veterans receiving statin, we observed a 2 mg/dl increase in serum glucose when comparing serum glucose measured at the time of statin initiation and short-term <1 y as well as long-term glucose values (all p <0.01). In crude analysis, statin use was associated with a 53% higher risk of T2D compared with non-users of statin [HR=1.53 (95% CI: 1.51-1.54)]. In a multivariable adjusted model, hazard ratio (95% CI) for T2D was 1.25 (95% CI: 1.24-1.26) after adjustment for propensity score for being on statin. There was a borderline statistically significant interaction between statin and triglycerides on T2D risk (p=0.09): HR=1.15 (95% CI: 1.14-1.16) for people with triglycerides below 150 mg/dl and HR=1.36 (95% CI: 1.35-1.38) for people with triglycerides of at least 150 mg/dl in the adjusted model. We did not have enough data to stratify by type of statin given the predominance of simvastatin in this population. Conclusions: Our data show a positive association between statin use and increase in both serum glucose and incidence of T2D among US veterans. If confirmed by others, this suggests closer monitoring of patients at risk of T2D when statin therapy is initiated.


Funding: No

Funding Component:

Duration of Prediabetes is Associated with Subclinical Atherosclerosis and Cardiac Dysfunction in Middle-Age: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Background: A prolonged duration of diabetes has been shown to be independently associated with incident cardiovascular disease (CVD). Whether duration of prediabetes is similarly associated with CVD is unknown. We sought to determine whether the duration of prediabetes during young adulthood is associated with the presence of coronary artery calcified plaque (CAC) and cardiac structure/function in middle-age.
Methods: Participants were 3244 white and black adults aged 18-30 years without prediabetes or diabetes at baseline (1985-86) or diabetes during follow-up in the multicenter community-based CARDIA Study. Prediabetes was defined at follow-up examinations 7, 10, 15, 20, and 25 years after baseline as fasting glucose 100-125 mg/dL, 2-hour oral glucose tolerance 140-199 mg/dL or HbA1c 5.7-6.4%. Presence of CAC was measured by computed tomography at follow-up years 15, 20, and 25. Measures of cardiac structure and function were obtained from echocardiography performed at year 25.

Results: Of the 3244 individuals, 1561 (48.2%) developed prediabetes during follow-up. Among those who developed prediabetes, the median (IQR) duration was 10 (5-12) years. After adjustment for age, sex, race, education, study center, and CVD risk factors, the hazard ratio for the presence of CAC was 1.21 times higher for each 10-year increase in duration of prediabetes (95% CI: 1.06, 1.37). Duration of prediabetes was also associated with worse global longitudinal strain (per 10 years: 0.2%; 95% CI: -0.3, -0.1; P < .001), and E/e’ ratio (0.113; 95% CI: -0.007, 0.233; P = .06) (Table). These results did not differ significantly by race or sex.

Conclusions: Exposure to a longer duration of prediabetes is associated with subclinical atherosclerosis and cardiac dysfunction in middle-age. Further research is needed to better understand the pathophysiology of these relationships.


Funding: No

Funding Component:

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Omega-6 Fatty Acid Biomarkers and Incident Type 2 Diabetes: A Pooled Analysis of 20 Cohort Studies

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Background Emerging evidence suggests that dietary omega-6 polyunsaturated fatty acids (n-6 PUFA) plays a role in the primary prevention of type 2 diabetes (T2D). Aims To evaluate the
relation between blood and adipose tissue levels of n-6 PUFA and incident T2D, including n-6 linoleic acid (LA), the major dietary PUFA abundant in vegetable oils, and n-6 arachidonic acid (AA), a key precursor of endogenous metabolites that modulate glucose metabolism and inflammation. **Methods** A global consortium of 20 prospective cohort studies identified by February 2016. Each study measured LA and AA at study baseline among adults>18y without prevalent T2D, and assessed the association of n-6 PUFA biomarkers and T2D risk prospectively using individual-level data, using a pre-specified analytic plan and harmonized exposures, covariates, and effect modifiers. Findings were centrally pooled using fixed-effects meta-analysis. **Results** 39,740 men and women from 10 countries were included (range of cohort means, age, 49-76y, and BMI, 25.0-28.1kg/m²), with 4,374 incident cases of T2D observed during follow-up. In continuous multivariate-adjusted analyses, higher LA was associated with 36% lower risk of T2D (RR=0.64, 95% CI=0.59-0.71, P<0.001, I²=49%, **Figure 1A**) per interquintile range. Similar inverse associations were observed for LA measured in different fractions, and in sensitivity analysis using random effects model. Levels of AA were not associated with T2D risk overall and in studies grouped by different biomarker fractions except total plasma (per interquintile RR=0.74, 95% CI=0.62-0.88, P<0.001, **Figure 1B**). The relations of LA and AA with T2D were not significantly modified by age, BMI, sex, race, aspirin use, n-3 PUFA biomarker, or FADS genetic variants (P≥0.13 for each). **Conclusion** Higher blood and adipose tissue LA levels, biomarkers of the major dietary PUFA, were associated with lower risk of T2D among free-living populations worldwide. There was little evidence that AA levels were appreciably associated with risk of T2D.

Disclosures: **J.H. Wu:** B. Research Grant; Significant; This analysis received research funding from Unilever. **M. Marklund:** None. **F. Imamura:** None. **N. Tintle:** None. **A.V. Ardisson Korat:** None. **J. de Goede:** None. **X. Zhou:** None. **W. Yang:** None. **M.C. de Oliveira Otto:** None. **J. Kroger:** None. **W. Qureshi:** None. **J.K. Virtanen:** None. **J. Bassett:** None. **A.C. Frazier-Wood:** None. **M. Lankinen:** None. **R.A. Murphy:** None. **K. Rajaobelina:** None. **R.N. Lemaitre:** None. **R. Micha:** None. **D. Mozaffarian:** None.

Funding: No

Funding Component: 41

**Omega-6 Fatty Acid Biomarkers and Incident Type 2 Diabetes: A Pooled Analysis of 20 Cohort Studies**

Jason HY Wu, The George Inst for Global Health, Univ of Sydney, Camperdown, Australia; Matti Marklund, Dept of Public Health and Caring
Background Emerging evidence suggests that dietary omega-6 polyunsaturated fatty acids (n-6 PUFA) plays a role in the primary prevention of type 2 diabetes (T2D). Aims To evaluate the relation between blood and adipose tissue levels of n-6 PUFA and incident T2D, including n-6 linoleic acid (LA), the major dietary PUFA abundant in vegetable oils, and n-6 arachidonic acid (AA), a key precursor of endogenous metabolites that modulate glucose metabolism and inflammation. Methods A global consortium of 20 prospective cohort studies identified by February 2016. Each study measured LA and AA at study baseline among adults>18y without prevalent T2D, and assessed the association of n-6 PUFA biomarkers and T2D risk prospectively using individual-level data, using a pre-specified analytic plan and harmonized exposures, covariates, and effect modifiers. Findings were centrally pooled using fixed-effects meta-analysis. Results 39,740 men and women from 10 countries were included (range of cohort means, age, 49-76y, and BMI, 25.0-28.1kg/m²), with 4,347 incident cases of T2D observed during follow-up. In continuous multivariate-adjusted analyses, higher LA was associated with 36% lower risk of T2D (RR,0.64, 95% CI;0.59-0.71, P<0.001, I²=49%, Figure 1A) per interquintile range. Similar inverse associations were observed for LA measured in different fractions, and in sensitivity analysis using random effects model. Levels of AA were not associated with T2D risk overall and in studies grouped by different biomarker fractions except total plasma (per interquintile RR=0.74, 95% CI=0.62-0.88, P<0.001, Figure 1B). The relations of LA and AA with T2D were not significantly modified by age, BMI, sex, race, aspirin use, n-3 PUFA biomarker, or FADS genetic variants (P≥0.13 for each). Conclusion Higher blood and adipose tissue LA levels, biomarkers of the major dietary PUFA, were associated with lower risk of T2D among free-living populations worldwide. There was little evidence that AA levels were appreciably associated with risk of T2D.

Funding: No

Funding Component:

41

Omega-6 Fatty Acid Biomarkers and Incident Type 2 Diabetes: A Pooled Analysis of 20 Cohort Studies

Jason HY Wu, The George Inst for Gobal Health, Univ of Sydney, Camperdown, Australia; Matti Marklund, Dept of Public Health and Caring Sciences, Clinical Nutrition and Metabolism, Uppsala Univ, Uppsala, Sweden; Fumiaki Imamura, MRC Epidemiology Unit, Univ of Cambridge, Cambridge, United Kingdom; Nathan Tintle, Dordt Coll, Sioux Center, IA; Andres V Ardisson Korat, Harvard T.H. Chan Sch of Public Health – Depts of Nutrition and Epidemiology, Boston, MA; Janette de Goede, Wageningen Univ, Div of Human Nutrition, Wageningen, Netherlands; Xia Zhou, Univ of Minnesota, Sch of Public Health; Minneapolis, MN; Wei-Sin Yang, Nati Taiwan Univ, Taipei, Taiwan; Marcia C de Oliveira Otto, Univ of Texas Health Science Ctr, Sch of Public Health, Houston, TX; Janine Kroger, German Inst of Human Nutrition, Potsdam, Germany; Waqas Qureshi, Wake Forest Univ, Winston-Salem, NC; Jyrki K Virtanen, Univ of Eastern Finland, Kuopio, Finland; Julie Bassett, Cancer Council Victoria, Melbourne, Australia; Alexis C Frazier-Wood, USDA/ARS Children’s Nutrition Res Ctr, Houston, TX; Maria Lankinen, Univ of Eastern Finland, Kuopio, Finland; Rachel A Murphy, Univ of British Columbia, Vancouver, BC, Canada; Kalina Rajaobelina, INSERM U897 - ISPED, Bordeaux, France; Rozenn N Lemaitre, Univ of Washington, Seattle, WA; Renata Micha, Dariush Mozaffarian, Tufts Univ, Boston, MA; CHARGE Fatty acids and Outcomes Research Consortium (FORCE)

Background: Emerging evidence suggests that dietary omega-6 polyunsaturated fatty acids (n-6 PUFA) plays a role in the primary prevention of type 2 diabetes (T2D). Aims To evaluate the relation between blood and adipose tissue levels of n-6 PUFA and incident T2D, including n-6 linoleic acid (LA), the major dietary PUFA abundant in vegetable oils, and n-6 arachidonic acid (AA), a key precursor of endogenous metabolites that modulate glucose metabolism and inflammation. Methods: A global consortium of 20 prospective cohort studies identified by February 2016. Each study measured LA and AA at study baseline among adults>18y without prevalent T2D, and assessed the association of n-6 PUFA biomarkers and T2D risk prospectively using individual-level data,
using a pre-specified analytic plan and harmonized exposures, covariates, and effect modifiers. Findings were centrally pooled using fixed-effects meta-analysis. Results 39,740 men and women from 10 countries were included (range of cohort means, age, 49-76y, and BMI, 25.0-28.1kg/m²), with 4,347 incident cases of T2D observed during follow-up. In continuous multivariate-adjusted analyses, higher LA was associated with 36% lower risk of T2D (RR,0.64, 95% CI,0.59-0.71, P<0.001, I²=49%, Figure 1A) per interquintile range. Similar inverse associations were observed for LA measured in different fractions, and in sensitivity analysis using random effects model. Levels of AA were not associated with T2D risk overall and in studies grouped by different biomarker fractions except total plasma (per interquintile RR=0.74, 95% CI=0.62-0.88, P<0.001, Figure 1B). The relations of LA and AA with T2D were not significantly modified by age, BMI, sex, race, aspirin use, n-3 PUFA biomarker, or FADS genetic variants (P≥0.13 for each). Conclusion Higher blood and adipose tissue LA levels, biomarkers of the major dietary PUFA, were associated with lower risk of T2D among free-living populations worldwide. There was little evidence that AA levels were appreciably associated with risk of T2D.


Funding: No

Funding Component:

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Diabetes Metabolomics Score and Risk of Progression from Gestational Diabetes to Type 2 Diabetes

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Background: A number of individual metabolites have been identified for their relationship with type 2 diabetes (T2D) risk. We sought to evaluate a pattern of T2D metabolites to estimate the collective impact of these markers on elevating the risk of progression to T2D among high risk women with a history of gestational diabetes mellitus (GDM).

Methods: We conducted a prospective nested case-control study among women with a history of GDM in the Nurses’ Health Study II longitudinal cohort. Three panels of plasma metabolites were assayed via liquid chromatography tandem mass spectroscopy among 175 T2D cases and 175 controls, matched for age and fasting status at blood draw in 1997-1999. Incident type 2 diabetes cases occurred a median of 7 years after blood collection (range 1-15 years). Based on the published literature, we identified 38 metabolites associated with T2D and available among our measured panels, including branched-chain and other amino acids, lipids, and others. Metabolite levels were log-transformed and standardized. We derived a T2D MET SCORE, summing across the points corresponding to individuals’ assigned quintile level for each of the 38 metabolites. We estimated the odds ratios (OR) and 95% confidence intervals (CI) for the association of the T2D MET SCORE with incident T2D risk using multivariable conditional logistic regression models, adjusted for age, fasting status, body mass index (BMI), physical activity, and other established T2D risk factors. Results: Cases and controls were on average 43 years at blood draw with a mean of BMI 28.6 kg/m². In the model adjusted for age and fasting status, the T2D MET SCORE was significantly associated with a step-wise increase in T2D risk across quartiles (Q1: [reference]; Q2: OR=2.5 CI=1.2, 5.6; Q3: OR=7.0 CI=3.2, 15.2; Q4: OR=10.9 CI=4.7, 24.9). Adjusting for BMI and other risk factors attenuated the relationship, although the score remained significantly associated with T2D risk (Q4 vs. Q1: OR=7.2 CI=2.5, 20.3). The T2D MET SCORE was associated with T2D risk among both obese and non-obese women (p for interaction=0.4). A BCAA sub-score (3 metabolites) and a lipid sub-score (16 metabolites) were also positively associated with T2D risk (BCAA Q4 vs. Q1: OR=3.5 CI=1.4, 8.8; lipids Q4 vs. Q1: OR=3.6 CI=1.4, 9.1).

Conclusions: A pattern of high-risk circulating metabolites is significantly associated with progression from GDM to type 2 diabetes later in life.


Funding: No

Funding Component:

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Association of Severe Hypoglycemia With Cardiovascular Disease and All-cause Mortality in Older Adults With Diabetes: The Atherosclerosis Risk in Communities (ARIC) Study

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Introduction: There is concern that the strong association of severe hypoglycemia with cardiovascular disease (CVD) and all-cause
mortality is confounded by diabetes severity or may not be causal and simply reflects general vulnerability. Our objective was to determine if the association of hypoglycemia with CVD and death withstood rigorous adjustment for likely confounders that prior studies have not adequately accounted for.

**Methods:** We included ARIC participants aged 65+ at Visit 4 (1996-1998) with diagnosed diabetes and CMS Part B insurance. Severe hypoglycemia was identified through 2013 with ICD-9 codes from hospitalizations, emergency department visits, and ambulance services. CVD events (coronary heart disease, stroke, or heart failure) and death were assessed through 2013. Hypoglycemia was a time-varying exposure in progressively adjusted Cox models that included demographics, clinical characteristics, comorbidities, cognitive function, and activities of daily living and instrumental activities of daily living.

**Results:** Of the 464 eligible participants, hypoglycemic events occurred in 65 participants prior to CVD or censoring and in 94 participants prior to death or censoring. The crude incidence rates of CVD and death were higher in persons with hypoglycemia compared to those without (CVD: 10.6 vs. 5.08 per 100 person-years (PY), p<0.001; death: 14.3 vs. 4.5 per 100 PY, p<0.001). After adjustment for age, sex, and race-center, hypoglycemia was strongly associated with both CVD and death (Figure). After additional adjustment for confounders, the hazard ratios (HR) for hypoglycemia were substantially attenuated but remained significant (CVD HR: 1.61 (95%CI 1.06-2.46); death HR: 1.83 (95%CI 1.35-2.84)).

**Conclusion:** After adjustment for rigorously measured shared risk factors, hypoglycemia was associated with both CVD and death. These results suggest that severe hypoglycemia may influence CVD risk and death independently of diabetes severity and general vulnerability.


Funding: No

Funding Component:

44

Cardiorespiratory Fitness Decreases Stroke Incidence in Hypertensive Veterans

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**Introduction:** Stroke incidence is significantly higher in hypertensive patients compared to normotensive subjects. Cardiorespiratory fitness (CRF) is associated with a more favorable cardiovascular health. The CRF-stroke incidence association in hypertensive patients has not been fully explored. **Hypothesis:** We assessed the hypothesis that CRF is inversely and independently associated with stroke incidence in hypertensive patients. **Methods:** From 1985 to 2014, we identified 12,933 hypertensive patients (mean age: 60±11 years) with a normal response to an exercise tolerance test and no prior history of stroke. We established five fitness categories based on age-stratified quintiles of peak metabolic equivalents (MET) achieved: Least-Fit (4.1±1.0 METs; n=2,516); Low-Fit (5.6±1.0; n=2,772); Moderate-Fit
(7.0±1.0 METs; n=2,803); Fit (8.4±1.3 METs; n=3,282); and High-Fit (11.4±2.0 METs; n=1,560). A multivariable Cox proportional hazards model was used to estimate hazard ratios (HR) and 95% confidence intervals [CI] for incidence of stroke across fitness categories. The model was adjusted for age, resting blood pressure, BMI, atrial fibrillation, gender, race, other cardiac risk factors, alcohol dependence and medications. The Least-fit category was used as the reference group. **Results:** During follow-up (median=11.4 years; 152,408 person-years), 694 individuals (4.5 events per 1,000 person-years) developed stroke. The risk for stroke was 5% lower for each 1-MET increase in exercise capacity (HR=0.95, CI: 0.92-0.98; p<0.001). When considering fitness categories, stroke risk was lower by 28% (HR=0.72; CI: 0.57-0.90) for the Moderate-Fit and Fit individuals (HR=0.72; CI: 0.58-0.89) and 33% for High-Fit individuals (HR= 0.67; CI: 0.50-0.88).  **Conclusions:** Increased CRF was inversely related to stroke incidence in hypertensive patients. The association was independent and graded.


Funding: No

Funding Component:

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**Trends in Cardiovascular Disease (CVD) Risk Factor Screening and Counseling: Impact of the Affordable Care Act (ACA)**

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**Introduction:** The Affordable Care Act (ACA), signed into law in 2010, was incrementally implemented by a series of reforms including an expansion of health insurance coverage and preventive services coverage without co-pay. It is not known whether CVD preventive services have increased as a result of enhanced healthcare access.

**Hypothesis:** We hypothesized that CVD risk factor screening and counseling would increase among US adults over the period of ACA implementation, 2011-2015.

**Methods:** The National Health Interview Survey is a telephone survey of a random sample of the US civilian noninstitutionalized population. Respondents (n=101,243) from survey years 2011, 2013, and 2015 were asked whether, in the past year, they had a screening test for blood pressure, cholesterol, and diabetes, and counseling about diet and smoking cessation from a health professional. We calculated annual percent change (APC) for each preventive service, using weighted constant-time Cox regression models, and examined whether findings were similar across demographic groups.

**Results:** Health insurance coverage increased from 2011-2015, primarily among lower socioeconomic status (SES) individuals and younger adults. There were significant annual increases in the prevalence of screening and counseling for each CVD risk factor (Table). Increases were larger among lower SES groups for blood pressure and cholesterol screenings. Increases were larger among younger age groups for blood pressure, cholesterol, and diabetes screenings, but were larger among older, Medicare-eligible adults for diet counseling. There were no significant differences in APC increases by gender or race.

**Conclusions:** CVD risk factor screening and counseling increased during ACA implementation. Differential increases across SES and age groups indicate improved access to care in populations that have been previously underserved. Outreach is needed to ensure newly insured persons are aware of covered CVD preventive services.
The Association between Acute Mental Stress and Changes in Left Atrial Electrophysiology


Background: Acute stress may trigger atrial fibrillation, but the mechanisms are not clear. We hypothesized that acute mental stress results in abnormal atrial remodeling via electrophysiologic effects. Methods: We examined our hypothesis in 168 patients (mean age=63±8.7 years; 74% men; 65% Caucasian) with stable coronary heart disease who underwent mental (speech task) stress testing. PTFV₁ duration (ms) times the value of the depth (µV) of the downward deflection (terminal portion) of the median P-wave in lead V₁, and was automatically measured on digital electrocardiograms (ECG) at rest, stress, recovery. Electrocardiographic left atrial abnormality was defined as P-wave terminal force in lead V₁ (PTFV₁) ≤ -4000 µV*ms. The mean values of PTFV₁ during stress and recovery were compared with rest. Additionally, the percentage of participants who had left atrial abnormality during stress and recovery was compared with those at rest. Results: The mean PTFV₁ at rest was -2857±2459 µV*ms. There were 51 (30%) participants who had baseline left atrial abnormality. Compared with rest, PTFV₁ became more negative with stress [mean change=-474, 95%CI=(-103, -845); p=0.013] and during recovery [mean change=-420, 95%CI=(-79, -761); p=0.016]. A larger percentage of participants showed left atrial abnormality during stress (n=63, 38%) and recovery (n=67, 40%) compared with rest. Similar changes in PTFV₁ with stress [mean change=-833, 95%CI=(-372, -1295); p<0.001] and recovery [mean change=-796, 95%CI=(-389, -1204); p<0.001] were observed when we excluded those with baseline left atrial abnormality. No differences were noted in the PTFV₁ response based on age, gender, race, or hemodynamic response to stress. Conclusion: Acute mental stress alters left atrial electrophysiology, as measured by PTFV₁, suggesting that stressful situations promote adverse atrial remodeling. This possibly explains the poor cardiovascular outcomes associated with acute mental stress that are triggered by left atrial abnormalities such as atrial arrhythmias and stroke.


Funding: No

Funding Component: 

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Atrial Fibrillation is Associated With Increased Risk of Incident Venous Thromboembolism: The Atherosclerosis Risk in Communities Study

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Background: It is well-established that atrial fibrillation (AF) is associated with thrombus formation in the left atrium, which can lead to ischemic stroke. Case reports, autopsies, and transesophageal echo data have indicated that clot formation also occurs in the right atrium (i.e. right-side intracardiac thrombosis) of AF patients, which could lead to pulmonary embolism (PE). However, it is unclear whether this occurrence is common.

Objective: Test the hypotheses that individuals with incident AF are at elevated risk of developing venous thromboembolism (VTE), and that the association will be stronger for those presenting with PE alone versus PE and deep vein thrombosis (DVT) or DVT alone.

Methods: A total of 15,205 Atherosclerosis Risk in Communities (ARIC) study participants, aged 45-64 years, were followed from baseline (1987-1989) to 2011 for incidence of AF and VTE (median follow-up 19.8 years). Incident AF and VTE events were identified via active surveillance and defined by relevant hospital discharge ICD codes. VTE events were validated by medical record review. Multivariable-adjusted Cox proportional hazards regression models were used, with AF modeled as a time-dependent covariate. We also evaluated separately risk of PE without evidence of DVT, DVT without PE, and events presenting with both PE and DVT.

Results: At baseline participants were on average 54 years old, 55% female and 26% black. In the absence of AF there were 678 VTE events, for an incidence rate of 2.6 per 1000 person-years. After an AF diagnosis there were 77 events, with an incidence rate of 7.1 per 1000 person-years. In multivariable-adjusted models, having AF (versus no AF) was associated with a greater risk of incident VTE; the HR (95% CI) was 2.10 (1.65-2.68) after adjustment for demographics, 1.82 (1.42-2.32) additionally accounting for numerous AF and VTE risk factors, and 1.97 (1.53-2.53) after further adjusting for time-dependent anticoagulant use. When we restricted to PE events without evidence of DVT there were 188 events in total, of which 19 occurred following a diagnosis of AF. The HR for AF (versus no AF) was 1.53 (0.92-2.56) in fully adjusted models. For DVT alone there were 384 events in total, of which 48 occurred after AF diagnosis; the HR for AF was 2.43 (1.77-3.33). Among the 116 events presenting with both DVT and PE, 10 occurred after AF diagnosis, and the HR for AF was 1.36 (0.67-2.75).

Conclusions: Diagnosis with AF was associated with a nearly 2-fold increased risk of incident VTE. The association was not stronger when isolated to those with PE without DVT, suggesting that higher risk of VTE among AF patients may be due to either the coagulation abnormalities that accompany AF, or shared risk factors that were not fully accounted for in this analysis.


Funding: No

Funding Component:

MP001

The Number of Low and High Energy Dense Foods Consumed Affects Body Mass Index Reduction in a Randomized Controlled Weight Loss Trial
Maya Vadiveloo, Univ of Rhode Island, Kingston, RI; Hollie Raynor, Univ of Tennessee Knoxville, Knoxville, TN

Background: Decreasing dietary energy density is recommended to promote weight loss. However, it is unclear whether decreasing dietary energy density is best accomplished by increasing the number of low energy dense (LED) foods (≤1 kcal/g) or by decreasing the number of high energy dense (HED) foods (≥3 kcal/g) in the diet, and whether these actions have different effects on weight loss. We explored how the number of LED and HED foods consumed affected dietary energy density and change in BMI during the 6-month weight-loss phase of an 18-month weight loss trial.

Methods: A secondary analysis of 202 adults 21-65y with a BMI between 27 and 45 kg/m² participating in a weight loss trial was conducted. Participants were randomized to 1 of 2 conditions – a standardized lifestyle intervention or a standardized lifestyle intervention plus a goal to limit consumption of non-nutrient-dense, energy-dense foods to 2 foods. Dietary intake, assessed via 3, 24-hour recalls, and BMI were measured at baseline and 6 months. Generalized linear models were used to examine the association between residualized changes in LED foods and HED foods and dietary energy density and change in BMI between baseline and 6 months. All analyses were adjusted for age, sex, race, education, treatment group, change in energy intake, and number of LED or HED foods.

Results: At baseline, participants had a daily average energy density of 1.25 kcal/g, which decreased to 0.82 kcal/g at 6-months (p<0.0001). Similarly, daily number of LED foods consumed increased from 4.46 to 5.64 foods/day while daily HED foods consumed decreased from 4.02 to 2.98 foods/day (p<0.0001). In fully-adjusted models, a 1-unit increase in LED foods was associated with a 0.07 decrease in the overall energy density of the diet while a 1-unit decrease in HED foods was associated with a 0.08 decrease in energy density (p<0.05); no significant changes in BMI were detected. However, when we examined changes in BMI among those who decreased (>1 unit), maintained (< 1-unit), or increased (>1 unit) the number of LED or HED foods, significantly greater changes in BMI were observed among those with stable (-3.3 ± 0.4 kg/m²) or increased LED food intake (-3.5 ± 0.4 kg/m²) compared to those who decreased LED foods (-2.4 kg ± 0.5 kg/m², p<0.05). No differences in BMI were observed among those who decreased, maintained, or increased the number of HED foods, though similar decreases in energy density were observed among those who decreased HED foods or increased LED foods (-0.6 kcal/g).

Conclusions: Decreasing HED foods and increasing LED foods both reduced the overall ED of the diet, but increasing LED foods was associated with significant reductions in BMI.

Disclosures: M. Vadiveloo: None. H. Raynor: None.

Funding: No

Funding Component:

MP002

Active Exercise Buddies Help Women With Young Children Improve Physical Activity

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Introduction: Women with young children are vulnerable to physical inactivity due to physical, emotional, or social changes resulting from pregnancy and child rearing. Family/friend social support is considered as an enabler to physical activity (PA) among physically inactive women with young children. However, little is known about how to utilize family/friend social support in this population. Purpose: The purpose of this pilot randomized controlled trial was to examine the potential efficacy of a 12-week buddy PA intervention in increasing PA among women with young children. Methods: Flyers posted in public places, advertisements
via a local newspaper and campus shuttle buses as well as online postings through local parents’ groups were used for recruitment between January 2015 and March 2016. Out of 108 women who contacted the research team via telephone or email, 79 met the eligibility criteria. The inclusion criteria were 1) 18-44 years of age; 2) having at least one child aged less than 5 years; 3) having at least one family member or friend who can support PA and reside in the community with the participant; 4) $25 \text{ kg/m}^2 \leq \text{ body mass index} < 45 \text{ kg/m}^2$; and 5) intent to increase PA. After run-in, 49 women were randomized into one of the two groups (the buddy group and the control group). Women assigned to the buddy group designated an exercise buddy and received a face-to-face session along with their buddies. Both participant as well as buddy received an accelerometer and installed its mobile app on their mobile phones. The primary outcome was the mean number of steps per day for the prior week measured by accelerometer. The effect of the intervention versus control condition on the primary outcome was examined in an intent-to-treat approach. We also did per-protocol analyses to compare three groups, dividing the buddy groups into 2 groups depending changes in PA among buddies (active buddy and inactive buddy) along with the control group. Results: 47 women completed the study. There were no significant differences between the intervention and control groups in steps at baseline ($p = 0.46$) as well as in changes in mean steps per day ($p = 0.56$). When the three groups (active buddy, inactive buddy, and control groups) were compared, there was no significant difference among groups in steps at baseline ($p = 0.61$), but overall changes in mean steps per day during 12 weeks were significantly different among groups ($p = 0.018$). The active buddy group ($p=0.005$) and the control group ($p=0.023$) showed significantly higher step changes than the inactive buddy group (1779 and 1272 vs. 76). Conclusions: The study findings indicate that having an inactive buddy for exercise would not help women to increase their PA and could be worse than having no buddy. Women may need to join a social network of physically active individuals and emulate other physically active people.


Funding: Yes

Funding Component: Western States Affiliate (California, Nevada & Utah)

**MP003**

**Development and Validation of a Prediction Model of Weight Loss Maintenance or Regain at 4 Years in the Look AHEAD Trial**

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**Introduction:** The development of type 2 diabetes is strongly associated with excess weight gain and can often be partially ameliorated or reversed by weight loss. While many lifestyle interventions have resulted in successful weight loss, strategies to maintain the weight loss have been considerably less successful. Prior studies have identified multiple predictors of weight regain, but none have synthesized them into one analytic stream.

**Methods:** We developed a prediction model of 4-year weight regain after a one-year lifestyle-induced weight loss intervention followed by a 3 year maintenance intervention in 1791 overweight or obese adults with type 2 diabetes from the Action for Health in Diabetes (Look AHEAD) trial who lost $\geq3\%$ of initial weight by the end of year 1. Weight regain was defined as regaining $<50\%$ of the weight lost during the intervention by year 4. Using machine learning we integrated factors from several domains, including demographics, psychosocial metrics, health status and behaviors (e.g. physical
activity, self-monitoring, medication use and intervention adherence). We used classification trees and stochastic gradient boosting with 10-fold cross validation to develop and internally validate the prediction model. **Results:** At the end of four years, 928 individuals maintained ≥50% of their initial weight lost (maintainers), whereas 863 did not meet that criterion (regainers). We identified an interaction between age and several variables in the model, as well as percent initial weight loss. Several factors were significant predictors of weight regain based on variable importance plots, regardless of age or initial weight loss, such as insurance status, physical function score, baseline BMI, meal replacement use and minutes of exercise recorded during year 1. We also identified several factors that were significant predictors depending on age group (45-55y/ 56-65y/66-76y) and initial weight loss (lost 3-9% vs. ≥10% of initial weight). When the variables identified from machine learning were added to a logistic regression model stratified by age and initial weight loss groups, the models showed good prediction (3-9% initial weight loss, ages 45-55y (n=293): ROC AUC=0.78; ≥10% initial weight loss, ages 45-55y (n=242): ROC AUC=0.78; 3-9% initial weight loss, ages 56-65y (n=484): ROC AUC=0.70; ≥10% initial weight loss, ages 56-65y (n=455): ROC AUC = 0.74; 3-9% initial weight loss, ages 66-76y (n=150): ROC AUC=0.84; ≥10% initial weight loss, ages 66-76y (n=167): ROC AUC=0.86). **Conclusion:** The combination of machine learning methodology and logistic regression generates a prediction model that can consider numerous factors simultaneously, can be used to predict weight regain in other populations and can assist in the development of better strategies to prevent post-loss regain.

Disclosures: **S.E. Berger:** None. **G.S. Huggins:** None. **J.M. McCaffery:** None. **A.H. Lichtenstein:** None.

Funding: No

Funding Component:

**MP004**

**Feasibility of an Appetite Awareness Intervention to Reduce Cardiovascular Disease Risk Factors and Binge Eating in African-American Women with Obesity**

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**Background:** Currently, 82.1% of African-American (AA) women are overweight or obese, and 48.9% of AA women have cardiovascular disease (CVD), the leading cause of death. Binge eating disorder (BED) is associated with severe obesity, psychiatric morbidity, and increased risk for CVD. Among AA women, BED is the most common eating disorder and has a 33% prevalence among those seeking weight loss. Since many adults with BED report becoming overweight after binge eating on a regular basis, intervening with individuals at risk to develop BED may be a viable strategy to prevent CVD and further weight gain. **Purpose:** To investigate the feasibility of an 8-week, community-based Appetite Awareness Training intervention among AA women who are overweight and obese reporting monthly binge eating episodes, and examine preliminary changes in CVD risk, eating self-efficacy, and binge eating between the intervention and control group. **Methods:** Eligible individuals were randomized to Appetite Awareness Treatment (AAT, n=16) or Wait-List Control (WLC, n=15) with the WLC receiving the AAT after 8-weeks of observation. The goal of Appetite Awareness Treatment is to help participants relearn their biological signals of hunger and satiety. Participants attend group sessions, and receive weekly homework to self-monitor their appetite cues. Assessments were
conducted at 0 and 8 weeks at a community-based site. Linear mixed modeling was used to examine the baseline to 8-week changes between AAT and WLC groups on CVD risk factors (body weight, waist circumference, blood pressure) self-efficacy by Weight Efficacy Lifestyle Questionnaire (WEL), and binge eating by the Binge Eating Scale (BES). Results: The sample (N=31), had a mean age of 48.8 (SD±12.8), and a BMI of 33.7 kg/m² (SD±3.90). Retention was 87.5%, session attendance 65.9%, and homework completion 55%. There were significant group differences over time in the WEL score (p<.01, d=1.06), and the BES score (p<.001, d=.52) at the end of the intervention. The AAT group had an increase in the WEL score (+25.14±6.67), with no changes in the WLC group (-1.27±4.15). Additionally, the AAT group had a decrease in the BES score (-5.87±0.61), with no changes in the WLC group (0 ±0.01). There were no significant differences within and between groups in CVD risk factors. Conclusions: Our pilot trial results suggest that AAT is feasible in this population, with good retention, attendance, and preliminary evidence of a positive impact on eating self-efficacy, binge eating behaviors, and weight gain prevention. Future research should investigate the effectiveness of AAT to reduce binge eating and CVD risk in a larger sample and study with a longer duration.


Funding: No

Funding Component:
Most common outcomes were intakes of fruits and vegetables (F&V) (19 studies), total fat or fat subtypes (18), and dietary fiber (4); and BMI (35) and waist circumference (WC) (10). Median duration was 12 months (range: 1-48 mo). In pooled analyses, WWP increased intake of F&V, especially fruits (Figure). Significant effects were not identified for dietary fiber, total fat, or fat subtypes. WWP also reduced BMI (Figure) and WC (-2.03 cm, 95% CI:-3.88,-0.20). Trial duration significantly modified effects on BMI (<12 mo duration: -0.64 kg/m²; 12+ mo: -0.16 kg/m²; P-interaction=0.046); but not WC or F&V intake. Additional findings for heterogeneity, including WWP components, and publication bias will be presented.

Conclusions
These novel findings support effectiveness of WWP for increasing F&V and reducing BMI and WC.

Disclosures: J.L. Penalvo: None. R. Micha: None. J.D. Smith: None. C.D. Rehm: None. E. Bishop: None. J.A. Onopa: None. I. Uzhova: None. J.H. Wu: None. D. Mozaffarian: E. Honoraria; Modest; DSM. H. Other; Modest; UpToDate.

Funding: No

Funding Component:

MP006

A Feasible and Effective Mobile Health Weight Loss Lifestyle Intervention for Filipinos With Type 2 Diabetes

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Introduction: Filipino Americans have the highest prevalence of obesity and type 2 diabetes (T2D) compared to Asian American subgroups placing them at high risk for cardiometabolic disease. Effective interventions are needed to reduce these health disparities. Mobile health (mHealth) weight loss lifestyle interventions have been effective in reducing cardiometabolic risks, but are untested among Filipinos, particularly with T2D. As prolific users of digital technology, Filipinos are ideal candidates for mHealth lifestyle interventions. Therefore, we conducted the PilAm Go4Health intervention study - a culturally adapted weight loss lifestyle intervention using mobile technology to reduce cardiometabolic risks among Filipinos with T2D.

Objective: To demonstrate intervention feasibility and potential efficacy.

Hypothesis: 1) participant retention rate will be greater than 80%; 2) Compared to the control, intervention group will have significantly greater reduction in: % weight loss, waist circumference, fasting plasma glucose, and HbA1c; and greater increase in step-counts.

Methods: Two-arm (intervention +active control groups) RCT compared a 3-month intervention (Fitbit accelerometer +mHealth app/diary +Facebook group) and control (Fitbit accelerometer). N=45 overweight Filipino adults with T2D were recruited from Northern California communities. Between group differences from baseline to 3-months were analyzed using: 1) multilevel regression for within-person change in weight and step-counts using a nonparametric bias-corrected bootstrapped 95% CI for the multilevel models, and 2) T-tests, ANOVA for waist circumference, fasting plasma glucose, and HbA1c (significance =p<0.05, 2-sided). Cohen’s d was used for effect size analyses.

Results: Randomized N=45 Filipinos (intervention =22 and control =23). Mean age was 58±10 years, 62% women, and retention
rate=100%. There was significantly greater reduction in the intervention group compared to the control for: % weight (2.3% greater decrease, d=0.46); and fasting plasma glucose (-18.52mg/dl; d= -0.86). HbA1c group difference was not significant (-0.34%; p< 0.19). Step-counts significantly increased in the intervention group compared to control (3432 steps at endpoint; d=1.44).

Conclusion: PilAm Go4Health intervention demonstrated excellent feasibility in recruitment and retention, and potential efficacy for reducing cardiometabolic risks in Filipinos with T2D. Results warrant further testing of this lifestyle intervention that may support translation to other at-risk diverse populations living with T2D.

Disclosures: M.S. Bender: None. B. Cooper: None. S. Arai: None.

Funding: Yes

Funding Component: National Center

MP007

Higher Plasma Galectin-3 is Associated With Increased Incidence of Atrial Fibrillation: The Atherosclerosis Risk in Communities (ARIC) Study

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Background: Atrial fibrillation (AF) is a common supraventricular tachyarrhythmia associated with increased risk of cardiovascular sequelae, including heart failure (HF), stroke, and premature mortality. Galectin-3, a beta-galactoside binding lectin involved in important regulatory roles in adhesion, inflammation, immunity, and fibrosis, may be relevant to AF etiology. We tested the hypothesis that plasma galectin-3 concentration would be associated positively with the incidence of AF independent of traditional AF risk factors and incident HF and coronary heart disease (CHD) in a large community-based cohort in the US.

Methods: Our analysis included 8,777 participants free of AF at visit 4 (1996-98) and with measures of plasma galectin-3 from the biracial Atherosclerosis Risk in Communities (ARIC) study. Incident AF was ascertained through the end of 2013 from study visit ECGs, hospitalizations and death certificates. Multivariable Cox proportional hazards models, adjusted for AF risk factors (Model 1) plus incident HF and CHD (Model 2), were used to estimate hazards ratios for the association between galectin-3 and incident AF.

Results: The mean age (SD) of participants was 62.5 (5.6) years; 58.7% were women and 21.5% blacks. During a median follow-up of 15.7 years, 1,233 incident cases of AF were observed. After adjusting for AF risk factors, participants with galectin-3 levels greater than 19.5 ng/ml had a significantly higher risk of incident AF when compared to the referent group (4.4 - 11.9ng/ml), with hazard ratios of 1.44 for the 90th - 94.9th percentile, and 1.61 for the 95th - 100th percentile (p-trend = 0.0003). The association between galectin-3 concentration and incident AF was attenuated somewhat after accounting for incident CHD and HF as time dependent variables (p-trend=0.03) (Table 1).

Conclusion: Elevated plasma galectin-3 is associated independently with increased risk of incident AF.

**Racial Differences in Total, Free, and Bioavailable 25(OH)D and PTH Levels and CVD Risk Among Postmenopausal Women**

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**BACKGROUND:** Recent evidence suggests that racial differences in circulating levels of free or bioavailable 25(OH)D rather than total 25(OH)D may explain the apparent racial disparities in cardiovascular disease (CVD). However, few prospective studies have directly tested this hypothesis. **OBJECTIVE:** Our study prospectively examined black white differences in the associations of total, free, and bioavailable 25(OH)D, vitamin D binding protein (VDBP), and parathyroid hormone (PTH) levels at baseline with incident CVD in a large, multi-ethnic, geographically diverse cohort of postmenopausal women. **METHOD:** We conducted a case-cohort study among 79,705 black and non-Hispanic white postmenopausal women aged 50 to 79 years and free of CVD at baseline in the Women’s Health Initiative Observational Study (WHI-OS). We included a randomly chosen subcohort of 1,300 black and 1,500 white noncases at baseline and a total of 550 black and 1,500 white women who developed incident CVD during the follow up. We directly measured circulating levels of total 25(OH)D, VDBP (monoclonal antibody assay), albumin, and PTH and calculated free and bioavailable vitamin D levels. Weighted Cox proportional hazards models were used while adjusting for known CVD risk factors. **RESULTS:** At baseline, white women had higher mean levels of total 25(OH)D and VDBP and lower mean levels of free and bioavailable 25(OH)D and PTH than black women (all P values < 0.0001). White cases had lower levels of total 25(OH)D and VDBP and higher levels of PTH than white noncases, while black cases had higher levels of PTH than black noncases (all P values < 0.05). There was a trend toward an increased CVD risk associated with low total 25(OH)D and VDBP and elevated PTH levels in both US black and white women. In the multivariable analyses, the total, free, and bioavailable 25(OH)D, and VDBP were not significantly associated with CVD risk in black or white women. A statistically significant association between higher PTH levels and increased CVD risk persisted in white women, however. The multivariate-adjusted hazard ratios [HRs] comparing the extreme quartiles of PTH were 1.37 (95% CI: 1.06-1.77; P-trend=0.02) for white women and 1.12 (95% CI: 0.79-1.58; P-trend=0.37) for black women. This positive association among white women was also independent of total, free, and bioavailable 25(OH)D or VDBP. There were no significant interactions with other pre-specified factors, including BMI, season of blood draw, sunlight exposure, recreational physical activity, sitting time, or renal function. **INTERPRETATION:** Findings from a large multiethnic case-cohort study of US black and white postmenopausal women do not support the notion that
circulating levels of vitamin D biomarkers may explain black-white disparities in CVD but indicate that PTH excess may be an independent risk factor for CVD in white women.


Funding: No

Funding Component:

**MP009**

Contemporary Risk Stratification After Myocardial Infarction in the Community: Performance of Scores and Incremental Value of ST2

Yariv Gerber, Susan Weston, Maurice Enriquez-Sarano, Allan Jaffe, Sheila Manemann, Ruoxiang Jiang, Veronique L Roger, Dept of Health Sciences Res, Rochester, MN

**Background:** Current AHA/ACC guidelines recommend the GRACE and TIMI scores for assessing myocardial infarction (MI) prognosis. With recent major changes in the epidemiology of MI and new biomarkers available for risk stratification, an updated assessment of the performance of these scores is needed in a real-world practice setting. **Objectives:** We assessed (a) the performance of GRACE and TIMI in predicting 1-year mortality among a community cohort of MI patients stratified by ST- and non-ST-segment elevation MI (STEMI/NSTEMI) and (b) the incremental discriminatory power of soluble ST2, a myocardial fibrosis biomarker. **Methods:** Olmsted County, Minnesota residents with incident MI (N=1,401) were recruited prospectively from 2002-2012 (mean age, 67 years; 61% men; 79% NSTEMI). Baseline data were used for calculating risk scores; stored plasma samples obtained shortly after MI were used for ST2 measurement. **Conclusions:** Guidelines-recommended scores for risk assessment post-MI underperform in contemporary community patients with NSTEMI, which now represent the majority of infarcts. Incorporating comorbidities and ST2 substantially improves risk prediction thereby delineating opportunity to improve clinical care.


Funding: No

Funding Component:

**MP010**

A Prospective Study of DNA Methylation Age Acceleration and Incidence of Coronary Heart Disease, Heart Failure, and Peripheral Arterial Disease in the Atherosclerosis Risk in Communities (ARIC) Study

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**Introduction:** DNA methylation patterns used to characterize rate of aging (i.e., epigenetic age acceleration) predict all-cause mortality independently of chronological age and traditional risk factors. It remains unclear how
epigenetic age acceleration is associated with cardiovascular disease risk and subclinical atherosclerosis.

**Hypothesis:** Higher epigenetic age acceleration is associated prospectively with greater risk of coronary heart disease (CHD), heart failure (HF), and peripheral arterial disease (PAD) and cross-sectionally with higher carotid intima-medial thickness (IMT).

**Methods:** Age acceleration of blood was estimated by two published methods (Horvath and Hannum) using DNA methylation levels (Illumina 450K array) at 353 and 71 CpG sites in African Americans of the Atherosclerosis Risk in Communities study in 1990-95 (baseline). Among those without prevalent disease at baseline, Cox and linear regression models were used to estimate the association of age acceleration with incident cardiovascular events occurring through 2013 and with carotid IMT cross-sectionally at baseline. Results were stratified by follow-up time for HF due to violation of the proportional hazards assumption.

**Results:** Participants [mean baseline age: 57 years (range: 47-72)] were followed prospectively for a mean 17 years. In fully-adjusted models (Figure), a 1 SD increment in Hannum epigenetic age acceleration was associated with 15-31% greater hazard of incident cardiovascular outcomes, except for HF in later follow-up. Associations using Horvath age acceleration were similar, except it was not associated with myocardial infarction. Cross-sectionally, a 1 SD increment in each age acceleration measure was associated with 0.01 higher baseline carotid IMT (both \( P \leq 0.01 \)).

**Conclusion:** This study of African Americans provides evidence that epigenetic age acceleration is associated with greater risk of CHD, HF, and PAD events and higher extent of carotid atherosclerosis, independently of traditional risk factors.


Funding: No

Funding Component:

**MP011**

**Cardiac Markers and Risk for Hospitalization with Infection: The Atherosclerosis Risk in Communities (ARIC) Study**

Junichi Ishigami, Johns Hopkins Bloomberg Sch of Public Health, Baltimore, MD; Ron Hoogeveen, Christie Ballantyne, Dept of Med, Baylor Coll of Med, Houston, TX; Aaron Folsom, Div of Epidemiology, Univ of Minnesota, Minneapolis, MN; Josef Coresh, Elizabeth Selvin, Kunihiro Matsushita, Johns Hopkins Bloomberg Sch of Public Health, Baltimore, MD

**Background:** Clinical cardiovascular disease (CVD) is a risk factor for infection, but the association may be confounded by other comorbidities. To better understand the underlying pathophysiology, we explored whether subclinical cardiac biomarkers were associated with infection risk in the general population.

**Methods:** Using 8,588 individuals free of clinical CVD in the biracial ARIC Study in 1996-98 (mean age 62 years and 22% African American), we assessed the association of high-sensitivity cardiac troponin T (hs-cTnT) and natriuretic peptide (NTproBNP) with risk of hospitalization...
through 2013 with an infection ICD code anywhere among the listed discharge diagnoses. Cox proportional hazards models were used to estimate hazard ratios (HRs).

**Results**: During follow-up (median, 15.2 years), 3,308 individuals were discharged with an infection ICD code. The incidence rate increased proportionally with higher hs-cTnT and NTproBNP (Table 1). The association did not change in multivariable Cox proportional analyses, and was consistent after further accounting for incident CVD during follow-up (Table 1) or restricting to hospitalizations with infection as the primary diagnosis. No interaction was observed for subgroup analysis by age, sex, race, and status of diabetes or chronic kidney disease (eGFR < 60 vs. ≥ 60 ml/min/1.73 m²). Although both cardiac markers were associated with different types of infection (pneumonia, urinary tract infections, bloodstream infections, and cellulitis), the association appeared strongest for cellulitis (HR, 1.41 [95%CI, 1.00-2.00] for hsTnT ≥ 4 vs. <3ng/L; and 1.51 [1.08-2.11] for NTproBNP ≥ 69 vs. <68 pg/mL).

**Conclusions**: Higher hs-cTnT and NTproBNP concentrations were independently associated with increased risk for hospitalization with infection, suggesting a potential relationship between cardiac damage/overload and infection.

Table 1: Association of cardiac biomarkers with incidence risk and rate for hospitalization with infection

<table>
<thead>
<tr>
<th>Cardiac Biomarker</th>
<th>Incidence Risk (HR)</th>
<th>Incidence Rate (vs. baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td>hs-cTnT</td>
<td>1.41 (1.00-2.00)</td>
<td>1.51 (1.08-2.11)</td>
</tr>
<tr>
<td>NTproBNP</td>
<td>1.35 (1.04-1.76)</td>
<td>1.26 (0.96-1.64)</td>
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</tbody>
</table>


Funding: No

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**Plasma Galectin-3 Levels and Subsequent Risk of Incident Chronic Kidney Disease**

**Casey M Rebholz**, Elizabeth Selvin, Menglu Liang, Johns Hopkins Bloomberg Sch of Public Health, Baltimore, MD; Christie M. Ballantyne, Ron C. Hoogeveen, Baylor Coll of Med, Houston, TX; Morgan E. Grams, Johns Hopkins Sch of Med, Baltimore, MD; Josef Coresh, Johns Hopkins Bloomberg Sch of Public Health, Baltimore, MD

**Introduction**: Galectin-3 is a 35 kDa β-galactoside-binding lectin which has been proposed as a novel biomarker of heart failure primarily due to its involvement in myocardial fibrosis. Elevated levels of galectin-3 may be associated with fibrosis of other organs, such as the kidney, and increase the risk of developing kidney disease.

**Methods**: Using Cox proportional hazards regression, we prospectively analyzed Atherosclerosis Risk in Communities (ARIC) study participants with measurements of plasma galectin-3 levels at baseline (visit 4, 1996-98) and without prevalent kidney disease or heart failure (N=9,647). Incident chronic kidney disease was defined as estimated glomerular filtration rate (eGFR) < 60 mL/min/1.73 m² accompanied by 25% eGFR decline, chronic kidney disease-related hospitalization or death, or end-stage renal disease between baseline and December 31, 2013.

**Results**: 2,105 participants (22%) developed incident chronic kidney disease over a median follow-up of 16 years. The mean (standard deviation) plasma level of galectin-3 was 14.7 (4.4) ng/mL. At baseline, galectin-3 was cross-sectionally associated with eGFR (r = -0.31) and urine albumin-to-creatinine ratio (UACR) (r = 0.19). After adjusting for demographics and kidney disease risk factors, there was a significant, graded, and positive association
between galectin-3 and incident chronic kidney disease (quartile 4 vs. 1 HR: 1.84, 95% CI: 1.62, 2.09, p for trend <0.001). The association between galectin-3 and incident chronic kidney disease was attenuated but remained significant after accounting for eGFR and UACR (quartile 4 vs. 1 HR: 1.58, 95% CI: 1.39, 1.80, p for trend <0.001). The association was similar by diabetes status (p for interaction = 0.33) and stronger among those with hypertension (p for interaction = 0.004).

**Conclusion:** In this community-based population, higher plasma galectin-3 levels were associated with elevated risk of developing incident chronic kidney disease, particularly among those with hypertension.

**Disclosures:** C.M. Rebholz: None. E. Selvin: None. M. Liang: None. C.M. Ballantyne: None. R.C. Hoogeveen: None. M.E. Grams: None. J. Coresh: None.

**Funding:** No

**Funding Component:**

**MP013**

**Diet High in Sweets and Sugar-sweetened Beverages But Low in Fruits and Vegetables is Associated With Pro-inflammatory Adipokine Profile in Mexican Americans at Risk For Diabetes**

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**Background:** High consumption of sweets and sugar-sweetened beverages is associated with obesity, insulin resistance and cardiovascular disease. Pro- and anti-inflammatory adipokines may mediate the relationship between dietary intake and poor metabolic profile. However, studies investigating the association between diet and adipokines are scant and often restricted to one or two biomarkers.

**Study design and methods:** Subjects were participants of BetaGene, a study of obesity, insulin resistance and β-cell dysfunction in Mexican Americans (n=1,128, 73% female, age 34.6±8.0, BMI 29.5±5.9). Adiponectin, IL-1β, IL-6, IL-1Ra, leptin, lipocalin, MCP-1, resistin and TNF-α were assayed using Millipore multiplex kits with magnetic bead panels; apelin, CRP, DPP-IV, visfatin, SFRP4 and SFRP5 were measured with ELISA. Dietary intake was assessed by 12-mo recall (126-item Harvard-FFQ). Joint multivariate associations between levels of adipokines and food group consumed (grams/day) were analyzed using canonical correlation after adjustment for age, sex and energy intake.

**Results:** Median (IQR) energy intake was 2.27 (1.75,2.85) Mcal/day. While 55% of total intake was accounted for by carbohydrates, 24% was due to sugar. A total of 37% of the shared variation between diet and adipokines was explained by the top linear association between the two. The top dietary component (Figure 1) was most represented by sugar-sweetened beverages (SSB, loading coefficient ρ=0.55), sweets (ρ=0.53), fruits (ρ=0.47), fruit juices (ρ=-0.34), and vegetables (ρ=-0.30), while the adipokine component was most represented by leptin (ρ=0.63), CRP (ρ=0.56), and MCP-1 (ρ=0.47).

**Conclusions:** Diets high in sweets and sugar-sweetened beverage but low in fruits and vegetables contribute to a pro-inflammatory profile characterized by high leptin, CRP and MCP-1, which in turn is associated with poor
metabolic profile in Mexican Americans at risk for type 2 diabetes.

Disclosures: **C. Koebnick**: None. **M. Black**: None. **J. Wu**: None. **Y. Shu**: None. **T. Buchanan**: None. **A. Xiang**: None.

Funding: No

**Funding Component:**

**MP014**

**Very Long Chain Saturated Fatty Acids and Diabetes Risk: Meta-Analysis of Cohort Studies in the FORCE Consortium**

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**Background:** Circulating saturated fatty acids are biomarkers of diet and metabolism that may influence the pathogenesis of diabetes. Unlike palmitic acid (16:0), which has been extensively studied, little is known of the relationship of very long-chain saturated fatty acids (VLSFAs), with 20 carbons or more, to diabetes risk. **Objective:** To investigate the associations of circulating levels of VLSFA with incident diabetes. **Methods:** A meta-analysis was conducted within a consortium of prospective (cohort or nested case-control) studies having circulating measures of one or more VLSFAs, including arachidic acid (20:0), behenic acid (22:0) and lignoceric acid (24:0). Standardized analysis was conducted in each study using pre-specified models, exposures, outcomes, and covariates. Study-specific estimates were pooled using fixed effects meta-analysis. **Results:** Current findings were based on 9 participating studies, including 46,549 total participants and 13,750 incident diabetes. In multivariable-adjusted analyses, higher levels of all 3 VLSFAs were associated with lower risk of incident diabetes. Pooled RRs (95% CI) per interquintile range were 0.80 (0.71-0.90) for 20:0; 0.83 (0.76-0.91) for 22:0; and 0.70 (0.63-0.79) for 24:0, after adjustment for demographics, lifestyle factors and clinical conditions. Additional adjustments for circulating palmitic acid and triglyceride levels moved the RRs toward the null (illustrated for 24:0, in model 3 of the Figure). **Conclusions:** Based on meta-analysis of results from several studies around the world, biomarker levels of VLSFA are associated with lower risk of incident diabetes, potentially mediated by effects on circulating triglycerides and 16:0.
Introduction: Directly proportional to body fat, leptin influences the regulation of blood glucose through several mechanisms some of them influenced by adiponectin. In population studies, high leptin levels have been associated with the development of type 2 diabetes mellitus (T2D), with differences by sex. Because African Americans have high prevalence of obesity and T2D, we assessed the association of leptin with T2D and its interaction with adiponectin in a large ongoing cohort study. The hypothesis was a direct association between leptin and T2D, with differences by sex and modulated by adiponectin.

Methods: We included participants who were free of T2D (ADA 2004) at the baseline examination (Exam 1) from the Jackson Heart Study (JHS), a single-site, prospective cohort of risk factors of heart disease in African Americans in Jackson, Mississippi. Incident T2D was defined as new T2D cases among Exam 2 or Exam 3 participants. Separate logistic regression models (odds ratios per log-transformed unit of biomarker) included a minimally adjusted model for age, sex and BMI; a model with addition of systolic blood pressure, antihypertension medication, triglycerides, HDL-cholesterol and antihyperlipidemic medication, smoking, alcohol intake, physical activity and education level; and a full model with addition of insulin resistance, HOMA-IR, on top of these variables. Several interactions were assessed such as by sex and glycated hemoglobin, HgA1c.

Results: Among our 3083 participants (mean age 53 years, 63% women) there were 584 incident T2D cases. Significant correlations were present among women for leptin with BMI (0.64) and HOMA-IR (0.30), and for adiponectin with HOMA-IR (-0.32) and HDL-cholesterol (0.39). Among men, significant correlations were found for leptin with BMI (0.76) and HOMA-IR (0.53); and for adiponectin with HOMA-IR (-0.28) and HDL-cholesterol (0.38). Leptin was directly associated with incident T2D in the minimally adjusted model (OR= 1.46; 95% C.I. 1.21, 1.77). The association remained in the additional model (OR=1.43, 95% C.I. 1.15-1.78). However, the fully adjusted...
model showed no association between leptin and T2D (OR=0.97, 95% C.I. 0.76-1.24), indicative of a mediation through insulin resistance. The direct association between leptin and T2D was present in men (OR=1.54, 95% C.I. 1.18-1.99; association nullified by insulin resistance), but not in women (OR=1.30, 95% C.I. 0.96-1.76); although no statistical interaction was present (p=0.96). Adiponectin did not interact with leptin in their association with incident T2D (p=0.08). Effect modification was not present for HbA1c and leptin or adiponectin. **Conclusion:** Among our African American participants there was an association between leptin and incident T2D, explained by insulin resistance but not modulated by adiponectin.


Funding: No

Funding Component:

**MP016**

**Glycated Albumin and Fructosamine May Not Overcome Limitations of HbA1c in the Setting of Chronic Kidney Disease**

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**INTRODUCTION**

Alterations in red blood cell turnover in the setting of chronic kidney disease (CKD) may limit the interpretability of hemoglobin A1c (HbA1c) as a measure of diabetic glucose control. Where HbA1c is problematic, glycated albumin and fructosamine have been proposed as better markers of hyperglycemia. We investigated whether the associations of HbA1c, glycated albumin, and fructosamine with fasting glucose and HbA1c varied by CKD stage.

**METHODS**

We performed a cross-sectional analysis of 1,678 persons with diagnosed diabetes aged 65 years or older from the Atherosclerosis Risk in Communities Studies (list 5, 2011-2013). We compared Spearman's rank correlation coefficients and root mean square error (RMSEs) for HbA1c, glycated albumin, and fructosamine with fasting glucose and HbA1c across CKD stages. CKD stages were defined using estimated glomerular filtration rate (eGFR) and urine albumin-to-creatinine ratio (ACR).

**RESULTS**

Mean age was 76 years, 54% (910 of 1,678) were female, and 29% (479 of 1,678) were black. The associations of HbA1c, glycated albumin, and fructosamine with fasting glucose were weaker (lower correlations and higher RMSEs) in persons with worse kidney function compared to those with preserved kidney function (Table). Both glycated albumin and fructosamine had stronger associations with HbA1c compared to fasting glucose and their associations with HbA1c were relatively similar across CKD stages.

**CONCLUSIONS**

In persons with worse kidney function, HbA1c, glycated albumin, and fructosamine were all poorly correlated with fasting glucose. Yet the associations between glycated albumin and fructosamine with HbA1c were similar across CKD stages. Our data suggest that glycated albumin and fructosamine might not overcome limitations of HbA1c as a marker of hyperglycemia in older adults with CKD.
Association of Change in Plasminogen Activator Inhibitor-1 Through Young Adulthood With Metabolic Disease in Middle Age: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Introduction: Circulating plasminogen activator inhibitor-1 (PAI-1) levels are elevated in obesity and diabetes mellitus (DM) in cross-sectional studies. Preclinical studies support a role for PAI-1 in obesity development and insulin signaling. To date, no studies have investigated the prospective association of PAI-1 in young adults with incident obesity and DM.

Hypothesis: Higher PAI-1 concentrations and greater increases in PAI-1 during young adulthood are associated with higher incidence of obesity and diabetes.

Methods: We performed an ancillary study in CARDIA measuring PAI-1 in plasma at exam year (Y) 7 and Y20 in a subset of 1200 participants (ppts) free of obesity and DM at Y7. Multivariable logistic regression was used to examine the association between PAI-1 at Y7 and change from Y7 to Y20 with incident obesity and diabetes by Y30. Covariates for adjustment included demographics (age, race, sex, center, education), lifestyle risk factors (physical activity, energy intake, smoking), metabolic traits (BMI, fasting glucose [for DM]), and Y7 PAI-1 level.

Results: At Y7, ppts (32±4 years, 54% female, 37% black) had mean BMI 24.5±3 kg/m², fasting glucose 89±8 mg/dL, and median PAI-1 14 (IQR: 8-24) ng/mL. Median change in PAI-1 from Y7 to Y20 was +10.0 ng/mL (IQR: +1.0-28.0 ng/dL). Each 1 standard deviation higher ln(PAI-1) at Y7 was associated with an adjusted hazards ratio for incident DM of 1.35 (95% CI: 1.09-1.67). Each 1 standard deviation greater increase in PAI-1 from Y7 to Y20 was associated with an adjusted odds ratio (OR) for incident obesity and DM of 1.21 (1.02-1.43) and 1.36 (1.10-1.68), respectively. When examined by quartiles, the highest (vs. lowest) quartile of Y7 to Y20 PAI-1 change was associated with an adjusted OR of 2.37 (1.33-4.21) for incident obesity and 3.11 (1.45-6.68) for incident DM by Y30, independent of Y7 BMI and PAI-1.

Conclusions: Higher plasma PAI-1 levels and greater increases in PAI-1 during young adulthood are positively associated with incident obesity and DM by middle age.
Performance of 1,5-anhydroglucitol Compared to the Oral Glucose Tolerance Test and Fasting Glucose for Identification of Diabetes in the Community

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Introduction: The oral glucose tolerance test has been a long-standing gold standard for diabetes diagnosis. The oral glucose tolerance test measures glycemic response to a glucose challenge, but has fallen out of favor due to its high patient burden. There is growing interest in 1,5-anhydroglucitol (1,5-AG), a non-fasting test that does not require a carbohydrate challenge, for use in clinical practice. There is currently no consensus on clinical cut points for 1,5-AG, although low levels of 1,5-AG reflect recent (~2 week) glycemic excursions. Our objective was to evaluate the performance of 1,5-AG to identify cases of undiagnosed diabetes defined by the oral glucose tolerance test as the gold standard for clinical use but its utility is unclear. Given its low sensitivity for detection of diabetes, 1,5-AG may not be able to substitute for fasting glucose or the oral glucose tolerance test for screening of diabetes.

Methods: We included 7,754 Atherosclerosis Risk in Communities (ARIC) Study participants without diagnosed diabetes who attended visit 4 (1996-98). We calculated ROC curves, Youden’s index, sensitivity, and specificity to investigate the performance of 1,5-AG to identify cases of undiagnosed diabetes defined by the oral glucose tolerance test or fasting glucose in a community-based population.

Results: The ROC curve of 1,5-AG compared to the oral glucose tolerance test as the gold standard was 0.658 and 1,5-AG compared to fasting glucose as the gold standard was 0.714. Youden’s index identified “optimal” 1,5-AG cut-points of 16 µg/mL and 17 µg/mL to identify diabetes defined by oral glucose tolerance test and fasting glucose, respectively. Decreasing values of 1,5-AG were more specific and less sensitive for detection of oral glucose tolerance test and fasting glucose-defined diabetes (Table).

Conclusion: 1,5-AG is currently approved for clinical use but its utility is unclear. Given its low sensitivity for detection of diabetes, 1,5-AG may not be able to substitute for fasting glucose or the oral glucose tolerance test for screening of diabetes.

Table: Performance of 1,5-anhydroglucitol compared to oral glucose tolerance test and fasting glucose to identify diabetes

<table>
<thead>
<tr>
<th>Test</th>
<th>Oral Glucose Tolerance Test</th>
<th>Fasting Glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,5-AG</td>
<td>0.658</td>
<td>0.714</td>
</tr>
</tbody>
</table>

Introduction: While predictors of incident hypertension are well-studied, the factors explaining the black-white (B/W) disparity in the...
incidence of hypertension are unknown. Absent interactions, for a factor to contribute to this racial disparity, it must both: 1) have a large B/W difference in prevalence, and 2) be strongly associated with the risk of incident hypertension. 

Methods: We selected 20 established risk factors for hypertension to assess the degree to which they contribute to the black excess risk of incident hypertension. The B/W difference in hypertension risk factors was assessed by the standardized difference score (SDS: # standard errors difference in the B/W means) adjusting for age group. The impact of risk factors on incident hypertension was assessed by logistic regression adjusting for age group and baseline SBP. The mediation by each risk factor was calculated as the percent change in the regression coefficient for black race with additional adjustment for each risk factor. 

Results: Over a 10-year follow-up, 45% of 619 black and 36% of 2204 white men, and 52% of 994 black and 34% of 2409 white women, developed hypertension. The B/W difference in the mean southern diet score (assessed by a food frequency survey) was large for men (SDS = 19.3) and women (SDS = 21.8). The diet score was also strongly associated with incident hypertension for men (OR = 1.17; 95% CI: 1.07-1.30) and women (OR = 1.18; 95% CI: 1.06-1.30). As such, the diet score was the most powerful mediator of the B/W difference in incident hypertension, accounting for 52% (95% CI: 19%-84%) of the black excess risk in men and 26% (95% CI: 10%-42%) in women. For women, BMI was the 2nd most powerful mediator, accounting for 17% (95% CI: 6% - 15%) of the excess black risk of hypertension (SDS = 9.5; OR = 1.04; 95% CI: 1.03-1.06); however, because BMI was similar in black and white men (SDS = 1.4) it did not significantly mediate the risk in men (p = 0.63). Low education was the 2nd most powerful mediator for men (14%; 95% CI: 3%-25%), but played a smaller role in women (4% mediation; 95% CI: 2% - 7%) because of a smaller B/W difference of the prevalence of low education in women (SDS = 1.4). The dietary sodium/potassium ratio (11%) was also a mediator in men; while in women (in decreasing order of mediation) low mobility (15%), low DASH diet score (11%), low income (10%), low neighborhood quality (8%), dietary sodium/potassium ratio (5%), low physical activity (5%) and low education (4%) also contributed to the excess black risk of incident hypertension. Other factors including exercise and discrimination did not significantly mediate the excess risk of hypertension in blacks. 

Conclusions: This report provides insights to the contributors of the higher incidence of hypertension in blacks, with a high consumption of southern foods being the most powerful contributor to black disparity in incidence of hypertension for both men and women. 


Funding: No
Methods: A total of 618 CARDIA Study members took part in a sleep sub-study (2003-2005) and had measured CMB risk (2000-2011; mean age at baseline=40.1; 43.5% AA; 56.5% EA; 42.1% male). Sleep efficiency (% of time in bed asleep) and total sleep time were assessed via actigraphy for six total nights in years 17 and 18 of the CARDIA Study. CMB risk was assessed in years 15 and 25 from borderline high (coded as 1) and high (coded as 2) levels in seven markers using recommended cutpoints from NCEP ATP III and AHA: blood pressure, glucose, insulin resistance, waist circumference, triglycerides, HDL-C, and C-reactive protein. Scores were averaged across markers, ranging from 0 to 2 (a score of 1 indicates a borderline high average in the seven markers). Using linear path models, sleep variables were tested as mediators of racial disparities in ten-year changes in CMB risk.

Results: AAs obtained less efficient sleep and less total sleep than EAs (76.5% vs 84.3%; 5.63 hrs vs. 6.43 hrs), and AAs had higher CMB risk at both periods (Mean at Y15: .75 vs. .55; Y25: .94 vs .67) (p’s < .001). Mediation tests are shown in the Table. Race was indirectly associated with increasing CMB risk over the ten-year period via sleep efficiency, explaining 25% of the racial disparity. Racial disparities in CMB risk were attenuated by 24.5% when adjusting for sleep time, although the mediation test was not significant. After adjusting for education and household income, 18.1% of the race disparity in diverging CMB risk was explained by sleep efficiency and 20.8% by sleep time.

Conclusions: Differences in sleep likely contribute to greater CMB risk among AAs as compared to EAs in adulthood. Sleep may be an important intervention point to reduce racial health disparities.


Funding: No

Funding Component: MP021

Identification of “At Risk” and “Resilient” CVD Census Tracts in the Morehouse-Emory Cardiovascular (MECA) Study

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The MECA study is unique in that it will study CVD resiliency in blacks at both the individual and community (census tract) level in the Atlanta Metropolitan Area. It is well established that blacks suffer from greater cardiovascular morbidity and mortality than whites in the United States. Not all blacks suffer from poor cardiovascular health, some individuals manage to live long healthy lives without ever developing cardiovascular conditions. The causes of this resilience are not known. Both individual and community level factors may be responsible for cardiovascular risk and resilience in blacks. The first stage of the MECA study was to identify “at risk” and resilient communities based on their rates of CVD related ED visits, hospitalizations and mortality.

Objectives: To determine if in fact a wide distribution of CVD rates exist among Blacks in census tracts in Metro Atlanta. To determine if there were still large differences in rates when black household income was controlled for.

Methods: Count data on CVD related emergency department and hospitalizations for blacks aged 35-64 living in census tracts in the
Atlanta--Athens-Clarke--Sandy Springs combined statistical area during 2010-2014 were obtained from the Georgia Hospital Association. CVD mortality data for the same population for the same time period were obtained from the Georgia Department of Public Health. In order to control for the socioeconomic status, age and gender distribution of the neighborhoods, negative binomial regression models controlling for median black household income, percent of 5-year age groupings, and percent male were estimated for each of the outcomes. Residuals in top 25% were considered to be “at risk tracts (high rate) while residuals in the bottom 25% were considered resilient (low rate tracts).

**Results:** 106 tracts were resilient for at least 2 of the 3 outcomes, 188 were “at risk” for 2 out of 3 outcomes. Both types of tracts were located throughout the Atlanta metropolitan area. Mean black household income in the tracts are similar (resilient: $46,335, “at risk”: $44,721). Black CVD hospitalization event rate was 28 vs. 132 per 1000 population (p<.0001) for resilient tracts vs “at risk” tracts. Black CVD ED visit event rate and CVD mortality rate was also lower in resilient (ED: 33 per 1000 pop; Mortality: 8 deaths per 1000 pop) than “at risk” (ED: 147/1000 pop; Mortality: 14 deaths per 1000 pop) census tracts.

**Conclusion:** We have identified census tracts in Metro Atlanta that have large differences in premature CVD outcomes for Blacks despite having similar mean income levels. The next phase of the MECA study will examine census tract and survey data to elucidate what contextual (demographic, food environment, reported neighborhood characteristics) and individual level (behavioral, psychological, social) factors may be associated with the different rates of CVD in resilient and “at risk” census tracts.

**Disclosures:** **P.T. Baltrus:** None. **T. Lewis:** None. **J. Xu:** None. **V. Vaccarino:** None. **M. Mujahid:** None. **H. Taylor:** None.

**Funding:** Yes

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**MP022**

**Cost-effectiveness of the Non-laboratory Based Framingham Algorithm in Primary Prevention of Cardiovascular Disease: a Simulated Analysis of a Cohort of African American Adults**

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**Background:** The non-laboratory based (non-LB) Framingham algorithm, which substitutes body mass index for lipids, has been validated for screening cardiovascular disease (CVD) risk among African Americans (AA). However, its marginal cost and benefit tradeoffs have not been contrasted with the established laboratory based (LB) Framingham algorithm. This study examines the incremental cost-effectiveness ratio (ICER) of a simulated CVD prevention program guided by the non-LB versus LB Framingham algorithm. **Methods:** We simulated the World Health Organization CVD prevention guidelines on AA participants of the Atherosclerosis Risk in Communities (ARIC) cohort. Treatment intensity was tailored according to absolute CVD risk scores calculated by non-LB and LB Framingham algorithms. Costs were estimated using Medicare fee schedules (diagnostic tests, drugs and visits), Bureau of Labor Statistics (RN wages), and Chapman’s estimates for initial and follow-up costs of managing incident CVD events. Outcomes were assumed to be true positive cases detected at the treatment threshold. ICER was calculated using Drummond’s framework. **Results:** Among 2690 AA (mean age 53.3 ± 5.8 yrs, 59% female) the simulation under the non-LB vs LB Framingham algorithm had an ICER of -$46,240 per true positive case detected. The average 12-year discounted costs under the LB Framingham algorithm were 18.3% higher ($29,991 vs

**Funding Component:** National Center
$25,357) and identified 6.5% fewer cases (309 vs 329) compared to the non-LB Framingham algorithm. **Conclusion:** The approach guided by the non-LB Framingham algorithm dominated the LB Framingham strategy with respect to both costs and predictive ability. Consequently, the non-LB Framingham algorithm could potentially provide a lower cost but a highly effective tool to address the high burden of CVD in AA and other resource constrained settings.


Funding: Yes

Funding Component: Founders Affiliate (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont)

**MP023**

Changes in Systolic Blood Pressure Differs by Immigration History in a Cohort of Older Mexican Americans

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**Background:** Studies on immigrant health suggest that foreign-born individuals have better health outcomes than their native-born counterparts due to health selection. However, effects of immigration history on changes in cardiovascular conditions and risk factors are less well understood.

**Objective and Hypothesis:** We examined the association between immigration history and change in systolic blood pressure (SBP). We hypothesized that Mexican Americans born outside the US and immigrated after age 30 (FB30+), would have lower SBP at baseline and have slower increase in SBP compared to people who were born in the US (US-B) or immigrated from Mexico before age 30 (FB<30).

**Methods:** Participants come from the Sacramento Area Latino Study on Aging (n=1789), a longitudinal cohort of community-dwelling older Mexican Americans (mean age=70.6 years); 51% were born in Mexico. Immigration history was categorized as US-B, FB<30, and FB30+. SBP measures were available at baseline and at five follow-ups over ten years. A mixed effects linear model was used to examine the association between immigration history and SBP. Other covariates included gender, education, current hypertension medication use, and baseline measures of age, BMI, and diabetes. Follow up time was defined as time since enrollment. Quadratic time was included to account for non-linear change in SBP. Two interaction terms (immigration history x linear time and immigration history x quadratic time) were included to assess differences in SBP change by nativity.

**Results:** The study included 1598 participants after exclusions. The figure shows the predicted average SBP by immigration history over the study period, derived from the mixed linear model. Compared to US-B, the FB<30 and FB30+ experienced an average of 7.3 (95% CI 2.0-12.7) and 7.9 (95% CI 2.2-13.5) mmHg increase in SBP over the study period, respectively.

**Conclusions:** In contrast to current literature, immigrants appeared to be at greater risk for adverse cardiovascular risk factors.


Funding: No
Increase in Adverse Cardiovascular Risk Profile among Hispanics/Latinos of Diverse Backgrounds Living in the United States: Findings from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)

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Background: HCHS/SOL showed that a sizeable proportion of Hispanics/Latinos (80% of men, 71% of women) had at least 1 major CVD risk factor (RF), with marked variations by ethnic background. Little is known about changes in CVD RF profiles over time in this population.

Objective: To describe ~6-year changes in CVD RF profiles and examine associations with demographic and socioeconomic/ sociocultural factors.

Methods. HCHS/SOL is a multi-center prospective community-based study of 16,415 Hispanic/Latino adults of Cuban, Dominican, Mexican, Puerto Rican, Central American, and South American backgrounds, aged 18-74 at Visit 1 (2008-11). Visit 2 (2014-17) is ongoing and 8,413 persons (~60% of the cohort to be studied) attended as of Sept. 2016. Analyses included 7,789 men and women with complete data. CVD RF profiles were defined as having 0 (0RF) or any 1 or more (1+RF) of the following: hypercholesterolemia, hypertension, obesity, diabetes, and smoking (see definitions in Table). Adjusted percent increases in number of RFs were computed. Multinomial logistic regression was used to examine associations of Visit 1 characteristics with change in RFs, adjusted for sociodemographic, sociocultural, and lifestyle factors. Results. After 5.8 years, 29% of men and 27% of women had increases in number of RFs; changes occurred more frequently in persons with 1+ RF at Visit 1 than in those with 0RF and varied by background (Table). Significantly higher odds of increase in number of RFs (vs. 0RF at both visits) were seen with older age (OR=1.07, 95% CI=1.06-1.08 per 1 yr) and male sex (1.74, 1.37-2.21); lower odds with higher education (0.60; 0.44-0.83 for > vs. < high school) and income (0.56, 0.38-0.81 for >$50,000 vs. <$20,000); acculturation did not relate to RF changes. Conclusions. In just a few years, a large percent of US Hispanic/Latino adults had an increase in number of adverse RFs, which varied by background; age, sex, education, and income were associated with RF increases. Greater efforts are needed to prevent CVD RFs in this population.


Funding: No

Funding Component:

MP025
Unfavorable Perceptions of Neighborhood Environment are Associated With Greater Sedentary Time - Data From the Washington, D.C. Cardiovascular Health and Needs Assessment

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Background: Sedentary time (ST) and unfavorable perceptions of neighborhood environment (NE) are independently associated with poor cardiovascular (CV) health. However, little is known about ST’s relationship to NE perceptions.

Methods: We examined associations between ST and NE perception in the Washington, DC CV Health and Needs Assessment (NCT01927783). Participants underwent a CV health evaluation designed using community-based participatory research principles and conducted in faith-based organizations in lower socioeconomic (SES) areas in DC. Participants responded, on a 5-point Likert scale, to questions about NE perceptions of sidewalks, recreational areas, crime, etc. Factor analysis was conducted to explore associations with overall NE perception. The factor sums were combined as the Total Perception Score (TPS). For ST, participants reported amount of time (in hours/minutes) “spent sitting or reclining on a typical day”. Linear regression analyses were performed to determine the relationship between TPS (range 15-75, higher score=more favorable perception) and ST for the 1) overall population, 2) Wards 5, 7, and 8 and 3) other DC wards/Maryland (MD) areas.

Results: For the study sample (N=99, 99% African American, 78% female), DC Wards 5, 7, and 8 had a significantly higher percentage of households with yearly income of <$60,000 (p<0.05) and lower mean TPS than residents of other areas (p < 0.001). Three factors (neighborhood violence, physical and social environment, and social cohesion) were associated with overall NE perception. Among those living in the lower SES Wards 5, 7, and 8, there was a negative association between TPS and ST that remained after adjusting for age, sex, and income (Table). This relationship was not observed for those in higher SES DC/MD areas.

Conclusions: Poorer NE perception is associated with greater ST for those living in lower SES areas of DC. Targeted interventions to improve perceptions of physical and social environment in these areas may decrease ST and improve CV health.


Funding: No

Funding Component:

MP026

Effects of Substituting Sedentary Behavior With Light and Moderate-to-vigorous Physical Activity on Obesity Indices in Adults

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Sedentary behavior (SB) has emerged as an independent risk factor for the occurrence of cardiovascular problems and all-cause mortality. However, the deleterious effect of SB may be a consequence of replacing time spent in light and moderate-to-vigorous (MVPA) physical activities. Few studies have explored this topic, especially in prospective follow-up studies with adults. We hypothesized that substituting SB with light and MVPA may be associated with 1-year change in body weight, body mass index (BMI) and fat body mass (FBM) in asymptomatic adults. We aimed to use isotemporal substitution modeling to investigate cross-sectional and longitudinal effects of reallocating SB with light and MVPA on obesity indices in asymptomatic adults. Also, we examined the correlations between 1-year changes in physical activity intensity categories (i.e., sedentary, light, moderate, vigorous, very vigorous, and MVPA) and changes in FBM. We included 780 participants over the age of 20-yr. Body weight, BMI, and FBM (bioelectrical impedance), as well as its 1-year changes, were the outcomes. We objectively measured physical activity using triaxial accelerometers (ActiGraph GT3X) worn above the dominant hip during waking hours for at least four consecutive days (4-7 days). After 1-year follow-up, 242 completed all the assessments. We reallocated time spent in SB by light or MVPA and assessed the cross-sectional and prospective associations with the outcomes. The cross-sectional isotemporal substitution analysis showed that substituting 10-min blocks of SB with MVPA was significantly related to decreases of 1.23 kg in body weight, 0.30 kg/m2 in BMI and 0.38% in FBM. Substituting 10-min blocks of SB with light physical activity produced significant lower values of body weight (1 kg) and BMI (0.1 kg/m2). We found no effects of substituting SB with light physical activity on FBM. As for the longitudinal analysis, we observed that reallocating SB with MVPA was only associated with a significant decline in FBM (-0.31%). We found no other significant effects of substituting SB with light or MVPA. We observed significant correlations between change in FBM and changes in sedentary (r = 0.147), light (r = -0.290) and vigorous (r = -0.277) physical activity. After stepwise multiple regressions adjusted for all physical activity intensities and covariates, change in vigorous physical activity was the only intensity selected as a significant predictor for 1-year absolute change in FBM (β = -0.312; ΔR² = 0.102). We may conclude that SB presents non-consistent influence on obesity indices in asymptomatic adults and its substitution with MVPA is associated with significant improvement in body composition over a short-term follow-up. Our results suggest that vigorous physical activities play the most important role in obesity in adults.


Funding: No

Funding Component:

MP027

Gene-environment Interaction Analysis Reveals Evidence for Independent Influences of Physical Activity and Sedentary Behavior on Obesity: Results From the Hispanic Community Health Study/study of Latinos (HCHS/SOL)

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Background Studies using self-reported data support gene-physical activity interaction on obesity, yet the influence of sedentary behavior, distinct from lack of physical activity, on genetic associations with obesity remains unclear. Methods We examined interactions of accelerometer-measured physical activity and sedentary behavior with genetic variants on BMI/obesity risk in 9,645 participants aged 18-74 years from the HCHS/SOL, a population-based cohort of US Hispanics/Latinos (2008-2011). A genetic risk score (GRS) was calculated by summing the BMI-increasing alleles of known 97 SNPs (identified primarily in European-ancestry in the GIANT BMI GWAS; \( P<5\times10^{-8} \)). Specific GRSs were also calculated based on the possible biological categories of these SNPs. Results The overall GRS was significantly associated with BMI in the HCHS/SOL (\( \beta=0.65 \) per SD \(~6\)-allele increase); \( P=1.0\times10^{-39} \). The genetic effect on BMI was stronger in participants with lower moderate-to-vigorous physical activity (MVPA) (1st tertile, \(<8\text{min/day}\) compared to those with higher MVPA (3rd tertile, \(>23\text{min/day}\) (0.78 [0.10] vs 0.39 [0.10]; \( P_{\text{int}}=0.005 \)), as well as in participants with more sedentary time (3rd tertile, \(>13\text{h/day}\) compared to those with less sedentary time (1st tertile, \(<11\text{h/day}\) (0.73 [0.1] vs 0.44 [0.1]; \( P_{\text{int}}=0.005 \)). The genetic effects on obesity risk were stronger in participants with lower MVPA (\( P_{\text{int}}=0.016 \)) or more sedentary time (\( P_{\text{int}}=0.016 \)). Interactions of GRS with MVPA and sedentary behavior remained significant after further adjustment for each other. Of note, 4 biological category-specific GRSs showed nominally significant interactions with both MVPA and sedentary behavior, while a number of different GRSs interacted with only MVPA or sedentary behavior, in relation to BMI (Figure).

Conclusions Our data suggest that both increasing physical activity and reducing sedentary behavior may attenuate the genetic association with obesity, possibly through interacting with shared and different genetic pathways.


Funding: No

Funding Component:

MP028

Bi-directional Relationship Between Sleep and Sedentary Behavior in Adults Who Are Overweight and Obese

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Introduction: It is assumed that inadequate sleep is associated with sedentary behavior and that being active during the day improves sleep. Given the emergence of sedentary behavior as an independent risk factor for cardiovascular disease (CVD), a better understanding of this bi-directional relationship in adults who are obese is needed for developing CVD-risk reducing interventions.

Hypotheses: Total sleep time (TST) is negatively associated with next day sedentary time (SED) and SED is negatively associated with that night’s TST in adults who are obese.

Methods: We used objective baseline data from the EMPOWER Study, a 12-mo study of lapses
during weight loss. We instructed subjects to wear accelerometers on the waist (ActiGraph GT3X) for 7 days and wrist (Actiwatch 2) for 14 days to assess daily activity and sleep, respectively. Subjects with ≥2 weekdays and 2 weekend days of overlapping data were included. SED was defined as <150 counts/min. Linear mixed modeling was used to examine the associations between TST and SED; each directional relationship was examined separately. Covariates included sex, race, body mass index (BMI), age, and day of the week.

Results: The majority of subjects (N=109) were white (82.6%), employed (92.6%), and female (89.0%) with mean (±SD) age of 50.6±10.6 years and BMI of 33.8±4.6 kg/m². Mean daily TST and SED were 409.5±83.0 min and 638.8±132.2 min, respectively. Previous night’s TST independently predicted the next day’s SED (p<.001) with each 3 min increase in TST being associated with a 1 min decrease in SED. SED did not predict that night’s TST. Weekends were associated with less SED (p<.001) and greater TST (p<.001; see Table).

Conclusions: Sedentary behavior and decreased TST were prevalent in this sample of mostly middle-aged working women. Less TST was associated with greater SED and weekdays were associated with greater SED and less TST, highlighting how weekdays influences these behaviors. These findings point to a need for interventions to increase TST in an effort to reduce SED and CVD risk.


Funding: No

Funding Component:
Conclusions: Contrary to prediction, short sleep duration combined with short to moderate sitting time was associated with CVD events. Interpretation of the results should be done cautiously given our analysis was limited by a small sample size and a lack of adjustment for other potential CVD risk factors.

Disclosures: C. Hoffmann: None. M.E. Petrov: None. M.C. Davis: None. A.J. Zautra: None.

Funding: No

Funding Component:

MP030

The Association Between Objectively Measured Sleep, Physical Activity and Sedentary Behaviour on Cardiorespiratory Fitness and Health in 9 - 11 Year Old New Zealand Children

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Background: The role of activity, sedentary behaviour and sleep in cardiorespiratory fitness (CRF) or cardiovascular health, has been primarily studied in adults. Therefore we assessed the hypothesis that longer sleep duration, more time spent in moderate to vigorous activity (MVPA), less sedentary time and a lower ratio of sedentary time to MVPA (Sedentary:MVPA) would be associated with higher CRF and lower pulse wave velocity (PWV) in children aged nine to 11 years from Dunedin, New Zealand. Methods: A cross-sectional study. Information on demographics and lifestyle was collected by questionnaire. Data on sleep, sedentary and MVPA time were collected using Actigraph wGT3X-BT accelerometers, worn over eight days. PWV was obtained using the SphygmoCor Xcel. VO₂max values, from a multi-stage 20-metre shuttle run test, were used as the measure of CRF. Generalised estimating equations were undertaken to investigate relationships between accelerometer derived variables and CRF and PWV separately in 404 participants. Analyses were adjusted for age, socioeconomic status, ethnicity and age and sex specific BMI Z scores. Results: Mean (SD) VO₂max was 47.5 (4.1) ML/Kg/min for girls and 49.9 (5.20) for boys and mean (SD) PWV was 5.72 (0.79) for girls and 5.85 (0.79) for boys. In multivariate models, a one hour increase in sedentary time was associated with a 0.81 (CI: -1.19, -0.42) ML/Kg/min increase in VO₂max in all participants. In boys only, a one hour increase in MVPA associated with a 3.50 (CI: 2.76, 4.20) ML/Kg/min increase in VO₂max. Sedentary:MVPA was associated with lower VO₂max in boys and girls. Sedentary time (β 0.15 m/s per hour increase, CI: 0.02, 0.27) and MVPA (β 0.25 m/s per hour decrease, CI: 0.04, 0.46) were only significantly associated with PWV in boys. No significant associations were seen between sleep and CRF or PWV.

Conclusions: In conclusion, sedentary behavior, MVPA and Sedentary:MVPA were both associated with CRF and PWV. Our results suggest that future interventions aimed at improving heart health in this age group need to target both increasing physical activity and reducing sedentary time. Funding sources: The National Heart Foundation of New Zealand and The University of Otago.

Prospective Association of Obstructive Sleep Apnea Risk Factors with Heart Failure with Preserved Ejection Fraction and Not Heart Failure with Reduced Ejection Fraction in Postmenopausal Women

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Background:
The relationship between obstructive sleep apnea (OSA) and heart failure (HF) has been under-researched especially in postmenopausal women. We therefore evaluated relationship between OSA risk factors and HFpEF and HFrEF in post-menopausal women.

Methods:
We performed a prospective analysis of a subset of participants who had adjudicated heart failure outcomes (n=42,362) in the Women Health Initiative Observational, Clinical Trial, and Extension Studies (1998-Present). The cohort was followed over an average of 13.4 years. Inverse probability weighting was employed to account for potential selection bias. Cox proportional hazards regression was used to examine the association between OSA risk factors and time to first hospitalized HF. Type of heart failure was determined using the ejection fraction (EF) obtained from 2D echocardiography. EF of ≥45% was categorized as HFpEF, and EF of < 45% was categorized as HFrEF. Models were adjusted for age, race/ethnicity, education, income, marital status, systolic blood pressure, waist-to-hip ratio, diabetes, coronary heart disease, atrial fibrillation, use of hormone replacement therapy, use of sleep medications, modified Charlson comorbidity index, smoking, alcohol consumption, physical activity, and hysterectomy. We also created an OSA summary score (obesity, snoring, poor sleep quality, sleep fragmentation, daytime sleepiness, and hypertension) based on the Berlin questionnaire, which reliably predicts OSA, to examine its relationship with HF.

Results:
Of the 42,362 women, 1,054 (2.49%) had preserved EF, and 631 (1.49%) had reduced EF. Four of the 6 risk factors (obesity (HR=1.51, 95% CI 1.29-1.76), snoring (HR=1.23, 95% CI 1.04-1.45), sleep fragmentation (HR=1.15, 95% CI 1.01-1.31), and hypertension (HR=1.46, 95% CI 1.31-1.62)) were associated HFrEF after adjusting for confounders. Each additional OSA risk factor in an OSA summary score compared to no risk factors significantly increased the risk of HFpEF in a dose-response fashion (HR=1.36, 1.61, 2.01, 1.97, 2.02, and 2.74 for scores of 1-6, respectively; \( P_{\text{trend}} < 0.001 \)) and not HFrEF (\( P_{\text{trend}} = 0.26 \)). Only hypertension was associated with HFrEF (HR=1.39, 95% CI 1.22-1.60).

Conclusion:
Having more OSA risk factors increases the risk of HFpEF but not HFrEF in postmenopausal women. Early recognition and management of OSA risk factors may play an important role in reducing risk of HFpEF in this population.


Funding: No

Anemia is Associated With Increased Risk of Mortality in Heart Failure With Preserved Ejection Fraction in the US Veteran Population

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**Background:** Anemia is increasingly being identified as a poor prognostic factor in patients with heart failure with reduced ejection fraction. However, few studies, and with small sample sizes, have examined the role of anemia in patients with heart failure with preserved ejection fraction (HFpEF). Thus, the purpose of our study is to examine whether anemia is associated with mortality in a large national cohort of patients with HFpEF.

**Methods:** We identified subjects with HFpEF using a validated algorithm in the national Veterans Affairs patient database from 2002 to 2012. The criteria for HFpEF included: all recorded ejection fractions > 50% and symptoms, signs and treatment for heart failure. Anemia was identified using the International Classification of Diseases (ICD-9) code at the index time of HFpEF diagnosis. All-cause mortality was confirmed from medical death records and Center for Medicare Services data. Using a multivariable Cox proportional hazards model, we examined the association of anemia at the time of HFpEF diagnosis with all-cause mortality.

**Results:** In total, 29,022 HFpEF patients met criteria for HFpEF. Mean age of the participants was 71±12 years; 96% were men, 84% were white, 35% had anemia, 88% had hypertension, 65% had hyperlipidemia and 42% had coronary artery disease at baseline. After a median follow-up of 3.6 years (IQR: 1.7-6.4), 17,269 deaths occurred. After adjusting for age, sex, race, body mass index, coronary artery disease, hypertension, hyperlipidemia, atrial fibrillation, chronic obstructive pulmonary disease, diabetes mellitus, serum sodium, renal function, heart rate and ejection fraction, patients with anemia had higher mortality (HR 1.52, 95% CI 1.47-1.57, p < 0.0001) as compared to those without anemia.

**Conclusion:** Our study suggests that prevalent anemia is associated with an increased risk of all-cause mortality among US veterans with HFpEF. Further studies may shed light on its role as a prognosticator and potential therapeutic target in this population.


**Funding:** No

**Funding Component:**

**MP033**

**Socioeconomic Disparities in the Risk of Developing Heart Failure: Prospective Findings from the Moli-Sani Study**

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**Introduction** The association between socioeconomic status (SES) and the risk of cardiovascular disease and all-cause mortality is well-established, while the impact of SES on heart failure (HF) incidence is less explored.

**Hypothesis** We tested the hypothesis of a SES gradient in the risk of HF. **Methods** Population-based cohort study on 22,395 individuals (mean
age 55.3±11.7, 47.7% men) free from HF at baseline randomly recruited from the general population included in the Moli-sani study (Italy). The cohort was followed up for a median of 7.6 years (168,031 person-years). Annual household income (Euros) and educational level were used as SES indicators. Presence of risk factors at baseline and a panel of health behaviours were tested as possible mediators of the association between SES and incident HF. Incident HF at follow-up was defined by HF hospitalization or HF death, according to the International Classification of Diseases-Ninth Revision (ICD-9). Hazard ratios (HR) with 95% confidence intervals were calculated by Cox-proportional hazard models.

**Results**

We identified 757 first HF events. Both lowest education (middle and secondary schools) and household income (<60,000 Euros/y) were separately associated with increased risk of HF as compared with the highest category (Table). After simultaneous adjustment, the association of income appeared to be largely explained by education. The inclusion of traditional risk factors, biomarkers of heart failure and health-behaviors into the model attenuated the association of low education with HF incidence by 12%, 3.8% and 11.5%, respectively. Overall, the full explanatory model accounted for 23.8% of the educational gradient in the risk of HF (Table).

**Conclusions**

Educational level, rather than income, is an independent predictor of HF development. Excess risk associated with low education was partially explained by traditional health risk factors, biomarkers of subclinical damage and health-behaviors.


Funding: No

Funding Component: MP034

**Muscle strength and Short-term Risk of Cardiovascular Outcomes in Community-dwelling Older Adults: The Atherosclerosis Risk in Communities (ARIC) Study**

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**Background:** Muscle weakness has been shown to predict mortality in older adults. However, its contribution to different cardiovascular disease (CVD) subtypes is not well known. **Methods:** Among 5,484 participants (age 67-91 years) in the ARIC Study at visit 5 (2011-13), we quantified the associations of grip strength (measured by Jamar Hydraulic Hand Dynamometer) with the risk of coronary heart disease (CHD including myocardial infarction or coronary death), stroke, and heart failure (HF) using Cox models. **Results:** Over a median follow-up of 1.7 years, there were 119 cases of CHD, 47 cases of stroke, and 168 cases of HF. In crude models, the lowest sex-specific quartile of grip strength demonstrated significantly higher risk of CHD and HF compared to the highest quartile (Table). After accounting for potential confounders such as diabetes, body mass index, and blood pressure, the significant association was only observed for HF (HR 2.09 [95% CI 1.25-3.50] between the lowest vs. highest quartile). **Conclusion:** Weaker muscle strength was significantly associated with CVD risk in
community-dwelling older adults, but its independent association was most evident for HF. Our results suggest the pathophysiological link between skeletal muscle function and HF as well as potential usefulness of grip strength to classify HF risk in older adults.


Funding: No

Funding Component:

MP035

The Clinical Epidemiology of Fatigue in Newly Diagnosed Heart Failure

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Introduction: Fatigue is a common and distressing, but poorly understood symptom among patients with heart failure (HF). The underlying mechanisms of fatigue in HF have not been clearly elucidated, but may lie in both psychologic and physiologic factors. Whether fatigue remains associated with mortality independent of other common clinical attributes also remains unresolved. Accordingly, the current study sought to evaluate the prevalence, predictors, and prognostic value of clinically documented fatigue in newly diagnosed HF patients. Methods: This retrospective cohort study consisted of 12,285 newly diagnosed HF patients receiving health care services through the Geisinger Health System, with passive data collection through electronic medical records (EMR). Incident HF, fatigue, and other study variables were derived from coded data within EMRs. A collection of 87 candidate predictors were evaluated to ascertain the strongest independent predictors of fatigue using logistic regression. The collection of candidate variables was drawn from several domains including demographics, physical examination findings, medical history, laboratory results, and medications. Patients were followed for all-cause mortality for an average of 4.8 years. The associations between fatigue and six-month, 12-month, and overall mortality were evaluated with Cox proportional hazards regression. Results: Clinically documented fatigue was found in 4827 (39%) newly diagnosed HF patients. Among the 87 candidate predictors, 18 were independently associated with fatigue at a multivariable p-value threshold of 0.001. Depression was the strongest predictor of fatigue. Fatigue was often part of a symptom cluster, as other HF symptoms including dyspnea, chest pain, edema, syncope, and palpitations were significant predictors of fatigue. Volume depletion, low body mass index, and abnormal weight loss were also strong predictors of fatigue. Though fatigue was significantly associated with 6-month (HR=1.49, p<0.01), 12-month (HR=1.39, p<0.01), and all-cause mortality (HR=1.20, p<0.01) in unadjusted models, effect sizes were attenuated and non-significant after adjustment for clinical variables with HRs of 1.12 (p=0.16), 1.07 (p=0.26), and 1.00 (p=0.89), for 6-month, 12-month, and overall mortality, respectively. Conclusions: Fatigue is a commonly documented symptom among newly diagnosed HF patients with likely origins in both psychologic and physiologic factors. Though fatigue provided a prognostic signal in the short-term, this was largely explained by physiologic confounders.

Disclosures: B. Williams: None.

Funding: No

Funding Component:

MP036
Prevalence of American Heart Association Heart Failure Stages in African-American and White Middle Aged Adults: The CARDIA Study

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Background: Symptomatic heart failure is increasingly recognized as a chronic and lethal condition with antecedents, earlier in life, including hypertension, obesity, and diabetes. The American Heart Association (AHA) has developed a four stage heart failure staging classification system. At the year 30 examination (and prior examinations) of the Coronary Artery Risk Determinants in Young Adulthood (CARDIA) data has been collected on a population-based cohort of 48-60 year old black and white men and women. Methods: Data on demographics and attributes for classification into a heart failure stage were retrieved from the CARDIA database. Participants were then assigned to No Risk, stage A (asymptomatic but with risk factors (hypertension, obesity, diabetes, atherosclerotic disease, metabolic syndrome, cancer), stage B (asymptomatic but prevalent cardiac structural abnormality or prevalent heart disease(prior myocardial infarction, LV hypertrophy, low LV ejection fraction, asymptomatic valve disease), or stage C/D (symptomatic, merged). Results: The Table shows the prevalence of each heart failure stage by race and gender and for the CARDIA cohort examined in Y30 without missing data. Almost half the cohort is at risk (Stage A) and about a fifth has heart failure associated co-morbidities (Stage B). Only about a fifth of African-Americans have no heart failure risk while about two fifths of whites have no risk, mostly secondary to higher prevalence of obesity and diabetes (p < 0.01). There is a higher prevalence of stage C/D in African-Americans. Conclusion: Heart failure prevention should begin in young adulthood, particularly in African-Americans.


Funding: No

Funding Component:

MP037

Blood Pressure Genetic Risk Score Predicts Blood Pressure Responses to Dietary Sodium and Potassium Interventions: The GenSalt Study

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Salt-sensitivity of blood pressure (BP) is a risk factor for hypertension, cardiovascular disease and all-cause mortality. Although documented as an important BP endophenotype, the relationship between genetic loci implicated in BP and BP salt-sensitivity remains unexamined. We assessed the hypothesis that weighted genetic risk scores (GRS), based on SNPs identified in previous BP genome-wide association study meta-analyses, would predict BP salt-sensitivity among participants of the Genetic Epidemiology Network of Salt-
Sensitivity (GenSalt) study. The GenSalt study was conducted among 1,906 participants from 633 Han Chinese families. Participants underwent a 7-day low sodium (51.3 mmol sodium/day), 7-day high sodium (307.8 mmol sodium/day), and 7-day high sodium plus potassium (60 mmol potassium/day) feeding study. BP was measured nine times at baseline and at the end of each intervention period using a random-zero sphygmomanometer. The relationships between systolic BP (SBP), diastolic BP (DBP) and mean arterial pressure (MAP) GRS and respective SBP, DBP and MAP responses to the dietary interventions were assessed using mixed linear regression models that accounted for familial dependencies and adjusted for age, gender, field center, and baseline body mass index and BP. As expected, baseline SBP, DBP, and MAP significantly increased per quartile increase in GRS ($p=5.6 \times 10^{-11}$, $p=1.3 \times 10^{-7}$, and $p=9.9 \times 10^{-5}$). In contrast, increasing GRS quartile conferred smaller SBP, DBP, and MAP responses to the low sodium intervention ($p=4.2 \times 10^{-3}$, $p=0.02$, and $p=7.3 \times 10^{-3}$, respectively) and smaller SBP responses to the high sodium and potassium interventions ($p=0.05$ and $p=0.03$, respectively) (Figure). Similar results were obtained when the data were analyzed per standard deviation increase in GRS. In summary, we identified an inverse relationship between BP GRS and BP salt-sensitivity. Further studies will be needed to elucidate the biological mechanisms contributing to this novel finding.


Funding: No
of 10.4 years, we ascertained 1,035 incident cases (19.5% of study population) of HTN. Total soft drink consumption showed significant association with increased risk for HTN after adjusting for potential confounders (age, sex, total energy intake, BMI, and socio-economic factors). The adjusted HR of HTN for the highest quartile of soft drink consumption was 1.24 (95% CIs: 1.02-1.51) compared to the lowest quartile. Furthermore, we found that higher consumption of soft drink was significantly associated with increased incidence of HTN in subjects with BMI ≥25 (HR: 1.54; 95% CIs: 1.15-2.01), whereas there was no significant association among subjects with BMI <25.

Conclusions: In conclusion, this study suggested that soft drink consumption contributes to increased risk of HTN, being prominent in obese participants. Our results support recommendations to reduce the consumption of soft drink to prevent and control HTN, although further large prospective studies or randomized controlled trials are warranted to confirm the observed association.


Funding: No

Funding Component:

MP039

Association Between Estimated 24-hour Urinary Sodium and Potassium Excretion and Blood Pressure in a Japanese Cohort: a Repeated Measure Analysis

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BACKGROUND
While measurement of sodium (Na) and potassium (K) from the collection of urine over a 24-hour period are associated with blood pressure, relationships with 24-hour urinary excretion estimates from more conveniently collected spot urine samples are less clear.

OBJECTIVES
The purpose of this report is to examine the association of estimated 24-hour excretion of Na, K and their ratio from annually repeated spot urine samples with systolic (SBP) and diastolic (DBP) blood pressures.

METHODS
Data include 4,958 normotensive Japanese aged 19 to 55 years who participated in annual physical examinations over a 5-year period in the High-Risk and Population Strategy for Occupational Health Promotion Study (1999-2004). At each examination, spot urine samples were collected in the morning and blood pressure was measured following standardized procedures. 24-hour urinary excretion of Na and K were estimated from spot urine specimens using the formula of Tanaka. Adjustments were made for potential confounding from demographic, lifestyle education, body mass index, smoking, alcohol consumption and physical activity. Mixed-effects regression models were used to examine the association of the estimated 24-hour excretion of Na, K, and the sodium-to-potassium (Na:K) ratio with SBP and DBP over the 5-year period of study.

RESULTS
A one standard deviation (SD) increase in the estimated 24-hour excretion of Na (36.6 mmol/day) was associated with a 1.3 mm Hg higher SBP and a 0.8 mm Hg higher DBP (P<.001). The association between Na and SBP was greater in men (1.4 mm Hg per SD) than in women (0.9 mm Hg per SD, P=.003 for interaction) and increased with age (1.0 mm Hg per SD at <35 years of age, 1.2 mm Hg per SD at 35 to 45 years of age, and 1.8 mm Hg per SD at...
Estimated 24-hour excretion of K was inversely associated with blood pressure where a one SD increase (8.9 mmol/day) was associated with a 1.1 mm Hg lower SBP and 0.7 mm Hg lower DBP (P<.001). Unlike the estimated 24-hour excretion of Na, interactions between K and age or sex were absent. Estimated 24-hour Na:K ratio were positively associated with SBP and DBP, with greater effects in men than in women and increasing positive associations with age (P<.01 for each interaction).

CONCLUSIONS
Estimated 24-hour excretion of Na, K, and the Na:K ratio from spot urine samples have significant associations with blood pressure. Findings suggest that the less costly and more convenient collection of spot urine samples for estimating excretion of Na, K, and their ratio over a 24-hour period may be an efficient way of monitoring these electrolytes in large population-based samples.


Funding: No

Funding Component:

MP040

Comparative-Effectiveness of Implementation Strategies on Blood Pressure Control among Hypertensive Patients: a Meta-Analysis

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Introduction: Globally, only 13.8% of adults with hypertension have controlled blood pressure (BP). Effective strategies are needed to overcome barriers to BP control. The overall objective is to determine the comparative-effectiveness of implementation strategies to reduce BP in adults with hypertension.

Methods: We searched Medline and Embase (through November 2015) for randomized controlled trials of implementation strategies targeting barriers to hypertension control compared to usual care. One hundred trials with 48,070 hypertensive participants met our eligibility criteria and were included in this analysis. These trials were grouped by intervention strategy, and the effects of the intervention on BP change were combined using random effects models.

Results: Multi-component team-based care with and without non-physician providers titrating medications had the greatest reduction in systolic and diastolic BP. Health coaching, home BP monitoring, and a combination of the two also resulted in significant reductions in BP. Few studies of BP audit and feedback and clinical decision support systems were available, and they did not result in significant reductions in systolic BP. Provider training did not significantly reduce BP.

Conclusions: Team-based collaborative care is the most effective strategy for BP control among patients with hypertension. In addition, health coaching and home BP monitoring are useful patient-level strategies for hypertension control. These strategies should be prioritized in future BP control efforts.


Funding: No

Funding Component:
Time Course of Change in Blood Pressure From the DASH Diet and Sodium Reduction

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Background The time course of change in BP from lifestyle interventions, particularly sodium reduction, is uncertain.

Hypotheses (1) The DASH diet and sodium reduction will lower BP rapidly (within 1 wk), and (2) BP effects will be sustained over time.

Methods In the DASH-Sodium trial, adults without cardiovascular disease, not using antihypertensive medications, were randomly assigned to either a control diet or the DASH diet. With either diet, participants were fed each of three sodium levels in random order in 4-wk periods separated by 5-day breaks. The three sodium levels were: low (50 mmol/d), medium (100 mmol/d), and high (150 mmol/d). BP was measured during the run-in period and weekly over 12 wks of the trial. Differences in BP were determined at the end of each wk. Trends in differences were modeled via linear regression.

Results The trial enrolled 412 participants (57% women, 57% black, mean age was 48 yrs, mean SBP/DBP was 135/86 mmHg). Compared with the control diet, DASH lowered SBP at wk 1 (-4.36; -6.96, -1.77) and wk 12 (-3.82; -6.03, -1.61); corresponding changes in DBP were -1.07 (-2.66, 0.53) and -0.99 (-2.32, 0.33) (Figure). From wk 1 to 12, there was no trend in the difference between DASH and control diets for either SBP (P-trend = 0.91) or DBP (P-trend = 0.99). In the context of the control diet, reducing sodium from high to low, changed SBP by -4.03 (-6.66, -1.39) and DBP by -0.80 (-2.50, 0.89) after 1 wk, and SBP by -6.66 (-8.84, -4.47) and DBP by -3.43 (-4.72, -2.13) after 4 wks. Trends in differences from wk 1 to 4 were significant for SBP (P-trend = 0.02) and non-significant for DBP (P-trend = 0.1). There was no trend over time in SBP or DBP from reducing sodium while on the DASH diet (P-trend for SBP = 0.71 and for DBP = 0.25).

Conclusions The DASH diet lowers SBP and DBP early and its effects were maintained with dietary adherence over time. Meanwhile, the effects of sodium reduction on SBP were not fully realized by 4 wks in the context of a typical American diet, suggesting that the effect of lowering sodium on SBP continues to increase over time.


Funding: No

Funding Component:

Higher Levels of Sodium Density (mg/kcal) are Associated With Increased Blood Pressure Independent of Absolute Sodium (mg): the DASH Sodium Trial

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Introduction: Dietary recommendations for Na are expressed as absolute amounts, that is, mg of Na/d rather than as Na density (mg/kcal).
The DASH-Na dose-response trial tested the impact of varying Na density on BP, that is, the absolute dose of Na received at the low, medium, and high levels depended on energy intake. For example, a dose of 3,600 mg was high density in individuals with average energy intake but was medium density in individuals with higher energy intake.

**Objective:** Evaluate whether the effect of Na density on BP was independent of absolute Na.

**Methods:** In the DASH-Na trial, participants with pre-or stage 1 hypertension were randomly assigned to a control or DASH diet; on both diets, participants were fed each of three Na levels in random order. We analyzed data from 378 Non-Hispanic Black and White participants (ages 23-76 yr, baseline BP 135/86). Using a mixed effects model, level of Na density (low, medium, or high) was added to a model of absolute Na on BP to determine if the effect of Na density on BP was independent of absolute Na, with adjustment for randomized diet, cohort, carryover, clinical center, age, sex, race, and interactions of diet with absolute Na and Na density.

**Results:** At the same absolute amount of Na, higher Na density was associated with higher SBP and DBP (both p<0.0001) in the control diet arm (Figure 1). At the recommended upper limit of Na (2300 mg), the average SBP and DBP of those on a medium-Na-density diet was 7.2 mmHg (95% CI: 4.8, 9.7) and 3.9 mmHg higher (95% CI: 2.3, 5.5), respectively, than those on a low-Na-density diet. At 3600 mg, the average SBP and DBP of those on a high-Na-density diet was 6.0 mmHg (95% CI: 3.6, 8.5) and 3.1 mmHg higher (95% CI: 1.5, 4.7) higher, respectively, than those on a medium-Na-density diet. These differences were somewhat smaller, but still significant, in the DASH diet arm.

**Conclusions:** The effects of Na on BP vary with energy needs. This suggests that Na density should be considered when designing and interpreting studies of Na and BP and when providing dietary guidance.


Funding: No

Funding Component: MP043

**Pericardial Fat Thickness Increases With Greater Burden of Adverse Metabolic Factors Among Adults With Normal-range Body Mass Index: the Framingham Heart Study**

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**Introduction:** Greater burden of pericardial fat is associated with increased body mass index (BMI). Obesity is associated with unfavorable metabolic characteristics such as hypertension, dyslipidemia, and glucose intolerance. We sought to determine whether increased pericardial fat thickness (PFT) was associated with unfavorable metabolic profile alone, in the absence of excess BMI.

**Methods:** From the 1,794 Framingham Offspring cohort adults who underwent cardiac magnetic resonance (CMR), we identified 446 free of non-skin cancer and prevalent clinical cardiovascular disease (CVD) who had $18.5 \leq \text{BMI} < 25.0 \text{ kg/m}^2$ and complete covariates.
We calculated a metabolic score (MS) based on ATPIII criteria where 1 point was assigned for each of: a) fasting plasma glucose ≥ 100 mg/dL or diabetes; b) SBP ≥ 130 or DBP ≥ 85 mm Hg or antihypertensive treatment; c) triglycerides ≥ 150 mg/dL; d) HDL cholesterol < 40(M)/< 50(W) mg/dL or lipid-lowering treatment; e) HOMA-IR ≥ 2.5; f) waist circumference ≥ 102(M)/≥ 88(W) cm. Participants were stratified as MS0 (no points), MS1 (1 point), MS2 (2 points) or MS3+ (≥ 3 points). PFT over the right ventricle (RV) was measured at the RV apex, at mid-ventricle and at maximal thickness from breathhold cine SSFP CMR in the 4-chamber view at end-diastole. The RV was selected because pericardial fat is commonly and well visualized over the RV. Analysis of covariance (ANCOVA), adjusted for sex, age, and BMI, was used to compare MS1, MS2 and MS3+ groups to the MS0 group. We further tested for linear trend across MS groups.

**Results:** PFT increased with worsening metabolic score (see Table) at the fixed locations of the apical and mid-level RV, as well as at maximal PFT. On pairwise comparisons, only the MS3+ group had PFT that was consistently significantly greater than that of MS0 (all p<0.01).

**Conclusions:** In a community-dwelling cohort, among participants who were free of cancer and clinical CVD and had normal-range or “healthy” BMI, worsening metabolic profile was associated with increased pericardial fat thickness.

Disclosures: **P.N. Gona:** None. **J.J. Lee:** None. **N. Oyama-Manabe:** None. **C.J. Salton:** None. **C.J. O’Donnell:** None. **W.J. Manning:** None. **M.L. Chuang:** None.

Funding: No

**Funding Component:**

**MP044**

**Fatty Liver Disease, Visceral Fat and Pectoral Muscle Area Are Independently Associated with Subclinical Atherosclerosis in Heavy Smokers**

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**Introduction:** Cardiovascular disease is a leading cause of death in those with chronic obstructive pulmonary disease. Coronary artery calcium (CAC) is a subclinical measure of cardiovascular disease. Fatty liver disease and visceral fat (VAT) are associated with CAC, and pectoral muscle area (PMA) has been shown to be associated with CAC in our population. However, it is unclear if fatty liver disease, VAT and PMA are all independently associated with CAC or if confounding exists. **Hypothesis:** We hypothesized that fatty liver disease will be associated with CAC independent of VAT and PMA. **Methods:** We utilized cross-sectional data from COPDGene, a cohort of former and current smokers with at least 10 pack-years of smoking history with CT measures of CAC, VAT, PMA, and liver and spleen attenuation. CAC positivity was defined as greater than 2.5 units of square root transformed total CAC volume to account for measurement variability. The liver/spleen ratio (LSR) was calculated, and fatty liver disease was defined as LSR < 1. Multiple logistic regression was used to assess the association between the presence of CAC and fatty liver disease. Models were adjusted for...
age, sex, race, and current smoking, pack-years of smoking, high cholesterol, hypertension, diabetes, pectoral muscle area and visceral fat. Interactions between fatty liver disease and sex and fatty liver disease and race were tested.

**Results:** Of the 5873 individuals with complete data, 3210 (54.7%) had CAC and 1153 (19.6%) had fatty liver disease. Both PMA (p<0.0001) and VAT (p=0.0002) were associated with having CAC, and with having fatty liver disease (p<0.0001 for both). There was a significant interaction between race and fatty liver disease (p=0.03). In non-Hispanic whites (NHW), fatty liver disease was associated with having CAC (OR=1.10, 95% CI 0.92-1.32), while in AA, fatty liver disease was not associated with CAC (OR=0.79, 95% CI 0.58-1.07). Removing VAT and PMA did not attenuate these results. There was no significant interaction between fatty liver disease and sex. **Conclusion:** In a large cohort of heavy smokers, fatty liver disease, VAT and PMA were associated with subclinical atherosclerosis independent of traditional cardiovascular risk factors in NHW but not AA. The racial differences in this association could indicate different biologic pathways in cardiovascular disease.

Disclosures: **K.A. Young:** None. **G.L. Kinney:** None. **M. McDonald:** None. **G.R. Washko:** None. **S.M. Lutiz:** None. **K.A. Pratte:** None. **E.K. Silverman:** None. **J.D. Crapo:** None. **M.J. Budoff:** None. **J.E. Hokanson:** None.

Funding: No

Funding Component:

**MP045**

**The Ratio of Visceral and Subcutaneous Adipose Tissue Area was Positively Associated with Subclinical Atherosclerosis for Smoking Men**

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Introduction: Several studies have examined the association between adipose tissue distribution and atherosclerosis. However, the effect of smoking on this association has not been evaluated yet.

Hypothesis: We assessed the hypothesis that there is positive association between the ratio of visceral and subcutaneous adipose tissue areas and carotid intima media thickness (CIMT), and the association can be modified according to gender and smoking status in South Korea.

Methods: A total of 1,606 middle-aged participants without cardiovascular disease were enrolled in this cross-sectional study from 2013 to 2015 in South Korea (568 men; 1,038 women). The CIMT of study participants was measured using B-mode ultrasonography at distal right common carotid artery, based on a predetermined protocol. We measured the abdominal adipose tissue distribution of study participants using computerized tomography. The area of adipose tissue at L4 vertebrae level was calculated, and the area of visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) were separated by abdominal wall. Then, we calculated the ratio of VAT and SAT (VAT/SAT) area. Other major cardiovascular risk factors were measured by standardized questionnaire, physical exam and fasting blood analysis. Smoking status of study participants was classified into three groups: current, former and never smokers. For evaluating the association between adipose tissue area and CIMT, we used multiple linear regressions. Separated analyses based on gender and smoking status were also performed.

Results: Mean CIMT of study participants was 0.62 mm (SD, 0.12 mm), and mean VAT/SAT ratio of study participants was 0.62 (SD, 0.29).
The prevalence of current smoker was 36.8% (209 of 568) for men, and 4.1% (42 of 1038) for women. In our multiple linear regression models, the VAT/SAT ratio showed statistically significant positive β-coefficient for total participants (β =8.62, p=0.008): showing significant for men (β =15.95, p=0.001) and not for women (β =3.15, p=0.377). When considering men only with respect to smoking status, the association between VAT/SAT ratio and CIMT was significant for current smokers (β=30.37, p<0.001), while it was not for never smokers (β=6.2, p=0.958) and former smokers (β=12.84, p=0.119). There was no significant interaction for gender and also for smoking status for men (p for interaction>0.05).

Conclusions: In conclusion, the VAT/SAT ratio was positively associated with CIMT, and more preeminent positive association was observed for current men smokers than for never and former men smokers. The results of this study supported the need of smoking cessation to prevent atherosclerosis by adipose tissue distribution, especially for men.


Funding: No

Funding Component:

MP046

Visceral Adipose Tissue but Not Subcutaneous Adipose Tissue Associates With Cholesterol Efflux Capacity in Psoriasis


Background: Psoriasis (PSO), a chronic inflammatory disease associated with increased cardiovascular (CV) risk, provides an ideal model to study inflammatory atherogenesis in vivo. PSO is associated with impaired cholesterol efflux capacity (CEC) and increased cardiometabolic dysfunction including adipose tissue dysregulation. Recently, visceral adiposity (VAT) was shown to be associated with increased CV events. However, neither VAT nor subcutaneous adiposity (SAT) have been shown to be associated with CEC. Hypothesis: Increased VAT by CT is associated with a decrease in CEC independent of CV risk factors. Methods: Consecutively recruited PSO patients (N=76) underwent CT scans to measure abdominal adiposity. VAT and SAT volume was quantified from the level vertebral level T10 to pubic symphysis. CEC was quantified using a cell-based ex vivo assay measuring the ability of apoB-depleted plasma to mobilize cholesterol from lipid-laden macrophages. The relationship of VAT and SAT with CEC was analyzed using multivariable regression models (STATA 12).

Results: The cohort had a low CV risk by FRS [median (IQR): 4.0 (2.0-7.0)], mild to moderate PSO [median (IQR): 5.2 (3.0-8.5)], overweight to obese with a mean BMI of 30, 40% were on statin treatment, and 40% were on systemic/biologic therapy for PSO. In unadjusted models VAT was inversely associated with CEC (beta = -0.41, p <0.001) while SAT was not significantly associated (beta = -0.12, p = 0.32). In fully adjusted models VAT retained inverse association with CEC (beta = -0.35, p = 0.04) while SAT remained insignificant (beta coefficient = 0.15, p-value = 0.43) (Table 1). Conclusions: VAT inversely associated with CEC while SAT showed no significant relationship suggesting that VAT may directly drive inflammatory HDL dysfunction while SAT may not. However, larger studies are needed to confirm these findings.
Abdominal Skeletal Muscle Density is Significantly Associated With Selected Measures of Adiposity Associated Inflammation: the Multi-Ethnic Study of Atherosclerosis

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Background: Excess adiposity is associated with higher levels of certain inflammatory markers that have been linked to cardiometabolic disease. Lean skeletal muscle is the largest regulator of glucose metabolism but few population-based studies have examined the associations between muscle and inflammation. Therefore, we studied the relationships between abdominal muscle mass [area] and density with selected measures of adiposity-associated inflammation.

Methods: Nearly 2,000 subjects enrolled in the Multi-Ethnic Study of Atherosclerosis underwent computed tomography (CT) of the abdomen and had venous fasting blood drawn concomitantly. The CT scans were interrogated for visceral and subcutaneous fat, as well as lean muscle areas and densities in the rectus abdominus, obliques, paraspinus and psoas muscle groups. We then categorized the muscle in locomotion (psoas) and stabilization groups (rectus, obliques and paraspinus). The blood samples were assayed for interleukin-6, resistin, C-reactive protein, and tumor necrosis factor - alpha. Multivariable linear regression was used to determine the independent associations between muscle area and density with each of the aforementioned adipokines. Results: The mean age was 64.7 years and 49% were female. Forty percent were non-Hispanic White, 26% were Hispanic/Latino American, 21% were African American, 13% were Chinese American. The mean BMI was 28.0 kg/m² and 30% were obese (BMI > 30 kg/m²). With adjustment for age, gender, race, dyslipidemia, diabetes, hypertension, eGFR, coronary artery calcium, physical activity, sedentary behavior, selected adipokines and both subcutaneous and visceral fat, a 1-SD increment in the mean densities for total abdominal muscle, total stabilization muscle and total locomotive muscle were each significantly associated with lower levels of interleukin-6 (-15%, -15% and -9%, p < 0.01 for all) and resistin (-0.11, -0.11 and -0.07 ng/mL, p < 0.02 for all), but not CRP or TNF-alpha. These associations remained significant after additional adjustment for muscle area in the corresponding muscle group. Conversely, the areas of the muscle variables were not independently associated with any of the adipokines, especially after adjustment for muscle density. There were no significant interactions between ethnicity and both muscle area and density for any of the adipokines.

Conclusions: Higher densities of several muscle groups in the abdomen are significantly associated with lower interleukin-6 and resistin levels, independent of the muscle area in these groups. Techniques that either enhance or maintain muscle density levels may reduce the risk of cardiometabolic diseases linked to adverse levels of inflammation.


Funding: No

Funding Component:

MP048
Ectopic Muscle and Liver Adiposity are Independently Associated with Type 2 Diabetes in African Ancestry Men

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Although obesity is a major driver of type 2 diabetes (T2D), many obese individuals do not develop T2D. Indeed, fat around and within non-adipose tissue organs (i.e., ectopic fat) is emerging as a strong risk factor for diabetes. The potential differential contribution of ectopic fat depots throughout the body on T2D risk is unclear because studies have mainly focused on visceral and/or liver fat. No study, to our knowledge, has addressed the potential independent association of visceral, liver, and skeletal muscle adiposity with T2D. Such studies are particularly needed among African ancestry populations, as generalized obesity and other risk factors do not appear to explain the high T2D burden in this population segment. To address this knowledge gap, we measured total body fat by DXA, and visceral, liver, and calf skeletal muscle adiposity by computed tomography in 490 Afro-Caribbean men, aged 50-91 years (mean age=64 years, mean BMI=27.5 kg/m²). The prevalence of T2D in this population was 22.3%. We employed multiple logistic regression using total body fat percent and ectopic fat depots as predictors (Table). We found that each 7.9 HU decrease in liver attenuation (indicative of greater liver adiposity) was associated with a 33% increased odds of T2D (p=0.011). Similarly, each 4.2 mg/cm³ decrease in muscle attenuation (indicative of greater intra-muscular adiposity) was associated with a 31% increased odds of T2D (p=0.04). These associations were independent of total and visceral adiposity. Our results support the “ectopic fat syndrome” theory, as opposed to the “portal theory”, in the pathogenesis of diabetes among African ancestry men. Longitudinal studies are needed to clarify the exact role of specific ectopic fat depots in T2D, particularly in high-risk African ancestry populations.


Funding: None

Funding Component:

MP049

Fermented vs. Non-fermented Dairy and Risk of Coronary Heart Disease in Men: the Kuopio Ischaemic Heart Disease Risk Factor Study

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Introduction: Most of the recent dairy studies, including multiple meta-analyses, show either no relationship or an inverse association between total dairy intake and risk of cardiovascular diseases. Some of these studies have suggested that especially fermented rather than non-fermented dairy might provide benefits on cardiovascular health, but the data is inconclusive. Also, the average dairy intake has been modest in many study populations, which reduces the generalizability of the findings to populations with high dairy intake. Hypothesis: We assessed the hypothesis that fermented and non-fermented dairy products
have distinct associations with the risk of coronary heart disease (CHD) in men from eastern Finland, a population with high intake of dairy products.

**Methods:** A total of 1981 men from the population-based Kuopio Ischaemic Heart Disease Risk Factor Study from eastern Finland, aged 42-60 years, with no CHD at baseline, were included. The consumption of foods was assessed with instructed 4-day food recording by household measures. Dairy products with fat content <3.5% were considered low-fat. Multivariable Cox regression analyses included age, examination year, smoking, leisure-time physical activity, education, family history of CHD, and intakes of alcohol, energy, fiber, polyunsaturated fatty acids, and fruits, berries and vegetables. Fatal and non-fatal CHD events were ascertained from national registries, with no loss to follow-up.

**Results:** The mean±SD intakes were 733±375 g/d for total, 187±218 g/d for fermented and 546±345 g/d for non-fermented dairy. Low-fat products comprised 87% (162±218 g/d) of the fermented and 43% (317±291 g/d) of the non-fermented dairy intake. During the mean follow-up of 20.1 years, 472 CHD events occurred. The multivariable-adjusted hazard ratio (95% CI) in the highest (>280 g) vs. the lowest (<26 g) quartile of total fermented dairy was 0.73 (0.56-0.95, P-trend=0.02) and in the highest (>727 g) vs. the lowest (<258 g) quartile of total non-fermented dairy 1.44 (1.06-1.94, P-trend=0.009). When low-fat and high-fat dairy were evaluated separately, only low-fat products were associated with the risk. The extreme-quartile hazard ratios (95% CIs) were 0.74 (0.57-0.96, P-trend=0.02) for low-fat fermented dairy and 1.47 (1.08-1.99, P-trend=0.02) for low-fat non-fermented dairy. Intakes of total dairy (extreme-quartile HR 1.03, 95% CI 0.74-1.42, P-trend=0.727), high-fat fermented dairy (HR 0.92, 95% CI 0.69-1.22, P-trend=0.32) or high-fat non-fermented dairy (HR 1.09, 95% CI 0.77-1.56, P-trend=0.44) were not associated with the risk of CHD.

**Conclusions:** Our results suggest that low-fat fermented dairy products are associated with a lower risk of CHD, whereas low-fat non-fermented dairy products are associated with a higher risk in a population with high intake of dairy products.

**Disclosures:** T. Koskinen: B. Research Grant; Modest; Otto A. Malm Foundation. B. Research Grant; Significant; Finnish Foundation for Cardiovascular Research. H.E.K. Virtanen: B. Research Grant; Modest; Finnish Cultural Foundation North Savo Regional Fund. B. Research Grant; Significant; Päivikki and Sakari Sohlberg Foundation, Juho Vainio Foundation. S. Voutilainen: None. T. Tuomainen: None. J. Mursu: None. J.K. Virtanen: None.

**Funding:** No

**Funding Component:**

**MP050**

**Changes in Dietary Fat Intake and Long-term Weight Change in US Women and Men**

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**Introduction:**

The role of dietary fat intake in body weight regulation remains controversial and few studies have examined long-term changes in types of dietary fat and weight change in longitudinal studies.

**Methods:**

We examined the association between changes in energy from dietary fat and weight change in three large, prospective cohorts including 102, 123 U.S. women and men who were free of diabetes, cardiovascular disease and cancer at baseline. Linear mixed model was used to assess the association between changes in energy from specific dietary fat and weight changes at 4-year intervals with multivariable adjustment for age, baseline body-mass index at each period, and simultaneous changes in...
dietary factors (total energy, energy from protein, cereal fiber) and lifestyle factors (smoking, physical activity, television watching, sleep duration).

**Results:**
Increased intake of polyunsaturated fatty acid (PUFA) was inversely associated with weight gain. A 5% increment in energy from total PUFA was associated with less weight gain (-1.8 lb, 95% CI: -1.95 to -1.65, p<0.0001) and a 5% increment in energy from n-6 PUFA was associated with 0.90 lb (95% CI: -1.07 to -0.73, p<0.0001) less weight gain over 4-yr period. For marine n-3 PUFA, a 0.3% increase in intake was associated with 2.28 lb (95% CI: -2.50 to -2.10, p<0.0001) less weight gain; a 0.3% increase in intake of vegetable n-3 PUFAs (ALA) was also associated with less weight gain (-0.77 lb, 95% CI: -0.86 to -0.68, p<0.0001) at a 4-year interval. The effect of monounsaturated fatty acid (MUFA) intake on weight changes varied across time as the major food contributors to MUFA shifted from animal sources since 1986 to plant sources after 1994 in these cohorts. Prior to 1994, increasing intake of MUFA was positively associated with weight gain (0.50 lb, 95% CI: 0.36 to 0.65), whereas after 1994, increasing intake of MUFA was inversely associated with weight gain (-0.56 lb, 95% CI: -0.56 to 0.07, p<0.0001 for interaction).

In addition, a 5% increase in energy from SFA was associated with 1.71 lb (95% CI: 1.59 to 1.83) greater weight and a 1% increase in energy from trans-fat was associated with 1.97 lb (95% CI: 1.86 to 2.08) greater weight gain within each 4-year period.

**Conclusion:**
Different types of dietary fats have divergent associations with long-term weight change: higher intakes of PUFA (both n-6 and n-3 PUFA) and plant-based MUFA were associated with less weight gain, whereas increasing saturated and trans-fat intakes were associated with greater weight gain. Our results support the current dietary guidelines that recommend unsaturated fats as replacements for saturated and trans-fats.


Funding: No

Funding Component:

**MP051**

**Circulating Dairy Fatty Acids and Total and Cause-specific Mortality: the Cardiovascular Health Study**

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**Background:** Controversy has emerged about cardiovascular benefits versus harms of dairy fat consumption. Further, little data are available on potential long-term noncardiovascular effects. In addition, most observational studies to date assessed self-reported estimates of dairy fat consumption, which may not capture all dietary sources; and the few studies using objective biomarkers included only one baseline measure, which may lead to poor estimation of long-term risk.

**Aims:** To investigate prospective associations of serial measures of dairy plasma phospholipid fatty acids (15:0, 17:0, trans 16:1n-7) with cause-specific and total mortality among older adults in the Cardiovascular Health Study.

**Methods:** Among 2,638 U.S. adults aged ≥65y and free of CVD at baseline, circulating fatty acid levels were measured serially at baseline, 6 years and 13 years using standardized methods. All-cause and cause-specific deaths were assessed and adjudicated centrally. Prospective associations were assessed by multivariate-adjusted Cox models incorporating time-
dependent fatty acid measures and covariates.

Results: During 36,486 person-years of follow-up (1992-2015), 2,619 deaths occurred (930 CVD deaths, 1,689 non-CVD deaths), with 603 CHD deaths and 208 stroke deaths. After adjustment for demographic and lifestyle factors, higher plasma phospholipid 17:0 and \textit{trans} 16:1\textsubscript{n-7} were associated with lower cause-specific and total mortality (see Table). There were no statistically significant associations with 15:0.

Conclusion: Plasma phospholipid 17:0 and \textit{trans} 16:1\textsubscript{n-7}, two objective biomarkers of dairy fat consumption, measured serially over 13 years, were associated with lower all-cause and especially CVD mortality among older adults. A third biomarker, 15:0, was not significantly associated with mortality. These novel findings highlight the need for detailed mechanistic and interventional investigation of long-term health effects of dairy fat, dairy-specific fatty acids, and dairy foods.

Disclosures: M.C. de Oliveira Otto: None. R.N. Lemaitre: None. X. Song: None. I.B. King: None. D. Siscovick: None. D. Mozaffarian: E. Honoraria; Modest; Ad hoc honoraria for one-time scientific presentations/reviews on diet: Haas Avocado Board. F. Ownership Interest; Modest; Royalties: UpToDate, for online chapters on fish oil and dietary fat, Patent US889739 B2 to Harvard University, listing Dr. Mozaffarian as a co-inventor, for use of trans-palmitoleic acid in identifying and treating metabolic disease. G. Consultant/Advisory Board; Modest; Ad hoc consulting: Life Sciences Research Organization, Astra Zeneca, Boston Heart Diagnostics, GOED, DSM.

Funding: No

Funding Component:

MP052

Neither Insulin Secretion nor Genotype Pattern Modify 12-Month Weight Loss Effects of Healthy Low-Fat vs. Healthy Low-Carbohydrate Diets Among Adults with Obesity

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BACKGROUND: Dietary modification remains an essential component of successful weight loss strategies. No one dietary strategy has been determined to be superior to others for the general population. Studies that contrast reducing dietary fat vs. carbohydrate report consistently high within-group variability in dietary adherence and weight loss. Previous research by our group and others suggest that insulin-glucose dynamics or genotype patterns may modify diet effects.

OBJECTIVE: To determine if within-group weight loss variability on a Healthy Low-Fat (HLF) vs. a Healthy Low Carbohydrate (HLC) diet can be attributed to underlying factors such as insulin-glucose dynamics (i.e., insulin resistance and secretion) or genotype pattern. We hypothesized the above factors would be effect modifiers of HLF and HLC diets on 12-month weight loss.

METHODS: Generally healthy, non-diabetic adults, 18-50 years, BMI 28-40 kg/m\textsuperscript{2}, were randomized to HLF or HLC with no specific prescribed energy restriction for 12 months (n=609). Health educators delivered the intervention in 22 1-hr group classes. Data were collected at 0, 3, 6, & 12 months. Dietary intake was assessed by three 24-hour recalls/time point. Clinical data includes: 75-g glucose oral
glucose tolerance tests (insulin concentration at 30 minutes [Ins-30], a measure of insulin secretion), genotyping (3-SNP multilocus genotype: Low-Fat Genotype vs. Low-Carb Genotype, UK Biobank Axiom® array), body composition (DXA), resting energy expenditure (indirect calorimetry), epigenetics, proteomics, subcutaneous adipose tissue, microbiota, and standard CVD risk indicators.

RESULTS: At 12 months participants collectively lost 6,559 lbs. Retention was 79%, with equal dropout between arms. Range of weight change in both diet arms was ~80 lbs (-60 to +20 lbs). Macronutrient distribution at 12 months was 48% vs. 30% carbohydrate, 29% vs. 45% fat, and 21% vs. 23% protein for HLF and HLC, respectively. Both groups reported achieving and maintaining an average ~500 kcal deficit relative to baseline. Weight loss was similar for HLF vs. HLC: -12.1 ± 1.1 lbs vs. -13.8 ± 1.0 lbs, mean ± SEM. Neither Ins-30 (p for interaction = 0.84) nor genotype pattern (p for interaction = 0.20) modified the effect of diet on 12-month weight loss.

CONCLUSIONS: Despite substantial weight loss, high within-group variability, and strong dietary differentiation between groups, neither baseline Ins-30 nor genotype pattern modified the effect of diet on 12-month weight loss.


Funding: No

Funding Component:

**MP053**

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**Dietary Trimethylamine Intake and Cardiovascular Mortality Among Urban Chinese Adults**

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**Background:** Trimethylamine (TMA)-containing nutrients (choline, betaine and carnitine) are dietary precursors of a gut microbial-derived metabolite, trimethylamine-N-oxide (TMAO). Studies have suggested that elevated TMAO contributes to atherosclerosis and increased mortality in cardiovascular disease (CVD) patients. However, epidemiological evidence remains limited regarding whether high TMA intake may increase CVD mortality. No population-based study has evaluated animal vs. plant food-derived TMA in relation to CVD.

**Objective:** We examined dietary TMA, from animal-source foods (e.g., eggs, red meat and fish) and/or from plant foods (e.g., soy foods, legumes and vegetables), in association with total CVD mortality and mortality from coronary heart disease (CHD) and ischemic and hemorrhagic stroke. We also evaluated whether the associations were modified by food sources of TMA and by major CVD risk factors.

**Methods:** Included were 73216 women and 61190 men from two prospective cohort studies of Chinese adults. They were 40-74 years of age, free of cancer and with a plausible energy intake at baseline. Usual diets were assessed using food-frequency questionnaires. Dietary TMA intake was calculated using the USDA database. Vital status and cause of death were obtained via linkages with the vital statistics registry. Cox model was used to estimate HRs and 95% CIs.

**Results:** During a mean follow-up of 12.5 years, we documented 3740 CVD deaths. After adjusting for potential confounders, including sociodemographics, lifestyle, disease history, and other dietary risk factors, high TMA intake...
was associated with increased mortality from total CVD and CHD—HR (95% CI) in the highest vs. lowest quintile of TMA intake was 1.33 (1.15, 1.53) for CVD mortality and 1.60 (1.25, 2.06) for CHD mortality; both p-trend=0.0001. A positive trend of association was also observed for ischemic stroke mortality (HR [95% CI] =1.31 [0.99, 1.74]), but not for hemorrhagic stroke mortality. With mutual adjustment, animal- and plant-sourced TMA showed similar magnitude of positive associations with CVD and CHD mortality—HR (95% CI) in the highest vs. lowest quintile was 1.13 (0.99, 1.29) for animal-TMA and 1.19 (1.07, 1.33) for plant-TMA related to CVD mortality, and 1.33 (1.05, 1.67) for animal-TMA and 1.29 (1.07, 1.57) for plant-TMA related to CHD mortality. The TMA-CVD mortality association seemed more evident in men than in women and among adults with higher socioeconomic status, higher waist-hip ratios, higher refined carbohydrate intakes, or diabetes, although no interactions were statistically significant.

Conclusion: Our study suggests that high TMA intake, from either animal or plant food sources, is associated with increased mortality from atherosclerotic CVD among urban Chinese adults. Potential mechanism involving gut microbial production of TMAO needs to be investigated in future studies.


Funding: No

Funding Component:

MP054

Associations of Monounsaturated Fat From Plant and Animal Sources With Coronary Heart Disease Risk


Background: The association between monounsaturated fat (MUFA) intake and coronary heart disease (CHD) risk remains unclear. We aimed to investigate whether MUFA from plant foods (MUFA-P) and animal foods (MUFA-A) show different associations with CHD risk in two large prospective studies of U.S. men and women. Method: We calculated MUFA-P and MUFA-A among 60,931 women in the Nurses’ Health Study (1990-2012), and 28,445 men in the Health Professionals Follow-Up Study (1990-2010). Diet was assessed by validated food-frequency questionnaire every 4 years. CHD incidence was self-reported and confirmed by review of medical records or death certificates. Result: MUFA-A (median intake: 5.8-6.1% energy) was highly correlated with saturated fat (SFA; spearman correlation \( r =0.81-0.83 \)) but not polyunsaturated fat (PUFA, \( r =0.04-0.19 \)), whereas MUFA-P intake (median: 5.3-5.4.9% energy) was strongly correlated with PUFA (\( r =0.61 \) for both cohorts) but not SFA (\( r =0.20-0.21 \); All P<0.001). In multivariate models adjusted for demographic, lifestyle, and dietary factors, hazard ratios of CHD (HR, 95% confidence interval [95%CI]) from low to high total MUFA quintiles were 1 (reference), 0.92 (0.83, 1.02), 1.03 (0.93, 1.05), 0.89 (0.79,1.00), 0.95(0.873, 1.08; P-trend=0.42). For MUFA P these were 1 (reference), 0.98 (0.89, 1.07), 0.90 (0.82, 0.99), 0.85 (0.77, 0.93), and 0.86 (0.78, 0.94; P-trend<0.001) and for MUFA-A 1 (reference), 1.09 (0.99, 1.20), 1.22 (1.11, 1.35), 1.26 (1.13, 1.39), and 1.33 (1.19, 1.48; P-trend<0.001). In the energy-density model, CHD risk was lower when MUFA-P iso-calorically replaced 1% energy from total SFA (HR [95%CI]: 0.96[0.92, 1.00]; P=0.03), with no significant changes when MUFA-A replacing SFA (HR [95%CI]: 1.01[0.95, 1.07]; P=0.76). When grouping fat intake as the sum of animal MUFA plus saturated fat and the sum of plant MUFA plus PUFA, the HR (95%CI) of CHD was 0.96 (0.95, 0.98; P<0.001) for replacing 1%
energy from the former with the latter.

**Conclusion:** Because MUFA compositions of animal and plant origins are largely similar, our data suggested other components in plant and animal foods may lead to the observed different associations of MUFA-P and MUFA-A with CHD risk. These findings provided a possible explanation on current controversies regarding MUFA intake and CHD risk, and further support health benefit of MUFA intake.

Disclosures: **G. Zong:** B. Research Grant; Significant; Geng Zong is supported by a postdoctoral fellowship funded by Unilever R&D Vlaardingen, the Netherlands. **Y. Li:** None. **A. Wanders:** A. Employment; Significant; Anne Wanders is an employee of Unilever R&D. Unilever is a producer of food consumer products. **P. Zock:** A. Employment; Significant; Peter Zock is an employee of Unilever R&D. Unilever is a producer of food consumer products. **L. Sampson:** None. **W. Willett:** None. **F. Hu:** None. **Q. Sun:** None.

Funding: No

Funding Component:

**MP055**

**T-Wave Axis Deviation, Coronary Artery Disease, Atrial Fibrillation, Heart Failure, Stroke and Cardiovascular Mortality: The MOLI-SANI Study**

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**Background** Deviation of frontal plane T-wave axis (TDev) is a reliable measure of ventricular repolarisation abnormality. **Objectives** We investigated the associations and possible mediators between TDev and the risk of coronary artery disease (CHD), atrial fibrillation (AF), heart failure (HF), stroke and cardiovascular mortality. **Methods** A large sample of 21,287 Moli-sani participants (54.0±10 years, 46% women), randomly recruited from the general adult population of Southern Italy and free of clinically and ECG recognized vascular disease (including HF), were followed for a median of 4.3 years. TDev was measured from a standard 12-lead resting electrocardiogram. ECG abnormalities were identified by the MINNESOTA codes. **Results** After adjusting for a large panel of covariates (see the Table), subjects with abnormal TDev showed a significant increase in the risk of CHD, AF, HF and CVD mortality, but not with stroke (Table). Associations with CHD and HF (but not AF or CVD mortality) were slightly reduced but remained significant after further adjustment for other ECG abnormalities (Table). Subjects with abnormal TDev showed higher levels of subclinical inflammation (measured by C-reactive protein, WBC, platelet counts and ratio of granulocytes to lymphocytes), hs-troponin I and hs-NT-proBNP (p<0.001 for all). However, while additional adjustment for inflammation markers did not change the association of TDev with any clinical outcome, further adjustment for troponin I or NT-proBNP or both determined a reduction ranging from 7.9 to 23.7% for the association of TDev with HF and from 20.7 to 33.8% for the association of TDev with CHD. **Conclusions** Deviation of TDev is associated with an increased risk of HF or CHD, independently from a large panel of covariates and other ECG abnormalities. The association was partially explained by the increase in hs-troponin I and hs-NT-proBNP levels.
Introduction: Proposed Emergency Medical Services (EMS) routing policies permit additional transport time for suspected large vessel occlusion acute ischemic stroke (LVO) patients if the nearest hospital is not an endovascular center (EC). The effectiveness of these policies may depend on the region.

Methods: We created a discrete event simulation of EMS-screened suspected stroke patients over a year, assuming that 40% were strokes and 20% of strokes were LVO. We used hospital locations and demographic data of Mecklenburg County, NC (2 ECs, 6 non-ECs, pop. 990k, 546 mi²) and King County, WA (4 ECs, 10 non-ECs, pop. 2.4M, 2300 mi²). Patients were assigned to census tracts using estimated annual strokes per tract calculated from published incidence rates. A patient’s location within the tract was randomized. We retrieved real road travel times to estimate transport time to hospitals. Last known well time (LKW) was probabilistically assigned. A patient was EC-routed if they positively screened for LVO, had LKW ≤ 6 hours, were within the permitted transport time, and the closest hospital was not an EC. We simulated policies varying stroke severity screen (Los Angeles Motor Scale ≥ 4 (LAMS): 81% sensitivity, 89% specificity; Cincinnati Stroke Triage Assessment Tool ≥ 2 (C-STAT): 83% sensitivity, 40% specificity) and the permitted additional transport time to EC (10, 20, and 30 minutes). Each policy was replicated 20 times. Number needed to route (NNR) is the number of patients EC-routed for one LVO to be routed to an EC.

Results: EMS screened on average 3102 patients in Mecklenburg and 5178 in King County. In Mecklenburg, 67%, 99%, and 100% of LVOs were within a respective 10, 20, and 30 minutes of additional transport time to an EC; an EC was not the closest hospital for 57%, 71%, and 71% of these. In King, fewer LVOs met the same transport time criteria (43%, 59%, and 68%) and fewer of these were closest to a non-EC (37%, 55%, and 62%). EC-routing added a mean 6, 10, and 10 minutes (Mecklenburg) and 6, 10, and 13 minutes (King) for 10, 20, and 30 minute policies, respectively. EC-routed LVOs totaled 54, 98, and 98 (Mecklenburg) and 55, 110, and 143 (King) for 10, 20, and 30 minute policies using LAMS. With LAMS, 62% of EC-routed patients were non-LVO, totaling 83, 148, and 158 annually (Mecklenburg) and 89, 177, and 218 (King) for 10, 20, and 30 minute policies. Using LAMS, NNR was 2.54, 2.51, and 2.61 (Mecklenburg) and 2.62, 2.61, and 2.52 (King) for 10, 20, and 30 minute policies. For C-STAT, 89% were non-LVO with NNR>8 for all policies.

Conclusions: Our customizable simulation evaluates EC routing policies. Low specificity of a screening tool coupled with a large permitted EC routing time may contribute to congested ECs. Our results suggest that with respect to NNR, Mecklenburg
may prefer to permit 20 additional minutes for EC transport, but King may prefer 30 minutes. We demonstrate that one policy may not be optimal for all regions.

Disclosures: B.M. Bogle: None. A. Asimos: None. W.D. Rosamond: None.

Funding: No

Funding Component:

MP057

Subclinical Cerebrovascular Disease is Associated with Worsening Gait and Balance in an Elderly Multi-Ethnic Population: The Northern Manhattan Study (NOMAS)

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Introduction: Age-related decline in gait and balance is a contributor to morbidity in the elderly. Subclinical cerebrovascular disease, seen on magnetic resonance imaging (MRI) as white matter hyperintensities (WMH) and silent brain infarcts (SBI), is associated with impaired mobility. Less is known about the association of WMH in specific brain regions and mobility impairment. We hypothesized that anterior WMH volume would be associated with lower scores on the Short Physical Performance Battery (SPPB), a well-validated mobility scale associated with falls and mortality in the elderly. Methods: Participants in the Northern Manhattan Study MRI cohort had the SPPB measured a median of 5 years after enrollment. The SPPB has three domains with a maximum total score of 12: gait speed, chair stands, standing balance. Volumetric distributions for WMH volume across 14 brain regions (brainstem, cerebellum, and bilateral frontal, occipital, temporal, and parietal lobes, and bilateral anterior and posterior periventricular white matter) were determined separately for each hemisphere by combining bimodal image intensity distribution and atlas based methods. Multi-variable linear regression was performed to examine the association between SBI and total and regional (frontal, parietal, occipital, temporal, anterior, posterior, and brainstem) head size-corrected WMH volumes, with the total SPPB score; models were adjusted for cardiovascular disease risk factors, osteoarthritis, and grip strength. Results: Among 668 stroke-free participants with the SPPB available, mean age at the time of assessment was 74 ±9 years, 37% were male and 70% Hispanic; the mean SPPB score was 8.2 ± 2.9, interquartile range 7-10. Mean total WMHV was 0.55±0.75cc, mean anterior WMHV 0.18±0.24cc, and 12% of participants had SBI. In multi-variable models, total WMHV was associated with a lower SPPB (beta = -0.3 per SD of logWMH, p=0.004), while SBI was not (beta= -0.12, p=0.7). For regional WMH volumes, only greater anterior periventricular WMHV was associated with SPPB (beta= -0.29 per SD, p=0.009). Conclusions: White matter hyperintensities, especially in the anterior cerebral regions, are associated with a lower SPPB. Prevention of subclinical cerebrovascular disease is a potential target to prevent physical aging in the elderly.


Funding: No

Funding Component:

MP058

Racial and Gender Differences in Acute Ischemic Stroke Pre-hospital Documentation: Last Known Well, Pre-alert Notification and
Stroke is the fifth leading cause of death in the United States and a major cause of adult disability. Documentation of stroke-related factors that occur before arrival to the hospital or immediately upon arrival may be critical in determining patient eligibility for life-saving measures, including receipt of thrombolytic therapy (e.g., alteplase) and other neurointerventional treatment. There is a need to describe differences in documentation of pre-hospital measures, in order to improve overall stroke patient care. De-identified data for 216,129 stroke patients were reported by hospital personnel during the 2012-2015 Paul Coverdell National Acute Stroke Program. Chi-square tests were performed to examine the differences on demographic and pre-hospital measures by gender and race. The median age was greater for females than males (75 vs 68 years) and for whites than blacks (74 vs 63 years). A higher percentage of females had Medicare coverage than males (67.8% vs. 57.4%, p<0.001), while blacks had higher Medicaid coverage than whites (12.8% vs. 4.2%, p<0.0001). Females (49.9%) and blacks (48.8%) had the highest percentage of arrival by EMS. Among patients who arrived by emergency services, the percentage of blacks with advance notification of stroke was lower than whites (49.8% vs. 58.2%, p<0.0001). Females (53.0%) were slightly less likely to have last known well time recorded than males (53.8%). Blacks were significantly less likely to have last known well time and stroke severity recorded compared whites (p<0.0001). The median time interval between last known well and emergency department arrival for blacks were 4.8 hours, significantly longer than median time of 4.0 hours for whites (p<0.001). Differences in documentation of pre-hospital measures, particularly between racial groups, suggest room for improvement in communication of information from the pre-hospital environment to emergency department staff, which may support access to critical links in the chain of stroke survival, including activation of stroke care teams who can provide swift access to life-saving treatment.

Disclosures: E. Odom: None. S. Coleman King: None. X. Tong: None.

Funding: No

Funding Component:

MP059

Incremental Light Activity Associated with Greater Brain Volume in Individuals Not Meeting the Physical Activity Guidelines: Cross Sectional Observations from the Framingham Heart Study

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Background: Recent evidence suggests that dementia appears linked to subclinical vascular changes, which may be attenuated by physical activity. The Physical Activity Guidelines for Americans (PA-Guidelines) are currently set at 150 min of moderate-to-vigorous physical activity (MVPA) per week, as a target for adults to achieve favorable health outcomes, but make no specific recommendations for prevention of dementia. Many Americans fall well below the PA-Guidelines. The aim of this investigation was to determine whether there is a continuum of lower intensities and volumes of physical activity associated with healthy brain...
aging even in individuals not meeting the PA-Guidelines. **Methods:** We included Framingham Heart Study (FHS) participants who wore an Actical accelerometer for ≥3 valid days (>10 h wear time per day) on their right hip during the most recent cohort examinations and completed brain magnetic resonance imaging (MRI) an average of 1.7 (±0.9) years later (n=2534): Offspring exam 9, Third Generation exam 2, and corresponding examinations of the Omni cohorts. Participants were excluded from this analysis if they had prevalent stroke or dementia (n=63) or met the 150 min MVPA per week PA-Guidelines (n=1158). Non-wear time (defined as 60 min of zero-counts, with two interruptions allowed) was removed. Sedentary time (<200 counts/min, <1.5 metabolic equivalents [METs]) and light activity (201-1485 counts/min, 1.5-3 METs) were only accumulated during 6 am-10 pm, were represented as proportions of wear time to account for differences in wear time among participants, and standardized to a 16 h day. MVPA (>1486 counts/min, ≥3 METs) and steps were accumulated at any time of day. The relations of physical activity measures to brain MRI measures were assessed using multivariable linear regression. **Results:** More than 53% of FHS participants did not meet the PA-Guidelines for MVPA during their last exam, and were thus included in this investigation (n=1313, 56 [±14] years old, 60% women). These participants took an average of 6149 [±3079] steps, spent 10.5 [±6.1] min MVPA, 13 h 36 min [±48 min] sedentary and 2 h 14 min [±48 min] in light activities per day. Each additional 40 min of light activity (spent in 1.5-3 METs) or 42 min less time spent sedentary was associated with 0.22% [±0.07%] greater total cerebral brain volume (TCBV), after adjusting for age, sex, body mass index, smoking, diabetes mellitus, and cardiovascular disease (p=0.001), equivalent to approximately 1.1 years less brain aging. Greater light activity and lower sedentary time were also associated with greater hippocampal volume (p<0.005). **Conclusions:** Our investigation demonstrates, in a community setting, that there may be a negative association of light physical activity with brain aging even among individuals not meeting the PA-Guidelines for MVPA.

Disclosures: **N.L. Spartano:** None. **K.L. Davis-Plourde:** None. **J.J. Himali:** None. **L. Trinquart:** None. **C. Andersson:** None. **C.L. Satizabal:** None. **C. DeCarli:** None. **J.M. Murabito:** None. **A.S. Beiser:** None. **R.S. Vasan:** None. **S. Seshadri:** None.

Funding: Yes

Funding Component: Founders Affiliate (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont)

**MP060**

Contributors to the Geographic Disparity in Stroke Incidence in the United States: Results From the Reasons for Geographic and Racial Disparities in Stroke Cohort

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**Introduction:** Geographic disparities in US stroke risk have recently been confirmed by REGARDS, but contributors to this are unknown. Higher prevalence of risk factors (RF) and lower socioeconomic status (SES) may contribute to this geographic disparity. For a RF/SES to contribute to this disparity it must both: 1) have a large geographic difference in prevalence, and 2) be powerfully associated with stroke risk. **Methods:** The 1,623 counties of residence of 24,863 REGARDS participants were placed in quartiles of Vital Statistics stroke mortality. Logistic regression assessed the geographic difference in prevalence of each RF/SES by quartile of stroke mortality. Proportional
hazards was used to calculate HR stroke for each RF/SES. Mediation analysis then estimated the proportion of increased stroke incidence in counties with high stroke mortality explained by each RF/SES.

**Results:** Higher county-level stroke mortality was significantly associated with low neighborhood SES (nSES), and more weakly associated with low education and presence of RFs (left column of table). Over 8-years follow-up there were 1,194 stroke events. Hypertension, diabetes and heart disease were all more strongly associated with higher stroke risk (HR ≥ 1.59) than nSES (HR = 1.21) (center column of table). The large differences in nSES between regions overcame the somewhat weaker association of nSES with stroke risk, since nSES was the largest single contributor to the geographic disparity in stroke incidence, accounting for 20.5% of the disparity (95% CI: 7.1 - 34.0) (right column in table). In multivariable analysis nSES, hypertension and diabetes collectively mediated 27% of the geographic disparity (95% CI: 20.0% - 34.0%), but the association with county-level mortality remained significant (p = 0.006).

**Conclusion:** Lower nSES played the largest role in explaining the county-level geographic disparity in stroke incidence in REGARDS, however, 73% of the excess risk of stroke incidence was not explained by any studied factors.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Incidence of Stroke in REGARDS per County (per 1000)</th>
<th>Hypertension (%)</th>
<th>Diabetes (%)</th>
<th>Heart Disease (%)</th>
<th>Low Education (%)</th>
<th>Low nSES (%)</th>
<th>RFs (%</th>
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<tbody>
<tr>
<td>Hypertension</td>
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Disclosures: **G. Howard:** None. **D.R. Labarthe:** None. **V.J. Howard:** None. **S.E. Judd:** None. **C.S. Moy:** None. **B.M. Kissela:** None. **M. Cushman:** None.

Funding: No

Funding Component:

**MP067**

**Reducing US Cardiovascular Disease Disparities Through Dietary Policy**

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Quantifying reductions in US cardiovascular deaths and disparities by different diet policies

**Background**

Large disparities exist in US dietary habits and cardiovascular disease (CVD) mortality. While economic incentives have demonstrated success in improving dietary choices, the quantitative impact of different dietary policies on CVD disparities is not well-established

**Methods**

Using a US IMPACT Food Policy Model and probabilistic sensitivity analyses, we estimated and compared the reductions in CVD mortality and disparities in the US population potentially achievable from 2015 to 2030 with specific dietary policy scenarios

a) a national mass media campaign (Media campaign) aimed to increase consumption of fruits and vegetables (F&V) or reduce sugar sweetened beverages (SSBs),

b) national fiscal policies to tax SSB and increase price by 10% and subsidize F&V to reduce prices by 10%; and
c) a targeted policy, to subsidize F&V to reduce prices by 30% among Supplemental Nutrition Assistance Programme (SNAP) participants only. We also evaluated a combined multi-component approach, combining each of the above policies.

**Results**

Among individual policy options, a national 10% F&V subsidy was estimated to be most effective, resulting in approximately 150,500 (95% CI, 142,700-157,900) CVD deaths potentially prevented or postponed (DPPs) by 2030. This far exceed the approximately 35,100 (32,000-37,900) DPPs from a 30% F&V subsidy targeting SNAP participants, or some 23,000 (21,700-24,600) DPPs from a 1-year Media campaign or approximately 21,400 (19,500-23,600) DPPs from a 10% SSB tax.

Neither the Media campaign nor individual national economic policies would significantly reduce CVD disparities. However, the SNAP-targeted intervention would significantly reduce CVD disparities between SNAP participants and SNAP-ineligible individuals, by approximately 7% (10 DPPs per 100,000 population).

The combined policy approach would save more lives than any single policy studied (approximately 215,500 DPPs by 2030) while also significantly reducing disparities by approximately 5% (7 DPPs per 100,000 population).

**Conclusions**

Fiscal strategies targeting diet could reduce CVD burdens. A national 10% F&V subsidy would save by far the most lives, while a SNAP-targeted 30% F&V subsidy would most reduce disparities.

A combined policy would have the greatest overall impact on both mortality and disparities.


Funding: No

Funding Component:

**MP068**

**Dietary Fatty Acids and Coronary Heart Disease in Mortality in the Alpha Omega Cohort**

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Background: Replacement of saturated fatty acids (SFA) with polyunsaturated fatty acids (PUFA) is associated with a lower risk of coronary heart disease (CHD) in the general population. Whether this is also the case for CHD patients is not yet clear. In this observational study of Dutch CHD patients, we examined the risk of CHD mortality for the exchange of SFA with total unsaturated fatty acids (UFA), PUFA and cis-monounsaturated fatty acids (MUFA).

Methods: We included 4146 post-myocardial infarction patients aged 60-80 (78% male; Alpha Omega Cohort) in whom diet was assessed at baseline (2002-2006) by a validated 203-item food-frequency questionnaire. Cause-specific mortality was monitored until January 2013. Iso-caloric replacement of SFA with (subgroups of) UFA in relation to CHD mortality was studied in quintiles and continuously per 5 energy percent (en%), using Cox regression models. Hazard ratios (HR, 95%-CI) were obtained after adjustment for age, sex, BMI, smoking, education, physical activity, cardiovascular drugs (anticoagulants, antihypertensives, statins), diabetes, and dietary factors, i.e. total energy, protein (en%), carbohydrates (en%), trans fatty acids (en%), dietary fiber (g/d) and dietary cholesterol (mg/d). The model for PUFA also included MUFA as a covariate, and vice
versa.

Results: During a median follow-up of 7.3 years, there were 888 deaths including 249 CHD deaths. SFA replacement was inversely associated with CHD mortality when comparing extreme quintiles of intake, which was statistically significant for total UFA (HR: 0.44; 95% CI: 0.21-0.92; P = 0.03) and non-significant for PUFA (0.58, 0.31-1.09) and MUFA (0.81, 0.45-1.49). When expressed per 5 en% (Figure), replacing SFA with either UFA, PUFA or MUFA was associated with a more than 30% lower risk of CHD mortality. Findings were similar when confined to statin users.

Conclusion: In well-treated CHD patients, replacement of SFA by UFA is associated with a lower CHD mortality risk.


Funding: No

Funding Component:

MP069

Dietary Factors Associated with Cardiovascular Outcomes: 25 Year Findings from the Coronary Artery Risk Development in Young Adults (CARDIA) Study
Conclusions: Dietary factors play an important role in development of ASCVD, but the same dietary factors may not necessarily be associated with CAC development. Adverse synergistic effects of sodium and added sugars may be especially related to CVD. Whether source of SFA e.g. meat/processed meat, vs dairy foods confers different ASCVD risks and whether added sugars directly or indirectly in SSB’s increase CAC and a CVD event, especially combined with high sodium intake, need further consideration.


Funding: No

Funding Component:

MP070

Saturated Fat Intake by Food Source and Risk of Incident Coronary Heart Disease in Men: the Kuopio Ischaemic Heart Disease Risk Factor Study

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Introduction: The epidemiological evidence of the role of dietary saturated fatty acids (SFA) in the etiology of coronary heart disease (CHD) is inconsistent. However, the proportions of different SFAs in different foods vary, and food sources of SFA (such as dairy and meat products) have had distinct associations with risk of CHD and its risk factors.

Hypothesis: We assessed the hypothesis that SFA from different food sources have distinct associations with CHD risk in men.

Methods: A total of 1981 men from the population-based Kuopio Ischaemic Heart Disease Risk Factor Study from eastern Finland, aged 42-60 years and free of CHD at baseline, were included. The consumption of foods was assessed with instructed 4-day food recording by household measures. Dietary intakes were adjusted for total energy using the residuals method. Multivariable-adjusted Cox regression analyses included age, examination year, body mass index, diabetes, hypertension, family history of CHD, smoking, education, leisure-time physical activity, and intakes of alcohol, energy, fiber, polyunsaturated fatty acids, and fruits, berries and vegetables. Fatal and nonfatal CHD events were ascertained from national registries, with no loss to follow-up.

Results: The mean±SD total SFA intake was 49.1±10.4 g/d (18.1 E%). SFA from dairy (16.1±7.7 g/d, excluding butter), butter (16.0±11.1 g/d), plant sources (6.7±5.0 g/d), processed red meat (4.7±4.2 g/d), and unprocessed red meat (3.6±2.7 g/d) contributed most to the total intake. During the mean follow-up of 19.6 years, 458 CHD events occurred. The extreme-quartile hazard ratios (95% CIs) were 1.08 (0.79-1.47, P-trend=0.57) for the highest vs. the lowest quartile of total SFA, 0.99 (0.75-1.32, P-trend=0.93) for total dairy SFA, 1.17 (0.84-1.63, P-trend=0.45) for butter SFA, 0.96 (95% CI 0.70-1.32, P-trend=0.62) for plant SFA, 1.09 (0.82-1.44, P-trend=0.76) for processed red meat SFA, and 1.15 (0.88-1.49, P-trend=0.29) for SFA from unprocessed red meat. Only SFA from fermented dairy (mean±SD intake 4.6±4.6 g/d) was associated with the risk (hazard ratio in the highest vs. the lowest quartile 0.69, 95% CI 0.52-0.91, P-trend=0.02). The associations were
not appreciably different with a shorter, 10-y follow-up (199 cases).

**Conclusions:** Our results suggest an overall non-significant role for SFA intake in the CHD risk and little difference in the associations with SFA from various food sources. Because milk is the raw material in all dairy products, the inverse association with fermented dairy likely reflects other constituents in these products than SFA.


Funding: No

Funding Component:

**MP071**

**Genetic Modification of Triggers of Acute Myocardial Infarction: Results From a Case-crossover Study in Costa Rica**

**Dongqing Wang,** Univ of Michigan, Ann Arbor, MI; Elizabeth Mostofsky, Murray Mittleman, Harvard T.H. Chan Sch of Public Health, Boston, MA; Sharon L Kardia, Univ of Michigan, Ann Arbor, MI; Hannia Campos, Harvard T.H. Chan Sch of Public Health, Boston, MA; Ana Baylin, Univ of Michigan, Ann Arbor, MI

**Background** - Coffee intake and heavy physical exertion are triggers of acute myocardial infarction (AMI). It is hypothesized that their triggering effects can be modified by genetic variation. **Methods** - The study population consisted of incident cases (n=1354 for coffee intake, and n=1101 for heavy physical exertion) of nonfatal AMI recruited in Costa Rica between 1994 and 2004. Coffee intake and heavy physical exertion were assessed with validated questionnaires. Blood samples were collected and genotyping was conducted. We used a case-crossover design to estimate the relative risks (RRs) and 95% confidence intervals (CIs) of AMI associated with each trigger stratified by the genotypes of each SNP included. Chi-square tests of homogeneity of RR across genotypic strata were used to assess effect modification by genetic factors. We included SNPs from both candidate genes (candidate SNPs) and previous genome-wide association studies (GWAS SNPs) related to the pathophysiological pathways of the triggering effects. Specifically, the candidate SNPs were from select genes related to sympathetic nervous system, renin-angiotensin system, caffeine metabolism, and habitual coffee consumption. The GWAS SNPs were those previously found to be associated with AMI/coronary artery disease, lipid metabolism, blood pressure, heart rate, blood coagulation, matrix metalloproteinase, and adhesion molecules. A p-value of 0.05 was considered statistically significant at first. We then performed Bonferroni correction and false discovery rate (FDR) adjustment to account for multiple testing. **Results** - Among the SNPs associated with AMI/coronary artery disease, rs10483853 significantly modified the triggering effect of coffee, and rs10507130 was significant for heavy physical exertion. Among the SNPs associated with blood pressure, rs935334 was significant for both triggers. Among the SNPs associated with heart rate, rs9398652, rs1541010 and rs1395479 were significant for coffee intake, and rs17287293 and rs223116 were significant for heavy physical exertion. Among the SNPs associated with blood coagulation, rs4460176, rs565229, and rs12367822 were significant for coffee intake, and rs2731672, rs10489087, rs647316, rs2138852, rs1473247, rs12367822 and rs1671152 were significant for heavy physical exertion. The two SNPs associated with serum matrix metalloproteinase (rs11225434 and rs495366) both significantly modified the triggering effect of heavy physical exertion. No SNPs remained statistically significant after Bonferroni correction or FDR adjustment. **Conclusions** - We identified several potential genetic modifiers of the triggering effects of coffee intake and heavy physical exertion on AMI. Among them, heart rate and blood coagulation traits appeared to be more important. Replication studies in other
populations will help confirm and expand our findings.

Disclosures: **D. Wang:** None. **E. Mostofsky:** None. **M. Mittleman:** None. **S.L.R. Kardia:** None. **H. Campos:** None. **A. Baylin:** None.

Funding: No

Funding Component:

**MP072**

**Low Vitamin K Status is Prospectively Associated With Greater Left Ventricular Mass**

_Hanne van Ballegooijen_, Ingeborg A. Brouwer, Marjolein Visser, VU Univ, Amsterdam, Netherlands; Giel Nijpels, Jacqueline M. Dekker, VU Univ Medical Ctr, Amsterdam, Netherlands; Roger J. Rennenberg, Univ Medical Ctr Maastricht, Maastricht, Netherlands; Cees Vermeer, R&D Group VitaK, Maastricht Univ, Maastricht, Netherlands; Coen D Stehouwer, Univ Medical Ctr Maastricht, Maastricht, Netherlands; Joline W. Beulens, VU Univ Medical Ctr, Amsterdam, Netherlands

**Introduction:** Vitamin K is a fat soluble vitamin and is required as a co-factor for the carboxylation of several proteins. Matrix gla-protein (MGP) requires vitamin K for its activation and is a potent vascular calcification inhibitor. High concentrations of dephosphorylated uncarboxylated MGP (dp-ucMGP) -a functional marker of vitamin K status- are associated with increased coronary artery calcification and cardiovascular disease, but the underlying mechanism remains unclear. **Hypothesis:** We hypothesized that higher levels of dp-ucMGP (indicating low vitamin K status) are associated with unfavorable measures of cardiac structure and function after 7 years of follow-up. **Methods:** In the Hoorn Study, a population-based cohort, 598 participants mean age 70.1±6.6 years, 51% female, had physical examinations in 2000-2001 (baseline for the current analyses), of whom 249 had a follow-up in 2007-2009. Plasma dp-ucMGP levels were measured with ELISA in baseline samples. We studied the cross-sectional and prospective association of dp-ucMGP with echocardiographic measures of left ventricular mass index (LVMI), ejection fraction and left atrium volume index using linear regression analyses, adjusted for age, sex, BMI, education, smoking, type 2 diabetes and LDL-cholesterol. **Results:** Median plasma dp-ucMGP was 567 (392-701) pmol/l and mean follow-up time was 7.0±0.7 year. Cross-sectionally, the highest dp-ucMGP quartile ≥701 pmol/l compared to the lowest quartile <392 pmol/l was associated with a 2.7 g/m².7 (95% CI -0.8, 6.2) greater LVMI. In the prospective analysis adjusting for baseline LVMI and follow-up time, the association was more pronounced and became significant 6.5 g/m².7 (95% CI 1.5, 11.4). This result was confirmed by the continuous association (Figure 1). No significant associations were observed between dp-ucMGP with ejection fraction and left atrium volume index. **Conclusion:** In conclusion, these results suggest that a low vitamin K status is prospectively associated with a greater LVMI.

Disclosures: **H. van Ballegooijen:** None. **I.A. Brouwer:** None. **M. Visser:** None. **G. Nijpels:** None. **J.M. Dekker:** None. **R.J. Rennenberg:** None. **C. Vermeer:** None. **C.D.A. Stehouwer:** None. **J.W. Beulens:** None.

Funding: No

Funding Component:

**MP073**
Sleep Patterns and Depression in a Diverse Sample of Women from the AHA Go Red for Women Strategically Focused Research Network (SFRN)

Brooke Aggarwal, Ming Liao, Columbia Univ Medical Ctr, New York, NY

BACKGROUND: Depression has been linked to increased risk of cardiovascular disease (CVD) through biological mechanisms and altered lifestyle behaviors, possibly including short and/or long sleep duration. However the relation between specific sleep components and depressive symptoms, and interaction by race/ethnicity has not been fully defined. The purpose of this study was to determine if sleep patterns including short sleep duration, poor sleep quality, and insomnia were associated with depressive symptoms in a free-living ethnically diverse population of adult women, and if they varied by racial/ethnic status.

METHODS: English or Spanish speaking females between the ages of 20-79 y, participating in an observational cohort study as part of the American Heart Association Go Red for Women SFRN, were included (n=50, 56% (28 of 50) non-white, mean age = 41 ±18y). Sleep patterns were assessed using the Pittsburgh Sleep Quality Index (PSQI), a validated instrument used to measure the quality and duration of sleep in adults. Presence of insomnia was measured using the Insomnia Severity Index (ISI). Depressive symptoms were assessed using the Beck Depression Inventory (BDI-II). Linear and logistic regression models were used to evaluate cross-sectional associations between sleep patterns and depression overall, and by race/ethnicity. RESULTS: Overall, nearly one-fifth of participants had depressive symptoms (BDI II score ≤13), 18% (9 of 50) had short sleep duration (<6 hours per night), 38% (19 of 50) had poor quality sleep (PSQI score ≥5), and 40% (20 of 50) had some level of insomnia (ISI score ≥8). Mean BDI-II scores among women who slept <6 versus ≥6 hours were significantly greater (16 versus 5, p=.0003). Higher depression scores were associated with shorter sleep duration (p=.001), poorer sleep quality (p=.03), and higher insomnia severity (p=.0001) overall. There was no association between depression and long sleep (≥8 hours). When stratified by race/ethnicity, depression was significantly associated with poor sleep quality among minority women in multivariable models adjusted for demographic confounders (OR=1.42, 95% CI=1.03-1.95), but not among non-Hispanic white women. Depression was also significantly associated with insomnia severity (p<.001), and sleep duration (p=.03) among minority women only, in multivariable adjusted models stratified by race/ethnicity.

CONCLUSIONS: In this diverse sample of women, sleep problems were highly prevalent. Poor sleep quality, insomnia, and short sleep duration (but not long sleep) were associated with greater depressive symptoms among minority women but not whites. These preliminary data suggest that minority women with short sleep duration may be at heightened CVD risk from depression. Future research should determine if interventions designed to improve sleep result in decreased depressive symptoms and reduced CVD risk.

Disclosures: B. Aggarwal: B. Research Grant; Significant; PI, Population Science- AHA Go Red for Women Research Network Center at Columbia University Medical Center. M. Liao: B. Research Grant; Significant; Data Analyst for AHA Go Red for Women Research Network Center at Columbia University Medical Center.

Funding: Yes

Funding Component: National Center

MP074

Pathway Linking Depression & Inflammation: A 5-year Longitudinal Twin Difference Study

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Background: Depression and inflammation are risk factors for cardiovascular disease. Depression and inflammation are associated, but the causal direction remains unclear. Genetic background (i.e., genes common to both conditions) may confound this association. We sought to examine the temporal relationship between depression and inflammation, after controlling for genetic confounding, in a 5-year longitudinal monozygotic (MZ) and dizygotic (DZ) twin difference study.

Methods: This analysis is based on a longitudinal in-person follow-up of a male middle-aged sample of twin pairs from the Vietnam Era Twin Registry. Inflammation was measured by log-transformed plasma levels of interleukin-6 (IL-6), and depression was evaluated using the Beck Depression Inventory-II (BDI). Inflammation and depression were measured at baseline (visit 1) and after 5 years (visit 2). A longitudinal cross-lagged model was run on signed sibling difference scores in IL-6 and BDI (i.e. twin A - twin B). The path coefficient was examined by the robust maximum likelihood test. We also tested the interaction between zygosity and within-pair difference in IL-6 or BDI score.

Results: A total of 166 male twins (83 pairs, mean age of 54) were examined at both visits, including 94 MZ and 72 DZ twins. There was a significant association between sibling differences in IL-6 and BDI score across two visits. At visit 1, the cross-sectional association between sibling difference in IL-6 and BDI score was not significant, but it became significant at visit 2 in MZ twins. The primary focus of our analysis was the longitudinal cross-lagged bidirectional association of BDI and IL-6. There was no significant association between baseline within-pair difference in BDI and their difference in IL-6 at follow-up, which suggests that members of the MZ twin pair who had higher levels of IL-6 than their siblings at baseline had significantly higher BDI scores at follow-up. This association was only significant in MZ twins (r=0.36, p=0.001) and not in DZ twins (r=0.09, p=0.49), with a significant interaction (p=0.03) between zygosity and within-pair difference in IL-6.

Conclusion: Higher inflammation is linked to higher depressive symptoms over time and not vice versa, which suggests that inflammation may be a cause of depression, rather than a consequence. This association is stronger in MZ than DZ twins, thus genetic confounding likely does not play a role.


Funding: No

Funding Component:

MP075

Profiles of Obese Depressed Adults in a Randomized Controlled Trial of Integrated Behavior Therapy

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Objective

To identify distinct profiles of obese depressed patients in an ongoing trial that tests the effectiveness and implementation potential of
an integrated care model in primary care combining standard behavioral weight loss treatment and problem solving therapy plus as-needed antidepressant(s).

**Design and Methods**
Analysis of variance for continuous and Chi-square tests for categorical variables compared 4 domains (sociodemographic, behavioral, clinical and psychosocial characteristics) among 4 severity categories of obese depressed participants (i.e., body mass index [BMI]<35 kg/m² and Depression Symptom Checklist 20 [SCL20]<1.5; BMI<35 and SCL20≥1.5; BMI≥35 and SCL20<1.5; and BMI≥35 and SCL20≥1.5). Discriminant analysis identified combinations of characteristics that best differentiated these categories.

**Results**
Participants (n=322) had baseline mean (SD) age of 50.4 (12.2) years, BMI of 36.7 (6.4) kg/m², and SCL20 of 1.5 (0.5). Pairwise comparisons showed participants in the 4 categories had similar sociodemographic characteristics, but they differed significantly in the other 3 domains (Table). Discriminant analysis showed the combination of higher abdominal obesity, problems with usual activities (eg, work and family or leisure activities), higher anxiety, poorer self-reported mental health, and more obesity-related problems differentiated the highest from lowest severity category. The combination of lower abdominal obesity, more obese-related problems, and higher anxiety differentiated the 2 intermediate (lower obesity/high depression vs. high obesity/lower depression) categories.

**Conclusions**
Discernable behavioral, clinical and psychosocial profiles reveal important variability according to comorbidity severity within a largely sociodemographically similar group of obese depressed adults. This insight may inform future analysis of heterogeneity of treatment effects and targeting of strategies to baseline participant profiles in a multicomponent intervention.


**Funding:** No

**Funding Component:**

**MP076**

**Angiographic Coronary Artery Disease Severity and Risk of Mental and Conventional Stress Induced Myocardial Ischemia**

**Muhammad Hammadah,** Naser Abdelhadi, Emory Univ, atlanta, GA; Shuyang Fang, Emory Univ, Atlanta, GA; Zakaria Almuwaqqat, Ayman Alkhoder, Mazen Ghafeer, Hawkins C Gay, Ijeoma Ibeanu, Wesley T. O'Neal, Samah Sullivan, Ayman Samman Tahhan, Heval Mohamed Kelli, Levantsevych Oleksiy, Malik Obideen, Pratik Pimple, Pratik Sandesara, ibhar almheid, Kobina Wilmot, Ronnie Ramadan, Amit J. Shah, J. Douglas Bremner, Paolo Raggi, David Sheps, Arshed Quyyumi, Viola Vaccarino, Emory Univ, atlanta, GA

**Background:** Mental stress induced myocardial ischemia (MSIMI) is linked to increased risk of adverse cardiovascular outcomes, but its mechanisms are thought to be different from those of conventional stress-induced ischemia (CSIMI). Specifically, whether MSIMI is associated with more severe underlying...
obstructive coronary artery disease (CAD) is unclear. We investigated the association between angiographically-defined CAD severity and both MSIMI and CSI MI with a hypothesis that, CAD severity will be linked to CSIMI, but not MSIMI. **Methods:** A total of 273 patients with stable CAD, aged 51±7 years, 49% female, who survived a myocardial infarction (MI) within the past 8 months (median 167±52 days) were enrolled in the Myocardial Infarction and Mental Stress 2 (MIMS-2) study. The coronary angiogram performed during the index MI hospitalization was used to assess CAD severity. Coronary artery obstruction was assessed by counting the number of diseased vessels with 70% stenosis (DV70%) and using the Gensini Score (GS) after correcting for revascularized vessels. Patients underwent 99mTc sestamibi myocardial perfusion imaging during mental stress, using a public speaking task, and during conventional stress test, using exercise or pharmacological stress. MSIMI and CSIMI were defined as a new or worsening impairment in myocardial perfusion using a 17-segment model. **Results:** A total of 68 (26%) patients developed CSIMI, while 46 (17%) developed MSIMI. Median DV70% and GS were 0 (0-1), and 3 (0-12), respectively. Using logistic regression models, and after adjustment for age, gender, hypertension, hyperlipidemia and diabetes, obstructive CAD was associated with increased risk of CSIMI [OR(95%CI) of 1.54 (1.02 - 2.31) for DV70% and 1.25 (1.03-1.53), for GS], but not MSIMI [OR(95%CI) of 0.93 (0.56 - 1.53) for DV70%, and 0.94 (0.75-1.18) for GS]. **Conclusion:** Although CSIMI is linked to underlying coronary obstruction, MSIMI is independent of CAD severity among post-MI patients. Other mechanisms are likely responsible for MSIMI post MI.

Disclosures: **M. Hammadah:** None. **N. Abdelhadi:** None. **S. Fang:** None. **Z. Almuwaqqat:** None. **Alkhoder:** None. **M. Ghafeer:** None. **H.C. Gay:** None. **I. Ibeanu:** None. **W.T. O’Neal:** None. **S. Sullivan:** None. **A. Samman Tahhan:** None. **H. Mohamed Kelli:** None. **L. Oleksiy:** None. **M. Obideen:** None. **P. Pimple:** None. **P. Sandesara:** None. **I. almheid:** None. **K. Wilmot:** None. **R. Ramadan:** None. **A.J. Shah:** None. **J. Bremner:** None. **P. Raggi:** None. **D. Sheps:** None. **A. Quyyumi:** None. **V. Vaccarino:** None.

Funding: No

Funding Component:

**MP077**

**Longitudinal Associations Between Venous Disease Progression and Change in Quality of Life: San Diego Population Study**

Adrienne M Schlang, UCSD, San Diego, CA; Jessica Wallace, Univ of Cincinnati Coll of Med, Cincinnati, OH; Julie Denenberg, Michael Criqui, Matthew Allison, UCSD, San Diego, CA

**Background:** Chronic venous disease, one of the most common chronic diseases in the United States, is associated with lower quality of life (QOL). Although earlier studies have identified a significant association between the cross-sectional prevalence of venous disease and QOL, few studies have investigated the association between venous disease progression and change in QOL. Therefore, the aim of this study was to investigate the relationship between progression of venous disease and change in QOL in a longitudinal cohort.

**Methods:** A population-based cohort of 1103 participants were examined at baseline and 11 years later. At both visits, QOL and risk factors were assessed by questionnaire, anthropometric measures obtained by clinical examination, and venous disease assessed by visual inspection and duplex ultrasound. QOL was measured with the Medical Outcomes Study 36-Item Short Form (SF-36) with the resulting physical component (PCS) and mental component scores (MCS) being used in the analysis. Using ANCOVA methods to control for age, gender, and ethnicity, changes in venous disease were compared against QOL stratified...
into tertiles. Then, linear regression models were used to examine the longitudinal association of venous disease at baseline and change in QOL score at follow-up after controlling for covariates.

**Results:** In the study population of 1103 individuals, 78 had regression, 340 had progression, and 685 were stable. The average age was 58.7 years (SD 10.4); 33% were male, 61% were non-Hispanic White, 15% were Hispanic, 12% were African American, and 12% were Asian. Mean BMI was 27.1 (SD 5.3), 45.4% had hypertension, 9.9% were diabetic, 3.6% were current smokers, and 34.8% were on medication for hyperlipidemia. Progression of venous disease was significantly associated with change in PCS after controlling for age, gender, and ethnicity ($\beta=-0.075; p=.04$). The association was only slightly attenuated ($\beta=-.065, p=.08$) after adjustment for BMI, high blood pressure, injury to either leg, smoking history, previous vein procedure, previous hernia surgery, flat feet, marital status, education level, occupation, cardiovascular-related morbidity, diabetes, and heaviness in either leg. No association was found with MCS before or after multiple covariate adjustment.

**Conclusions:** This study confirms that individuals with progression of chronic venous disease have a greater decrease in QOL as identified by the physical component score of SF-36. Prevention of chronic venous disease progression may help retain QOL.

Disclosures: **A.M. Schlang:** None. **J. Wallace:** None. **J. Denenberg:** None. **M. Criqui:** None. **M. Allison:** None.

Funding: No

Funding Component:

**MP078**

**Are Patients With Less Activation at Greater Risk of Declines in Health-related Quality of Life After Hospitalization for an Acute Coronary Syndrome?**

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**Background:** Patient activation comprises the knowledge, skills, and confidence for self-care, and may lead to better health outcomes.

**Hypothesis:** We hypothesized that less-activated survivors of a hospitalization for an acute coronary syndrome (ACS) would be more likely to experience declines in health-related quality of life than more activated patients.

**Methods:** We studied patients from 6 medical centers in central Massachusetts and Georgia who had been hospitalized for an ACS between 2011 and 2013. At 1 month after hospital discharge, patients completed the 6-item Patient Activation Measure and at 1, 3, and 6 months after discharge generic physical (SF-36 PCS), generic mental (SF-36 MCS), and disease-specific (SAQ - Seattle Angina Questionnaire) health-related quality of life (QOL) scales. Four categories of 1-month activation levels were defined. Multinomial logistic regression estimated odds ratios were calculated for clinically meaningful changes in QOL, with patients in the highest level of activation serving as the referent group, adjusting for sociodemographic and clinical confounders.

**Results:** Patients (n=1,042) were on average 62 years old, 34% were female, and 87% were non-Hispanic white; 10% and 29% of patients were in the lowest and highest levels of activation, respectively. Higher proportions of patients in the least activated group vs. the most activated group tended to experience clinically meaningful declines in QOL, with patients in the highest level of activation serving as the referent group, adjusting for sociodemographic and clinical confounders.

**Conclusions:** Following hospitalization for an ACS, patients with low activation may be more likely to have declines in mental and disease-specific health-
related QOL than highly activated patients, identifying a group at high risk of poor outcomes.


Funding: No

Funding Component:

MP079

Excess Weight, Cardiovascular Events, and Healthy Longevity: The Lifetime Risk Pooling Project

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Background: Compared with normal BMI, overweight status (body-mass index [BMI] 25.0-29.9 kg/m²) appears to be associated with greater longevity, but it is unclear to what extent this comes at the expense of greater burden of cardiovascular disease (CVD) and years lived with CVD. Methods: We pooled individual-level data from 10 prospective cohorts and included adults free from CVD, stratified by index age (20-39, 40-59, and 60-79 years). We used: (1) modified Kaplan-Meier analysis to estimate lifetime risks for CVD events and non-cardiovascular death; (2) Irwin’s restricted mean to estimate years lived free from and with CVD; and (3) adjusted competing Cox models to estimate joint cumulative risks for CVD or non-cardiovascular death. Results: The mean (SD) baseline BMI in middle-age (ages 40-59 years) was 27.4 (4.1) kg/m² for men and 27.1 (6.0) kg/m² for women. Through 72,490 person-years of follow-up, 13,457 CVD events (coronary heart disease, stroke, and heart failure; including 6,309 CVD deaths) and 11,782 non-CVD deaths occurred in middle-aged participants. Compared with normal BMI, lifetime risks for CVD were higher in overweight and obese adults. Average years lived free from CVD were longest for normal BMI individuals, whereas years lived with CVD were longer for overweight and obese (FIGURE). Compared with middle-aged men and women, respectively, with normal BMI, competing hazards ratios (95% CI) for incident CVD were 1.21 (1.14-1.28) and 1.32 (1.24-1.40) for BMI 25.0-29.9; 1.67 (1.55-1.79) and 1.85 (1.72-1.99) for BMI 30-39.9; and 3.14 (2.48-3.97) and 2.53 (2.20-2.91) for BMI 40.0 and greater. Similar patterns were observed in younger and older adults. Conclusions: Compared with normal BMI, both overweight and obesity are associated with similar or shorter total longevity and more years of life lived with CVD. These data suggest that the “obesity/overweight paradox” present after the diagnosis of CVD occurs because of earlier onset of CVD.


Funding: No

Funding Component:

MP080
Contributions of Social, Behavioral, and Biological Factors to Racial Disparities in Incident Obesity: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Background: A combination of social, behavioral, and biological factors are hypothesized to account in large part for racial disparities in obesity, but few studies have shown this empirically. Thus, the goal of this study was to determine the extent to which these factors accounted for racial differences in the development of obesity in men and women over a 30-year period (mean follow-up 21.7 years). Methods: This study includes the 1,617 Black (743 men and 874 women) and 1,950 White (928 men and 1,022 women) CARDIA participants with complete data on all baseline covariates who were not obese at baseline (1985-1986; ages 18-30). A series of gender-stratified Cox proportional hazards models were run adjusting separately for socioeconomic, psychosocial, neighborhood, lifestyle, and physiological factors to determine the extent to which they explained race differences in incident obesity. Results: Among men, 36.9% of Whites and 43.7% of Blacks became obese over follow-up. In women, 33.7% of Whites and 60.3% of Blacks became obese. After adjusting for age and baseline BMI, Black men were 1.39 (95% confidence interval (CI): 1.19, 1.62) times more likely to become obese than White men (Table). Covariate adjustment reduced race differences by 34%; neighborhood factors were the strongest contributors. Black women were 1.63 (95% CI: 1.42, 1.88) times more likely to become obese than White women in the base model. This association was reduced by 57% in fully adjusted models. Lifestyle factors explained the largest proportion of the race difference, followed by individual-level socioeconomic factors and neighborhood conditions. Conclusions: Racial disparities in incident obesity, and the extent to which these disparities were explained by baseline covariates, differ for men and women. Whereas substantial attenuation occurred after adjustment for a wide variety of baseline covariates, race differences in obesity incidence remained significant.


Funding: No

Funding Component:

MP081

Short-long-short Sequence of RR Intervals is Associated With Increased Risk of Sudden Cardiac Death: the Atherosclerosis Risk in Community Study

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Introduction: A Short-long-short sequence of RR’ intervals frequently precedes ventricular tachyarrhythmia. However, an association of RR’ alternans with sudden cardiac death (SCD) in the general population has not been previously studied.

Hypothesis: We hypothesized that RR’ alternans is associated with SCD. Methods: We analyzed baseline visit 10-second ECG in 14,250 participants of the Atherosclerosis Risk in Communities (ARIC) cohort (mean age 54.1±5.87y; 45% men; 74% white). Only normal sinus beats were included in the semi-automated analysis. Digital 12-lead ECG was transformed into orthogonal ECG, from which respiratory signal was derived. Joint symbolic analysis was used to assess increase or decrease in successive RR’ intervals and R-instant respiratory phases calculated using the Hilbert transform. Short-long-short or long-short-long RR’ sequence was defined as RR’ alternans. RR’ alternans occurring during respiratory phase transitions were not considered. SCD, non-SCD, and non-cardiac death served as competing outcomes. Three competing risks models were constructed.

Model 1 was adjusted for age, sex, race, and study center. Model 2 was in addition adjusted for prevalent CVD. Model 3 was further adjusted for subclinical CVD, its risk factors, including traditional ECG predictors, and medications affecting SA or AV nodes. Results: Over median follow-up of 24.4 years, there were 497 SCDs (incidence 1.66 [95%CI 1.52-1.82], 742 non-sudden cardiac deaths (incidence 2.48 [95%CI 2.31-2.67], and 3,753 non-cardiac deaths (incidence 12.6 [95%CI 12.1-13.0]) per 1,000 person-years. RR alternans was present in 1,679 (11.8%) participants. In competing risks analysis (Table) the presence of RR’ alternans, excluding those occurring due to respiratory phase changes, was independently associated with increased risk of SCD.

Conclusion: In competing risks analysis the presence of RR’ alternans that are not due to respiratory phase transition is associated with SCD. Further study of RR’ alternans is warranted.


Funding: No

Funding Component:

MP082

Sex Hormone Levels and Change in Left Ventricular Structure Among Men and Women With Preserved Ejection Fraction The Multi Ethnic Study of Atherosclerosis

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Guallar, Johns Hopkins Bloomberg Sch of Public Health, Baltimore, MD; Chike C Nwabuo, Mount Auburn Hosp, Harvard Medical Sch, Cambridge, MA; Matthew A Allison, Univ of California San Diego, La Jolla, CA; Susan R Heckbert, Univ of Washington, Seattle, WA; Wendy S Post, Erin D Michos, Johns Hopkins Sch of Med, Baltimore, MD

**Background:** Heart failure with preserved ejection fraction (HFpEF) is more common in older women than men. Differences in sex hormone (SH) levels may contribute to sex differences in HFpEF risk. Left ventricular (LV) hypertrophy and concentric remodeling [increased Mass (M): Volume (V) ratio] are risk markers of HFpEF. In a multi-ethnic cohort of men and women with preserved EF, we examined whether SH levels were associated with LV structure. We hypothesized that a more androgenic pattern would predict adverse concentric remodeling in women but not men.

**Methods:** We studied 4279 MESA participants (49% women) aged 45-84 yrs with serum SH levels and cardiac MRI performed at baseline (2000-2002) and baseline EF ≥50%. Among these, 2957 participants underwent MRI at Exam 5 (2010-2012). Stratified by sex, we used linear regression for cross-sectional analyses and mixed model effect methods for longitudinal analyses to test the associations of SH and binding globulin (SHBG) levels [per 1 SD greater log(SH)] with baseline levels and changes in LV mass (LVM), end diastolic volume (LVEDV) and M:V ratio. Models were adjusted for age, ethnicity, center, height, weight, education, physical activity and smoking, and for hormone use and menopause in women.

**Results:** The mean (SD) age was 64 (9) for women and 62 (10) yrs for men. Cross-sectionally, among women, higher Testosterone (T) and Dehydroepiandrosterone (DHEA) levels were associated with greater LVM (Table). Among both men and women, higher free T and lower SHBG were associated with lower LVEDV and greater M:V ratio. In men, greater estradiol levels were associated with lower LVEDV and greater M:V ratio. After a mean followup of 10 yrs, higher free T and lower SHBG were associated with an increase in LVM in both sexes. Findings were generally consistent after adjustment for possible mediators of these associations such as blood pressure and other CV risk factors. **Conclusion:** A more androgenic profile of higher free T and lower SHBG is associated with greater increase in LVM over 10 yrs in both men and women.


**Funding:** Yes

**Funding Component:** Mid-Atlantic Affiliate (Maryland, North Carolina, South Carolina, Virginia & Washington, DC)

**MP083**

**Autonomic Imbalance at the Level of Atrioventricular Node, but Not at the Level of Sinus Node, is Associated With Sudden Cardiac Death: The Atherosclerosis Risk in Community Study**

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Winston, NC; David S. Siscovick, The New York Acad of Med, New York City, NY; Alfred Buxton, Mark E. Josephson, Beth Israel Deaconess Medical Ctr, Boston, MA; Larisa Tereshchenko, Oregon Health and Science Univ, Portland, OR

Introduction: Autonomic imbalance, quantified by decreased heart rate variability (HRV), is associated with increased cardiovascular mortality. It is unknown if autonomic influences on sinus and atrioventricular (AV) nodes are equally important for the risk of sudden cardiac death (SCD). Hypothesis: Autonomic influences on sinus and AV node are equally strongly associated with increased SCD, non-sudden cardiac death (non-SCD), and non-cardiac death. Methods: Baseline visit 10-second ECGs (n=14,250) of the Atherosclerosis Risk in Communities (ARIC) cohort were analyzed. Normalized variance of P-onset to P-onset intervals (PPVN) and QRS-onset to QRS-onset intervals (QQVN) was calculated to assess autonomic influence on sinus and AV node respectively. Normalized variance of Rpeak-Rpeak intervals was determined as HRV measure. Values were log-transformed to normalize distribution. SCD served as primary outcome. Secondary outcomes were non-SCD and non-cardiac death. Three Cox regression models were constructed for dichotomized at 20th percentile predictor variables. Results: Over median follow-up of 24.4 years, there were 497 SCDs (incidence 1.66 [95%CI 1.52-1.82], 742 non-SCDs (incidence 2.48 [95%CI 2.31-2.67], and 3,753 non-cardiac deaths (incidence 12.6 [95%CI 12.1-13.0]) per 1,000 person-years. In paired analysis, LogPPVN was significantly larger than LogQQVN (-7.28±1.06 vs. -7.72±1.24; P<0.0001). There was no difference between LogQQVN and LogRRVN (-7.72±1.24 vs -7.72±1.23; P=0.364). After full adjustment, LogRRVN and LogQQVN were significantly associated with non-SCD and SCD. Association with non-SCD was stronger. LogPPVN was independently associated with non-SCD but not SCD. No value was associated with non-cardiac death. Conclusion: Autonomic imbalance at the AV node, with likely summary effect at the bundle of His, is associated with SCD and non-SCD. Autonomic imbalance at the SA node is associated with non-SCD only. Autonomic input to SA and AV node should be further studied.


Funding: No

Funding Component: MP084

Associations of Left Ventricular Structure and Function in Early Adulthood With Incident Adverse Geometry and Systolic Dysfunction in Middle Age: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

Amanda M Perak, Laura A Colangelo, Northwestern Univ, Chicago, IL; Anderson C Armstrong, Univ of Sao Francisco Valley and Johns Hopkins Univ, Petrolina, Brazil; Samuel S Gidding, Alfred I. Dupont Hosp for Children, Wilmington, DE; Cora E Lewis, Univ of Alabama at Birmingham, Birmingham, AL; Joao Lima, Johns Hopkins Univ, Baltimore, MD; Kiang J Liu, Northwestern Univ, Chicago, IL; Jared P Reis, Natl Heart, Lung, and Blood Inst, Bethesda, MD; Pamela J Schreiner, Univ of Minnesota, Minneapolis, MN; Stephen Sidney, Kaiser Permanente, Oakland, CA; Donald M Lloyd-Jones, Northwestern Univ, Chicago, IL
**Introduction**: Cardiac remodeling occurs across the lifespan and predicts clinical outcomes. We hypothesized that inter-individual variability in left ventricular (LV) structure and function parameters in early adulthood would be independently associated with incident adverse LV geometry and ejection fraction (EF) <50% in middle age.

**Methods**: We included CARDIA participants with echocardiograms at study years (Y) 5, 25, and 30. Geometry and EF analyses included only participants free of the outcome at Y5 (i.e., normal geometry or EF≥50%, respectively). We assessed associations of indexed Y5 LV parameters, including end-systolic (ESD/ht) and -diastolic (EDD/ht) dimensions, mass (M/ht^{2.7}), septal and posterior wall thicknesses, and EF, with incident Y30 adverse geometry (defined as LV concentric remodeling [CR], concentric hypertrophy [cLVH], or eccentric hypertrophy [eLVH]) and EF <50%. We used multivariate polytomous (for geometry) or dichotomous (for EF) logistic regression, adjusting for demographics, heart rate, and cumulative (Y5-Y25) clinical risk factor burden.

**Results**: Participants (N=2335) were 56% female, 44% black, and ages 23 to 35 and 48 to 60 in Y5 and Y30, respectively. With increasing age across the 3 study echocardiograms (Y5, Y25, and Y30), unadjusted mean LV M/ht^{2.7} and EDD/ht generally increased, while ESD/ht and EF changed minimally. Y5 LV ESD/ht and M/ht^{2.7} were most consistently associated with the odds for incident abnormalities in Y30 LV geometry and EF (Table). For example, Y5 LV ESD/ht and M/ht^{2.7} were each associated with incident eLVH by Y30 (OR 1.48 [1.25-1.74] and 1.55 [1.28-1.88] per 1 SD increment, respectively). Y5 ESD/ht was also associated with EF <50% by Y30 (OR 1.84 [1.46-2.31]).

**Conclusions**: In young adults with categorically normal LV geometry and systolic function, inter-individual variation in LV parameters is associated with incident concentric remodeling, hypertrophy, and EF <50% over 25 years, independent of demographics and cumulative clinical risk factor burden.


**Funding**: No

**Funding Component**: MP084

**Associations of Left Ventricular Structure and Function in Early Adulthood With Incident Adverse Geometry and Systolic Dysfunction in Middle Age: the Coronary Artery Risk Development in Young Adults (CARDIA) Study**

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and 30. Geometry and EF analyses included only participants free of the outcome at Y5 (i.e., normal geometry or EF ≥50%, respectively). We assessed associations of indexed Y5 LV parameters, including end-systolic (ESD/ht) and -diastolic (EDD/ht) dimensions, mass (M/ht^{2.7}), septal and posterior wall thicknesses, and EF, with incident Y30 adverse geometry (defined as LV concentric remodeling [CR], concentric hypertrophy [cLVH], or eccentric hypertrophy [eLVH]) and EF <50%. We used multivariate polytomous (for geometry) or dichotomous (for EF) logistic regression, adjusting for demographics, heart rate, and cumulative (Y5-Y25) clinical risk factor burden.

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Conclusions: In young adults with categorically normal LV geometry and systolic function, interindividual variation in LV parameters is associated with incident concentric remodeling, hypertrophy, and EF <50% over 25 years, independent of demographics and cumulative clinical risk factor burden.


Funding: No

Funding Component:

MP084

Associations of Left Ventricular Structure and Function in Early Adulthood With Incident Adverse Geometry and Systolic Dysfunction in Middle Age: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Introduction: Cardiac remodeling occurs across the lifespan and predicts clinical outcomes. We hypothesized that inter-individual variability in left ventricular (LV) structure and function parameters in early adulthood would be independently associated with incident adverse LV geometry and ejection fraction (EF) <50% in middle age.

Methods: We included CARDIA participants with echocardiograms at study years (Y) 5, 25, and 30. Geometry and EF analyses included only participants free of the outcome at Y5 (i.e., normal geometry or EF ≥50%, respectively). We assessed associations of indexed Y5 LV parameters, including end-systolic (ESD/ht) and -diastolic (EDD/ht) dimensions, mass (M/ht^{2.7}), septal and posterior wall thicknesses, and EF, with incident Y30 adverse geometry (defined as
LV concentric remodeling [CR], concentric hypertrophy [cLVH], or eccentric hypertrophy [eLVH]) and EF <50%. We used multivariate polytomous (for geometry) or dichotomous (for EF) logistic regression, adjusting for demographics, heart rate, and cumulative (Y5-Y25) clinical risk factor burden.

**Results:** Participants (N=2335) were 56% female, 44% black, and ages 23 to 35 and 48 to 60 in Y5 and Y30, respectively. With increasing age across the 3 study echocardiograms (Y5, Y25, and Y30), unadjusted mean LV M/ht$^{2.7}$ and EDD/ht generally increased, while ESD/ht and EF changed minimally. Y5 LV ESD/ht and M/ht$^{2.7}$ were most consistently associated with the odds for incident abnormalities in Y30 LV geometry and EF (Table). For example, Y5 LV ESD/ht and M/ht$^{2.7}$ were each associated with incident eLVH by Y30 (OR 1.48 [1.25-1.74] and 1.55 [1.28-1.88] per 1 SD increment, respectively). Y5 ESD/ht was also associated with EF <50% by Y30 (OR 1.84 [1.46-2.31]).

**Conclusions:** In young adults with categorically normal LV geometry and systolic function, inter-individual variation in LV parameters is associated with incident eccentric remodeling, hypertrophy, and EF <50% over 25 years, independent of demographics and cumulative clinical risk factor burden.

**Introduction:** Cardiac remodeling occurs across the lifespan and predicts clinical outcomes. We hypothesized that inter-individual variability in LV structure and function parameters in early adulthood would be independently associated with incident adverse LV geometry and ejection fraction (EF) <50% in middle age.

**Methods:** We included CARDIA participants with echocardiograms at study years (Y) 5, 25, and 30. Geometry and EF analyses included only participants free of the outcome at Y5 (i.e., normal geometry or EF≥50%, respectively). We assessed associations of indexed Y5 LV parameters, including end-systolic (ESD/ht) and -diastolic (EDD/ht) dimensions, mass (M/ht$^{2.7}$), septal and posterior wall thicknesses, and EF, with incident Y30 adverse geometry (defined as LV concentric remodeling [CR], concentric hypertrophy [cLVH], or eccentric hypertrophy [eLVH]) and EF <50%. We used multivariate polytomous (for geometry) or dichotomous (for EF) logistic regression, adjusting for demographics, heart rate, and cumulative (Y5-Y25) clinical risk factor burden.

**Results:** Participants (N=2335) were 56% female, 44% black, and ages 23 to 35 and 48 to 60 in Y5 and Y30, respectively.
60 in Y5 and Y30, respectively. With increasing age across the 3 study echocardiograms (Y5, Y25, and Y30), unadjusted mean LV M/ht\(^2\) and EDD/ht generally increased, while ESD/ht and EF changed minimally. Y5 LV ESD/ht and M/ht\(^2\) were most consistently associated with the odds for incident abnormalities in Y30 LV geometry and EF (Table). For example, Y5 LV ESD/ht and M/ht\(^2\) were each associated with incident eLVH by Y30 (OR 1.48 [1.25-1.74] and 1.55 [1.28-1.88] per 1 SD increment, respectively). Y5 ESD/ht was also associated with EF <50% by Y30 (OR 1.84 [1.46-2.31]).

Conclusions: In young adults with categorically normal LV geometry and systolic function, inter-individual variation in LV parameters is associated with incident concentric remodeling, hypertrophy, and EF <50% over 25 years, independent of demographics and cumulative clinical risk factor burden.


Funding: No

Funding Component:

MP085

Cognitive Impairment Mediates the Impact of Short Sleep Duration on Mortality in Individuals with Cardiovascular or Cerebrovascular Disease

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Background: Cardiovascular disease (CVD) and cerebrovascular disease (CBV) have been associated with short sleep duration and mortality. Furthermore, short sleep duration has been associated with impaired cognition. Most studies have been limited by using self-report measures and treating sleep duration as a sole, independent predictor, thus, its role in predicting mortality is still not well-established.

Hypothesis: We hypothesized that 1) short sleep duration increases the impact of CVD and CBV on mortality and 2) cognitive impairment mediates the association of short sleep duration with mortality in those with CVD or CBV.

Methods: We addressed this question in the Penn State Adult Cohort, a random, general population sample of 1,741 men and women (48.7 ± 13.5 years) who were studied in the sleep laboratory and followed-up for 16.7 ± 4.6 years. CVD was defined by a history of heart disease, including hypertension or diabetes, and CBV by a history of stroke. Polysomnographic (PSG) total sleep time was classified as normal (≥ 6 hours) and short (< 6 hours) sleep duration based on the median of the cohort. All individuals underwent a comprehensive neuropsychological evaluation, including Symbol Digit Modalities Test, Trail Making Test, Benton Visual Retention Test, Thurstone Word Fluency Test, and Mini-Mental State Examination. We tested the interaction between CVD, CBV and PSG sleep duration on mortality using Cox proportional hazard models controlling for multiple potential confounders.

Results: The hazard ratios (95%CI) of mortality associated with CVD and CBV were 0.9 (0.6-1.3) and 1.3 (0.5-3.1) for individuals with normal sleep duration and 1.8 (1.3-2.5) and 2.4 (1.3-4.4) for individuals with short sleep duration (P-interaction < .05). In individuals with CVD or CBV, short sleep duration was associated with impaired processing speed, executive attention, and short-term memory (all Ps < .05). Cognitive impairment significantly mediated the impact of short sleep duration on mortality in those with CVD or CBV [proportion of mediation effects were 6.5% (1.4%-18.6%), 4.5% (0.4%-14.2%), and 6.2% (1.0%-18.4%) for processing speed,
executive attention and short-term memory, respectively]. **Conclusions:** The risk of mortality associated with CVD and CBV is significantly increased in those with short sleep duration. Although cognitive impairment significantly mediated this association, its modest effect suggests that future studies should examine other underlying mechanisms linking short sleep duration with mortality in individuals with CVD or CBV.

Disclosures: **J. Fernandez-Mendoza:** None. **F. He:** None. **A.N. Vgontzas:** None. **D. Liao:** None. **E.O. Bixler:** None.

Funding: Yes

Funding Component: National Center

**MP086**

**Cross-sectional and Longitudinal Predictors of Poor Sleep Among Adolescent Girls and Young Adult Women**

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Sleep is important for the psychosocial and physical health of adolescents and young adults. Predictors of poor sleep include family demographics and living situation, neighborhood factors, psychosocial health and health behaviors. Previous studies have examined these associations across the range of adolescence, without considering how they may differ across adolescent stages or into young adulthood. We examined the cross-sectional and longitudinal predictors of poor sleep among a cohort of 474 girls at 3 distinct ages: 14, 17, and 22 years. We used the item “during the past week my sleep was restless” to define sleep quality. Responses were categorized as poor sleep “no” (restless sleep “rarely or none of the time” or “some or a little of the time”) or “yes” (restless sleep “a lot of the time” or most or all of the time”). Independent variables were chosen from previous research examining demographic, psychosocial, and behavioral predictors of sleep quality among adolescents; race/ethnicity, family structure, socioeconomic status, neighborhood crime, depressive symptoms (excluding the sleep item) (all assessed from self-report), and physical activity and sedentary time (assessed from accelerometers). About 46% of the cohort was white, 25% Black, and 20% Hispanic. At each age, about 25% reported poor sleep, with 50% reporting no restless sleep at any time and 4.2% reporting restless sleep at all 3 time points. Cross-sectional correlates are displayed in the Table. Fully-adjusted longitudinal predictors of restless sleep were higher depression scores (OR: 1.10, 95% CI: 1.08, 1.11) and fewer sedentary minutes (OR: 0.99, 95% CI: 0.99, 0.99). Results demonstrate that sleep problems are prevalent across adolescence and persist into early adulthood. While correlates change over time, depressive symptoms and sedentary time are consistently predictive of sleep quality. Interventions that focus on improving mental health and increasing physical activity may also benefit sleep quality among adolescents and young adults.

Disclosures: **D.R. Young:** None. **W. Troxel:** None. **M.A. Sidell:** None. **M.A. Grandner:** None. **Y.D. Mohan:** None.

Funding: No

Funding Component:

**MP087**
Sleep Quality is Associated with Subclinical Cardiovascular Disease in Mid-Life Mexican Women

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Introduction: Sleep quantity has been associated with higher risk of cardiovascular disease (CVD), however little is known about the impact of sleep quality on subclinical CVD.

Hypothesis: Poor sleep quality is associated with subclinical CVD.

Methods: We assessed the relationship between sleep quality and common carotid artery intima media thickness (IMT) through a cross-sectional analysis of a sub sample of 442 disease-free women from the Mexican Teacher’s Cohort. Sleep quality was evaluated through the Pittsburgh Sleep Quality Index (PSQI) in an online questionnaire applied to participants in 2014-2016. We defined poor sleep quality as a PSQI score above 5. Right and left carotid IMT was measured at clinical visits in 2012, 2013 and 2016 through carotid ultrasound performed by trained neurologists; results were log-transformed. Subclinical CVD was defined as the mean of right and left IMT ≥0.8mm or the presence of an atherosclerotic plaque. Multivariable linear and logistic regression models were used to evaluate the association of sleep quality with IMT or subclinical CVD, respectively.

Results: In women of 49±5 years, the prevalence of poor sleep quality was 41% (185 of 442) and of subclinical CVD was 12.2% (54 of 442). The multivariable-adjusted percent difference of IMT was 2.4% (95% CI 0.03, 4.9), greater amongst those with poor sleep versus adequate sleep quality. The odds of developing subclinical CVD in women with poor sleep quality were 2.2 (95% CI 1.2, 4.1) times greater than those with adequate sleep quality (figure). Additionally, further adjustments for stress and depressive symptoms attenuated the results and were no longer statistically significant. Conclusion: Poor sleep quality is associated with IMT and subclinical CVD in a population of middle-aged women and this association is potentially mediated by stress and depression. Further analysis is needed regarding this association.


Funding: No

Funding Component:

MP088

Relationship Between Daytime Sleepiness and Poor Physical Performance in Middle-aged Adults of the Bogalusa Heart Study

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Background: Studies conducted in elderly and frail adult populations, especially those with heart failure, have shown a consistent relationship between poor sleep and poor physical performance. Likewise, a similar association between poor sleep and lower performance has been found in extremely fit, elite athletes. However, this relationship has not been examined in healthy, middle-aged adult populations. Here, we test the cross-sectional association of daytime sleepiness with poor physical performance in our large, bi-racial cardiovascular cohort.

Methods: From 2013-2016, 1,223 adults from the Bogalusa Heart Study attended follow-up visits to assess physical and cognitive performance and answer questionnaires pertaining to sleep habits. The Epworth Sleepiness Scale (ESS) was used to measure daytime sleepiness on an ordinal scale from 0-24. Short Physical Performance Battery (SPPB), which consists of chair stands, balance testing, and walk speed, was the outcome measure, with a score of <10 out of 12 being considered poor physical performance. Multivariable logistic regression, adjusted for age, race, sex, sleep duration, employment status, BMI, and symptoms of sleep apnea was used to test the association between ESS [both continuously and dichotomized to abnormal (ESS>10) vs. normal (ESS≤10)] and poor physical performance.

Results: Our study population had a mean(SD) age of 48.1(5.2) and was 58.6% female and 34.7% black. Mean(SD) ESS was 6.3(4.7). 252 (20.6%) adults exhibited poor physical performance. After covariate adjustment, ESS was significantly associated with an increased risk of poor physical performance (Odds Ratio per 1 SD increase=1.17; 95% Confidence Interval=1.01-1.35; p=0.03). As a dichotomous exposure, an abnormal ESS resulted in a 53% increased risk of poor physical performance (OR=1.53; 95% CI=1.05-2.23; p=0.03).

Conclusions: Even among relatively healthy middle-aged adults, daytime sleepiness appears to be associated with poor physical performance.


Funding: No

Funding Component:

MP089

Sleep Apnea is Reduced Following a Behavioral Weight Loss Intervention but Impedes Weight Loss Outcomes

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Introduction: Several trials have documented that behavioral weight loss interventions reduce obstructive sleep apnea (OSA) severity. However, despite the known bidirectional association between body weight and OSA severity, few studies have addressed whether the presence of OSA impedes weight loss outcomes in a lifestyle intervention.

Hypothesis: We hypothesized that a behavioral weight loss intervention would significantly reduce OSA severity, but that the presence of OSA would lead to poorer weight loss outcomes. Methods: Overweight and obese adults (N = 101; 50.6 ± 10.3 y, body mass index: 34.1 ± 4.6; 91.1% female, 80.2% white) who participated in a 12-mo behavioral weight loss intervention study and had OSA assessed were included in these secondary analyses. Participants wore a limited-channel home sleep testing device (ResMed ApneaLink Plus) for one night at baseline, 6 and 12 mo. Measures of OSA severity included the apnea-hypopnea index (AHI), oxygen desaturation index (ODI), and snoring index (i.e., number of snoring events divided by flow recording time). Weight change at 6 and 12 mo was expressed as percentage change from baseline. Linear mixed models were used to evaluate the effect of the intervention on OSA measures, and ANCOVA models examined the effect of weight change on OSA and the effect of OSA on subsequent weight loss. All analyses were adjusted for age, sex, and race.

Results: Baseline AHI, ODI, and snoring index were 6.6 ± 7.1, 8.7 ± 8.3, and 109.9 ± 122.0, respectively; 50.5% of the sample had a baseline AHI ≥ 5. AHI and ODI, but not the snoring index, were significantly reduced by the end of the intervention (12-mo changes: -1.3 [P < .05], -2.3 [P < .01], -2.8 [P = .82], respectively). Weight loss at 6 and 12 mo were 9.0 ± 6.0% and 9.1 ± 8.3%, respectively. Participants with ≥ 5% weight loss at 6 mo had significant reductions in AHI (P = .02), ODI (P < .05), and the snoring index (P < .001) at 6 mo; adults with ≥ 5% weight loss at 12 mo had a significant reduction in the snoring index at 12 mo (P < .01), but not AHI (P = .29) or ODI (P = .39), relative to baseline. Participants with a baseline AHI ≥ 5 lost significantly less weight at 6 mo compared to those without OSA at baseline (-8.4% vs. -11.4%; P < .01), and those with an AHI ≥ 5 at 6 mo lost significantly less weight at 12 mo compared to those without OSA at 6 mo (-7.1% vs. -10.9%; P = .04). Conclusion: Behavioral weight loss interventions in overweight and obese adults lead to significant improvement in OSA severity. However, the presence of at least mild OSA is associated with less favorable weight loss in this population. Future work should explore the mechanisms underlying the blunted weight loss in overweight and obese adults with OSA.


Funding: No
and/or obesity or changes in body mass index prospectively. Relative risks (RR), regression coefficients (beta) and 95% C.I. were extracted and pooled using a random effect model. Sensitivity analyses and meta-regressions were performed, heterogeneity and publication bias were also assessed. Results. Overall, 41 studies provided 56 independent cohort samples, including 98,130 boys and girls aged 0-18 years (follow-up 1 to 27 years). Sleep duration was assessed by questionnaire, either to parents or to children, actigraphy or polysomnography. Body mass index (BMI) was measured in all participants. In the pooled analyses, short duration of sleep was associated with a greater risk of becoming overweight or obese (RR: 1.57; 95% CI 1.34, 1.85; p<10^{-5}; n=59,471). There was significant heterogeneity (I^2=92%, p<0.001), accounted for by three studies (I^2=3% after their removal) and evidence of publication bias (p=0.007). The effect size increased with age (infants 1.40 [1.19, 1.65]; early childhood 1.53 [1.33, 1.76]; middle childhood 2.23 [2.18, 2.27]; adolescence 1.30 [1.11, 1.53]; p for heterogeneity <10^{-5}). The effect was not associated with average length of follow-up (p=0.923) or quality (p=0.475). BMI decreased for every hour of increased sleep (pooled beta: -0.01; -0.03, 0.00 kg/m^2 per h, p=0.032; n=16,225). Conclusion. Short duration of sleep is a significant predictor of the development of overweight, obesity and weight gain from birth to adolescence.


Funding: No

Funding Component: MP091

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Background: Peripartum cardiomyopathy (PPCM) is a rare condition that carries a high morbidity and mortality among young women. Studies examining the association of modifiable risk factors such as hypertension with outcomes in this population are sparse. Methods: We conducted a multi-center retrospective study across three major centers (BWH, BIDMC, MGH) to identify subjects with PPCM using the following criteria: ejection fraction < 40%, development of heart failure within the last month of pregnancy or within 5 months of delivery and no other identifiable cause of heart failure with reduced ejection fraction. We defined adverse clinical outcome as a composite of heart failure hospitalizations, need for extra-corporeal membrane oxygenation, ejection fraction <35%, cardiac transplantation or death during the follow-up period.

Results: In all, 237 women met criteria for PPCM across the three centers between April 1995 and November 2015. Participants had a median age of 33.1 years (IQR: 28.6-38.0), gravida 2.0, para 2.0, mean left ventricular ejection fraction at diagnosis of 30%; 25% had chronic hypertension and 14% had preeclampsia. After a median follow-up of 3.2 years (IQR: 1.0-7.8), 59 events occurred. In a logistic regression model adjusting for age, number of prior pregnancies and number of deliveries, women with preeclampsia had an OR of 1.34 (95% CI: 1.05-1.72), p=0.02 as compared to those without preeclampsia. A similar association was

Hypertension is Associated With Increased Risk of Adverse Clinical Outcomes in Women With Peripartum Cardiomyopathy
observed for hypertension (Table). In sensitivity analysis, the association between preeclampsia and adverse outcomes persisted for blacks and other races, but not for whites. **Conclusion:** Our study suggests that hypertension or preeclampsia at diagnosis is associated with increased risk of heart failure hospitalizations, need for extra-corporeal membrane oxygenation, poor left ventricular function recovery, cardiac transplantation and death on follow-up in women with PPCM. Clinicians should consider aggressive treatment of hypertension in women of childbearing age.

**Table 1. Odds ratios (95% CI) of adverse clinical outcomes according to hemorrhagic or preeclampsia at diagnosis in women with preeclampsia.**

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>1.2 (0.94-1.56)</td>
</tr>
<tr>
<td>Cardiac transplantation</td>
<td>1.8 (1.01-3.30)</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>1.5 (1.01-2.40)</td>
</tr>
</tbody>
</table>

Disclosures: **T.F. Imran:** None. **D. Mohebali:** None. **D. Lopez:** None. **N. Bello:** None. **S. Truong:** None. **E. Defilippis:** None. **L. Gilstrap:** None. **M. Semigran:** None. **J. Gaziano:** None. **L. Djo usse:** None. **R. Kociol:** None.

**Funding:** No

**Funding Component:** MP092

**Ultrasound Measures of Abdominal Fat Predict Gestational Insulin Resistance**

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**Introduction:** Gestational diabetes mellitus (GDM) is a serious condition affecting approximately 10% of pregnancies. Obesity, and particularly abdominal obesity, is strongly associated with insulin resistance, the hallmark characteristic of diabetes. The current standard-of-care is the use of an oral glucose test to diagnose GDM at approximately 25 weeks gestation. After diagnosis, a lifestyle intervention is prescribed. If abdominal fat can be measured during routine prenatal ultrasounds, then it may provide an option for early identification of women at high risk for GDM and, in turn, earlier intervention.

**Hypothesis:** This pilot study tested the hypothesis that deep abdominal fat depots are predictive of gestational insulin sensitivity, regardless of overall body fat.

**Methods:** In 31 nulliparous pregnant women (age 27±4.5, BMI 27±7.8, 71% non-hispanic white), abdominal fat was measured at 18-20 weeks gestation via ultrasound. Two measurements were collected 1 inch above the umbilicus (deep intra-abdominal (IAAT) and subcutaneous (SAT1)); two were immediately below the xiphoid process (pre-peritoneal (PPAT) and subcutaneous (SAT2)). Overall body composition was calculated via 4-compartment model from body density via air displacement plethysmography (BodPod) and body water via bioelectrical impedance (InBody 720) measured at 18-20 weeks gestation, along with post-partum bone density via DXA. Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) was computed using fasting glucose and insulin at 24-28 weeks gestation. Gestational weight gain (GWG) was monitored by medical records. After testing variables for normality, HOMA-IR was log-transformed for partial correlation and multiple regression analyses.

**Results:** HOMA-IR was strongly correlated to overall gestational body fat \( (r=.666, p=.003) \) and measures of regional adiposity \( (r=.673 \text{ for IAAT}, r=.471 \text{ for PPAT}, r=.627 \text{ for SAT1}, r=.627 \text{ for SAT2, } p<.05 \text{ for all}) \), but not GWG \( (r=.012, p=.957) \), when controlling for age and race. HOMA-IR remained strongly associated with IAAT and SAT1 \( (r=.510 \text{ and .491, respectively, } p<.05 \text{ for both}) \), but not PPAT or SAT2 \( (r=.143 \text{ and .380, } p=.559 \text{ and .108, respectively}) \), when correlations were repeated controlling for age, race, and percent body fat. Multiple regression analysis revealed that IAAT and SAT1 were significant independent predictors of HOMA-IR \( (\beta = .570 \text{ and .491, respectively, } p<.05 \text{ for both}) \), but not PPAT, SAT2, or overall body fat \( (\beta = - .
Conclusions: Gestational insulin resistance is strongly associated with intra-abdominal and subcutaneous adipose accumulation in the lower abdomen, independent of overall body fat. Thus, abdominal fat ultrasound measures may be a simple way to identify, early in pregnancy, those who are at high risk for gestational diabetes.


Funding: No

Funding Component:

MP094

Cardiorespiratory Fitness and Birth Outcomes: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Background: High fitness is related to inflammation, blood pressure (BP), and endothelial dysfunction, the pathways believed to be involved in the development of hypertension in pregnancy. High fitness may also protect against preterm birth (PTB) and small for gestational age (SGA) deliveries, birth outcomes frequently associated with maternal vascular dysfunction.

Hypothesis: Higher cardiorespiratory fitness in the years preceding pregnancy and childbirth is inversely associated with incident SGA and PTB.

Methods: The CARDIA study is a prospective cohort study that encompasses child-bearing years. We studied 840 women who were nulliparous at baseline, reported ≥1 live birth(s) between the baseline and year 25 exam, and underwent a maximal treadmill exercise test at baseline. Number of births, gestational age for each birth, and birth weight were obtained by self-report at each exam. SGA was defined as birth weight <10th percentile for gestational age, and PTB was any birth that occurred before week 37 of pregnancy. We used Cox regression to determine hazard ratios for incident SGA and/or PTB. We adjusted for demographic and clinical co-variates at the exam immediately preceding the incident SGA/PTB or the 1st birth for women who did not report SGA or PTB (Model 2).

Results: Women who reported SGA (n=118) or PTB (n=185) were younger at baseline, completed fewer years of education, and were more likely to be black compared to women who did not report SGA/PTB (n=537). There was no difference in baseline BP or BMI between groups. Women without SGA/PTB had higher fitness than women with SGA/PTB; treadmill test duration was 541 s (95% CI: 529, 553 s) vs 500 s (95% CI: 483, 518 s). Treadmill test duration was inversely associated with time to SGA/PTB following adjustment (Table). Findings were similar by race.

Conclusions: Higher cardiorespiratory fitness in the years preceding pregnancy and childbirth was associated with decreased risk of SGA/PTB. Achieving a higher fitness level in young adulthood may help protect against SGA and PTB.
Disclosures: **A.D. Lane-Cordova**: None. **M.R. Carnethon**: None. **J.M. Catov**: None. **C.E. Lewis**: None. **S.E. Montag**: None. **P.J. Schreiner**: None. **A. Dude**: None. **B. Sternfeld**: None. **T.H. Vu**: None. **S. Badon**: None. **P. Greenland**: None. **E.P. Gunderson**: None.

Funding: Yes

Funding Component: National Center

**MP095**

**Pregnancy as a Window to Racial Disparities in Hypertension**

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Background: Black women in the United States have 50% higher rates of hypertension (HTN) than white women. This disparity persists after accounting for many known HTN risk factors. Evidence indicates that pregnancy complications may reveal increased risks for later HTN, and some complications, such as preterm delivery, are more common in black vs. white women.

Hypotheses: 1) Adjustment for multiple HTN risk factors measured at mid-life will explain some, but not all, of the black-white disparity in mid-life HTN among women. 2) Markers of pregnancy health will help explain the remaining black-white disparity in mid-life HTN.

Methods: Data came from a Michigan-based cohort study of women enrolled during pregnancy and followed-up at mid-life (n=678, mean age = 37, range 25-58). We included women without pre-pregnancy hypertension (n=652) categorized as African American (AA) (n=242) and white (n=373). We categorized women as hypertensive (systolic BP ≥140, diastolic BP ≥90, or self-reported use of antihypertensive medications, n=126), pre-hypertensive (systolic BP 120-139 or diastolic BP 80-89, n=149), and normotensive (n=340). Mid-life risk factors for HTN were grouped into 4 domains: socioeconomic status ([SES], based on education, occupation, marital status, insurance, and wealth), psychosocial (depression, hostility, job strain), behavioral (current smoking, diet quality score, sedentary hours/day, global sleep score), and physiological (body mass index [BMI], lipids, c-reactive protein [CRP]). We used generalized logit models to assess the degree to which each individual factor attenuated the AA (vs. white) odds ratio (OR) for HTN at mid-life and then sequentially added variables to a multivariable model. We then added indicators of pregnancy health (preterm delivery, pre-pregnancy BMI, and CRP, depressive symptoms, hypertensive disorders, and lipids during pregnancy).

Results: AA women had 3.28 (95% CI:1.96,5.51) times the odds of HTN compared to white women after adjusting for age. Adjustment for SES attenuated the OR to 2.52 (95% CI:1.46,4.36). Further adjustment for psychosocial factors and behaviors attenuated the OR to 2.30 (95% CI:1.29,4.11), and BMI and CRP attenuated it to 2.13 (95% CI:1.15,3.93). Adjustment for preterm delivery, pre-pregnancy BMI, and CRP and depressive symptoms during pregnancy reduced the OR to 1.88 (95% CI:0.97,3.64), with BMI, CRP, and depressive symptoms playing a larger role than preterm delivery. Adjustment for hypertensive disorders and lipids during pregnancy did not further reduce the race disparity.

Conclusions: SES, psychosocial factors, behaviors, and biomarkers measured at mid-life explained some, but not all, of the race disparity in mid-life HTN. Indicators of pregnancy health, particularly pre-pregnancy BMI, inflammation (CRP), and depressive symptoms contributed...
substantially to the race disparity in HTN at mid-life.

Disclosures: C.E. Margerison-Zilko: None. J.M. Catov: None. C. Holzman: None.

Funding: No

Funding Component:

MP096

Patterns of Physical Activity Across Pregnancy and Their Association With Adverse Pregnancy Outcomes

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Background: Cardiovascular disease (CVD) is the leading cause of death among women, and pregnancy complications reveal risk decades before overt CVD. While physical activity is related to CVD, less is known about how the activity patterns during pregnancy may contribute to adverse pregnancy outcomes. 

Hypothesis: Increasing activity across pregnancy is related to reduced risk of adverse pregnancy outcomes. 

Methods: Nulliparous women were enrolled at 8 centers early in pregnancy (n=10,020). Frequency and duration of up to three leisure activities reported in the first, second and third trimester were analyzed as metabolic equivalents (METs). Growth mixture modeling was used to identify activity patterns in pregnancy. Adverse outcomes (preterm birth [PTB], hypertensive disease of pregnancy [HDP], and gestational diabetes [GDM]) were collected by chart abstraction. 

Results: Four patterns of activity across pregnancy were identified: sustained high (3%, n=297); increasing (12%, n=1231); sustained low (77%, n=7717); and decreasing (8%, n=775; Figure). Women with sustained low activity were younger and more likely to be black or Hispanic, obese, or to have smoked prior to pregnancy when compared to those with increasing activity. Women with sustained low vs. increasing activity had higher rates of PTB (9.2 vs. 6.2%), HDP (13.8 vs. 10.5%), and GDM (4.7 vs. 2.5%; all p <0.01). After adjusting for maternal factors (age, race/ethnicity, BMI and smoking), the risk of GDM remained higher in women with sustained low activity compared with those having increasing activity patterns (adjusted OR 1.79 [1.21, 2.66]). Sustained low activity was also associated with higher risk of PTB (adjusted OR 1.36 [1.05, 1.76]). 

Conclusion: The majority of women have sustained low activity across pregnancy, and this is independently associated with higher risks of GDM and PTB. These associations raise the possibility that increased activity during pregnancy may improve pregnancy outcomes, and perhaps long-term maternal cardiovascular health.


Funding: No

Funding Component:

P001

Life’s Simple 7 in Middle-age and Prognosis After Myocardial Infarction in Later Life

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Background: The AHA recommends focusing on seven traditional risk factors (Life’s Simple 7) for cardiovascular health promotion, primarily based on their impact on the risk of incident cardiovascular disease. However, the contribution of Life’s simple 7 in mid-life to prognosis after myocardial infarction (MI) in later life is unknown.

Methods: In 13,500 participants from the Atherosclerosis Risk in Communities (ARIC) study (age 45-64 years) at Visit 1 (1987-1989), a 14-point score of Life’s simple 7 was constructed according to the status of each of seven factors (smoking, body mass index, physical activity, dietary quality, total cholesterol, blood pressure, and fasting glucose). We quantified the association between this score and adverse outcomes after validated incident hospitalized MI occurring during ARIC follow-up, using Cox proportional hazards models adjusting for age at MI, gender, race, and year of MI occurrence.

Results: 1,341 participants had a definite or probable hospitalized MI after the ARIC baseline visit (median elapsed time between baseline and MI occurrence, 24.4 years [IQR 17.5-25.4]). Of these, 807 (60%) had cardiovascular outcomes of interest after MI during a median follow-up of 3.0 years. Higher Life’s Simple 7 score (better cardiovascular health) in middle-age was associated with lower risk of adverse outcomes after MI in later life (Table). For example, individuals with Life’s Simple 7 score ≥10 had 50-80% lower risk of cardiovascular mortality, recurrent MI, and heart failure compared to those with score ≤3. The associations were largely consistent across years of MI occurrence and when we restricted the follow-up after MI to 1-3 years.

Conclusion: A better AHA Life’s Simple 7 in middle-age was associated not only with lower incidence but also with a lower risk of adverse outcomes after MI in later life. Our findings suggest a secondary prevention benefit of striving for ideal CV health status in mid-life, further supporting AHA promotion of Life’s Simple 7.


Funding: No

Funding Component:

P002

The American Heart Association's Life's Simple 7 and Risk of Incident Atrial Fibrillation: the REasons for Geographic and Racial Differences in Stroke Study

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Background: The American Heart Association has identified metrics of ideal cardiovascular (CV) health known as Life’s Simple 7 (LS7), including blood pressure, body mass index, cholesterol, cigarette smoking, diet, glucose, and physical activity, to target primary cardiovascular disease prevention. While poor control of these metrics are individually associated with a higher risk of atrial fibrillation
(AF), the association of the combination of these metrics with incident AF has not been evaluated. We determined the relationship between LS7 and incident AF in a cohort of middle and older-aged adults.

**Methods:** The REasons for Geographic And Racial Differences in Stroke Study is a biracial prospective study of 30,249 individuals. Eligible participants included those without AF who had data on all LS7 components at baseline and completed a follow-up exam 10 years later. An overall LS7 score was calculated as the sum of the LS7 component scores (0 to 2 points per component). This score was classified as inadequate (0-4), average (5-9), or optimum (10-14) CV health. Incident AF was identified at follow-up by either electrocardiogram or a self-reported medical history of a physician diagnosis.

**Results:** 9,576 participants (mean age=63; 57% women; 30% black) were included. In adjusted logistic regression analyses, optimum CV health (referent=poor) and each one point higher LS7 score were associated with a lower incident AF (Table). Associations did not differ by race or gender (interaction p-values of 0.51 and 0.49 respectively).

**Conclusions:** Better CV health, as defined by the LS7 score, is associated with a reduction in the incidence of AF. Further study into whether efforts to improve the population’s CV health lower AF incidence is needed.

Disclosures: **P. Garg:** D. Speakers Bureau; Modest; Regeneron. **W. O’Neal:** None. **A. Ogunsua:** None. **G. Howard:** None. **E. Soliman:** None. **M. Cushman:** None.

Funding: No

Funding Component: P003

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**Application of a Lifestyle-based Score to Predict Cardiovascular Health in the Coronary Artery Risk Development in Young Adults (CARDIA) Study**

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**Introduction:** The Healthy Heart Score (HHS) is a lifestyle-based risk prediction tool developed to predict cardiovascular disease (CVD) events in young and middle-aged adults. We evaluated the performance of the HHS to predict cardiovascular health (CVH).

**Methods:** We applied the HHS to 3288 white and black adults ages 18-30 years at the CARDIA study baseline exam in 1985-6. The HHS includes age, smoking status, body mass index, alcohol intake (g/d), exercise (hours/week) and a diet score composed of self-reported daily intake of cereal fiber, fruits/vegetables, nuts, sugar-sweetened beverages, and red/processed meats. We tested the utility of the HHS to predict having all ideal CVH factors at the year 25 exam when participants were ages 43-55 years, defined as the simultaneous presence of unmedicated blood pressure <120/80 mmHg, total cholesterol<200 mg/dl, fasting
glucose<100 mg/dl and absence of diabetes or CVD. We assessed the HHS in the total population, in race and sex-specific groups, and in those with and without clinical CVD risk factors (RFs) at baseline. We first applied original HHS coefficients, then cohort specific coefficients. We assessed model discrimination in comparison to age-only models with Harrell’s C-statistic and model calibration with Hosmer-Lemeshow’s chi-square.

Results: Mean (SD) age at baseline was 25.1 (3.6) years; 57% were female, 46% black, and 8% had at least one clinical CVD RF at baseline. Only 593 participants (18%) had all ideal CVH factors in middle age; the prevalence was lower in men compared to women, blacks compared to whites, and in those with vs. without clinical CVD RFs in young adulthood (Table). The HHS showed moderate discrimination for CVH prediction (Table). The HHS was adequately calibrated overall and within each sub-group.

Conclusions: The HHS performs moderately well predicting CVH 25 years later when applied to young adults. Its reliance on self-reported, modifiable lifestyle factors makes it an attractive tool for the promotion of CVH across the lifespan.


Funding: No

Funding Component:

P004

Shift-working Firefighters Have Poorer Heart Health Than They Think: An Intervention Opportunity

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Background: As an occupational sub-group, career firefighters experience a disproportionately higher prevalence of cardiac events and risk factors than the general population. The pervasive nature of poor cardiovascular health (CVH) in this population might belie an occupational norm. Underestimation of poor health could be a barrier to the adoption of health-enhancing behaviors.

Methods: Baseline data from a sample of 478 male firefighters from five different fire houses were used to examine the relationship between objective and perceived health. Objective CVH was defined as meeting the American Heart Association ideal recommendations for the following six, CVH metrics: tobacco use (non-smoker), body mass index (≤24.9 kg/m²), physical activity (≥75 min/wk vigorous or ≥150 min/wk moderate activity), fruit and vegetable intake (≥4.5 cups/d), blood pressure (<120/80 mm Hg) and total lipids (<200 mg/dL). Firefighters rated their perceived health as excellent, average, fair or poor. The proportion of firefighters meeting the ideal status for each CVH metric, and total CVH metrics achieved, was generated. A chi-square test of independence examined differences between the binary ideal CVH metrics (0-3 versus 4-6 ideal CVH metrics) and perceived excellent/average health.

Results: The mean age of the sample was 38.2 years (SD=9.9), 89% (413/478) were Caucasian, 73% (334/478) were married, 67% (290/478)
had an annual income of at least $75,000, and 90% (410/478) had attended college. Three-quarters (76%; 225/478) of the sample met the ideal recommendations for tobacco use, 20% (93/478) for body mass index, 0% for physical activity, 36% (174/478) for fruit and vegetable intake, 39% (184/478) for blood pressure, and 88% (345/478) for lipids. Overall, none of the firefighters sampled had ideal status on all 6 CVH metrics considered. Ninety-two percent (426/478) of the sample rated their health as average to excellent, although only 10% (47/478) of the sample had ideal status for 4-6 of the CVH metrics; 90% (431/478) had ideal status for 0-3 metrics ($X^2 = 4.54; p=.03$).

**Conclusion**: The CVH status of firefighters is poor, but firefighters with poor heart health inaccurately perceive their health as average or better. Addressing this misperception gap will be necessary to optimize responses to CVH interventions delivered to this population.


Funding: No

Funding Component:

**P005**

**Improving Heart Health in the Workplace: Results From the First Year of the American Heart Association’s Workplace Health Achievement Index**

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**Background:**
Comprehensive workplace wellness programs (CWWPs) have the potential to improve the heart health of the US workforce. To accelerate the adoption of these programs, the American Heart Association launched the Workplace Health Achievement Index (WHAI). The WHAI is an online scorecard that evaluates a workplace’s culture of health and the aggregate heart health score of its workforce as measured by Life’s Simple 7. Evidence from other workplace scorecards indicate that smaller companies achieve lower scores.

**Objective:**
To quantify differences in WHAI scores and score components between smaller (<250 employees) and larger (250+ employees) worksites.

**Methods:**
The total WHAI score is derived from 55 structure and process measures across seven best-practice domains and performance metrics based on employee Life’s Simple 7 data. Data from the first WHAI cycle (Feb 1 - June 30, 2016) were analyzed from 239 worksites that provided structure and process information. All data were stratified according to company size (smaller vs. larger). Differences in practice and performance measures were assessed across groups using Pearson chi-square tests or paired t-tests.

**Results:**
Overall, 5% of workplaces submitted the required amount of heart health metrics data (≥25% of employees) for eligibility. Smaller companies achieved a lower total WHAI score and lower scores across all domains except for Partnerships (Table 1).

**Conclusion**
Lower WHAI scores for smaller companies may be due to limited resources and capacity to implement CWWPs. Low submission of performance metrics highlights the challenge of including these data in a comprehensive assessment of CWWPs. To meet its 2020 Goals, AHA should consider providing smaller companies with resources to implement CWWPs and develop strategies to increase submission of employee Life’s Simple 7 data. Table 1: Differences in mean AHA Index scores between small and large companies

*Sample sizes too small for meaningful comparison.*
Disclosures: C. Calitz: A. Employment; Significant; Full-time AHA Employee. K. Pham: A. Employment; Significant; Full-time AHA Employee. A. Santana: A. Employment; Significant; Full-time AHA Employee. E. Sanchez: A. Employment; Significant; Full-time AHA Employee. R. Arena: H. Other; Modest; AHA Workplace Health Steering Committee, Member, uncompensated. G.C. Fonarow: H. Other; Modest; AHA Workplace Health Steering Committee, Chair, uncompensated.

Funding: No

Funding Component:

P006

A Comparative Case Study of the American Heart Association ANCHOR Partnerships Program

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Purpose: In 2014, the American Heart Association (AHA) started a new initiative called the Accelerating National Community Health Outcomes through Reinforcing (ANCHOR) Partnerships Program. The ANCHOR Program works to improve cardiovascular health using population-based strategies targeting policy, systems and environmental (PSE) level changes. From March 2015-April 2016, the ANCHOR program supported 15 markets within AHA Affiliates as they implemented community-based interventions using PSE strategies to increase access to healthy food and beverages, physical activity, and smoke-free environments. This community-based approach is relatively new for the organization therefore, a comparative case study was conducted to understanding how the ANCHOR Program worked within the AHA and its Affiliates, as well as what community-based strategies were most successful. Methods: Using a systematic selection procedure that assessed level of readiness, the 15 sites were categorized as either “implementation ready (IR)” or “capacity building (CB)”. After stratifying the sites by intervention focus three markets from each category (n=6) were selected as the units of analysis. Evaluators conducted site visits in each market from February-April 2016. During site visits, a total of 24 interviews were conducted with Affiliate staff, program managers, implementation partners, and community partners. Each interview assessed expected outcomes, planning processes, community support, and success. Interviews were audio recorded, transcribed, and synthesized using a thematic analysis. Results: Significant differences were found in expected outcomes. IR sites wanted to increase community engagement, while CB focused on policy change. Both sites were supported by their Affiliates and partners. Action plans were developed by program managers with Affiliate input, and were used to plan in both sites. IR sites identified barriers at the beginning of planning, while CB sites made revisions frequently as barriers were encountered. Both sites engaged partners in planning. Program managers at IR sites worked closely with partners on implementation, whereas those at CB sites led implementation and partners provided support and connections. Differences were also found in how sites engaged partners. CB sites built broad community engagement and IR sites focused on implementation partner buy-in. Overall, the IR sites felt most successful, while CB sites laid groundwork but were not able to create tangible outcomes. Discussion: This comparative case study provides important information about how the AHA can embed community-based work within their ongoing efforts using existing Affiliate structures. The multiple viewpoints captured provides insight...
into implementation processes and how this type of work is best accomplished, as well as how level of readiness can impact progress.

Disclosures: **W. R. Garney**: None. **K. Garcia**: None. **K. McLeroy**: None. **L. King Hahn**: None. **V. Taffe**: None.

Funding: Yes

Funding Component: National Center

**P007**

**Sex-Specific Disparities in Risk Factor Control of Patients Undergoing Elective Percutaneous Coronary or Peripheral Intervention**

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**Introduction:** The American Heart Association (AHA) developed 7 health metrics to define “ideal cardiovascular health” in its 2020 Impact Goal. Sex-specific disparities in attainment of the 7 health metrics in patients undergoing elective percutaneous or peripheral interventions has not been well characterized.

**Methods:** We interviewed 1,517 patients (1,127 males and 390 females) undergoing elective percutaneous coronary or peripheral intervention at a large tertiary care center between November 2010 and March 2015. Survey data was used to reconstruct the 7 health metrics (blood pressure, physical activity, cholesterol, diet, weight, smoking status, and metabolic control). Multivariable linear regression was performed to identify characteristics associated with ideal metric attainment in the overall cohort and when stratified by sex.

**Results:** Overall, males were younger, less likely to be white, more likely to be married, and had higher levels of education and higher prevalence of prior coronary artery disease than females (p<.05 for each). Males achieved fewer ideal health metrics than females (2.0 ± 1.2 vs 2.3 ± 1.1, p<.01), including poorer attainment of the ideal smoking (p<.01), physical activity (p<.01), and diet health metrics (p<.05). Females had poorer attainment of the ideal weight (p<.05) and cholesterol health metrics (p=.01). After multivariable adjustment, males achieved fewer ideal health metrics than females (p<.01; Table). Sex-specific differences are presented in the Table, which includes single marital status and depression as negative predictors of ideal metric attainment in males, and a reduced ejection fraction as a negative predictor in females.

**Conclusions:** Attainment of the 7 AHA ideal health metrics is low in both males and females undergoing elective percutaneous coronary or peripheral intervention. Sex-specific disparities in risk factor control illustrate interesting areas for further exploration into the predictors of behavior that may guide future targeted interventions.

**Disclosures:** **A. Vani**: None. **J. Berger**: None. **H. Rudy**: None. **R. Balakrishnan**: None. **E. Gianos**: None.

Funding: No

Funding Component:

**P008**

**Abnormal Ankle-Brachial Index is Inversely Associated with Improved Cardiovascular Health**

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Background/Objective
An abnormal ankle-brachial index (ABI) strongly correlates with higher mortality in patients with cardiovascular disease; however, the inverse link has not been established for cardiovascular (CV) health. The American Heart Association (AHA) aims to improve CV health by 20% by 2020 and has thus proposed the use of CV health metrics (Life’s Simple 7 or LS7). This study examines the relationship of abnormally low ABI with CV health.

Methods
We evaluated 5,308 men and women aged ≥40 years, without history of CVD or diabetes mellitus (DM), participating in NHANES from 1999-2004. Abnormally low ABI was defined as ABI< 1.00 which included borderline low [0.91-0.99] and low ABI [<=0.90]). LS7 was scored on a 0-14 point scale and calculated based on poor, intermediate and ideal categories of 7 health components: diet, BMI, smoking, physical activity, blood pressure, glucose and cholesterol. LS7 scores were categorized as inadequate (0-7 points), average (8-11) and optimum (12-14) CV health. Ordinal logistic regression models identified associations between abnormal ABI and CV health, with adjustments for sex, age, race/ethnicity, socioeconomic status and hs-CRP.

Results
The mean (95% CI) LS7 score was 7.4 (7.3-7.5), with the majority of the population (75.3%) clustered at the lower end of average CV health. Adjusted models demonstrated that, compared to those with inadequate CV health, those with average CV health experienced 28% lower odds of abnormal ABI (OR 0.72, 95% CI; 0.52-0.97). Further improving CV health from inadequate to optimum was associated with 78% lower odds of abnormal ABI (OR 0.22, 95% CI; 0.09-0.57). On examining individual components, only blood pressure was found to be significantly associated with lower odds of abnormal ABI. Those with intermediate, as compared to poor, blood pressure readings showed 32% lower odds of abnormal ABI (OR 0.68, 95% CI; 0.48-0.94) while those with ideal blood pressure showed a 61% lower odds of abnormal ABI (OR 0.39, 95% CI; 0.21-0.72).

Discussion/Conclusion
Although those with average CV health experienced lower odds of abnormal ABI, improving CV health to optimum can significantly lower these odds. This suggests that optimizing cardiovascular health, particularly in those who have not yet been affected by CVD or DM, can significantly slow or prevent progression of systemic atherosclerosis.

Disclosures: S. Singh: None. C. Pilkerton: None. S. Frisbee: None.

Funding: No
Funding Component: P009

Break the Myth and Revisit Non-Obese Asian American’s Cardiometabolic Risk

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Asian Americans (AA) have been excluded in major research addressing cardiometabolic health mainly due to their low rate of obesity. However, CVD morbidity and mortality are rapidly increasing among AA population and that warrants revisiting their cardiometabolic risks. The recent National Health and Nutrition Examination Survey (NHANES) conducted between 2011-14 included non-Hispanic Asian Americans as the first time ever since the survey started in 1960’s, and that will advance our understanding of the AA population by characterizing their cardiometabolic risk. We aimed to compare AA with other ethnic groups in terms of obesity indices, such as body mass Index (BMI), waist circumference (WC), and sagittal abdominal diameter (SAD): and clinical markers of CVD risks, such as level of cholesterol, triglyceride, and glucose, systolic- and diastolic blood pressure, whether being
treated with medication for blood pressure, smoking, and having diabetes. Method: From NHANES 2013-2014 data with total 6553 participants, 5992 were selected by age≥19 for analysis. Demographics, obesity indices, CVD risk factors were extracted in six ethnic groups for comparisons using univariate analysis, ANOVA and Chi-square tests. Results: AA, compared to all ethnic groups, was the leanest in terms of the BMI (24.86±4.32 vs. 29.05±7.18, p<0.001), WC (88.55±11.26 vs. 98.93±16.70 cm, p<0.001), and SAD (19.80±3.20 vs. 22.76±4.89 cm, p<0.001). However, the plasma levels of cholesterol (195.11±40.73 vs. 190.11±42.37 mg/dL, p<0.005), triglyceride (162.85±106.12 vs. 111.13±76.60 mg/dL, p<0.001), and glucose (106.54±42.10 vs. 102.25±40.81 mg/dL, p<0.05) were all higher in AA than in non-Hispanic Black. AA had the highest diastolic blood pressure among all ethnic groups (71.37±11.55 vs. 69.00-69.28mmHg in other groups, p<0.001), but lower in systolic blood pressure compared to non-Hispanic White and non-Hispanic Black (120.60±17.56 vs. 122.30±17.82, p<0.05, and 126.60±17.56 mmHg, respectively, both p<0.001). In AA, 7.7% were taking prescription for blood pressure, 24.6% smoked everyday which was the lowest among ethnic groups (p<0.001), however AA started smoking at younger age than all other ethnic groups (18.50 vs. 21.40 years, p<0.05). Morbidity of diabetes was 10.2% in AA, lower than other ethnic groups except other-Hispanics (p<0.001). We conclude that unlike the longtime-believed myth, Asian Americans are at high risk as other ethnic groups. Our findings warrants further studies for the mechanisms of non-obese-related CVD that will advance the precision of intervention for AA and the larger population in the world.


Funding: No

Funding Component:

P010

Obesity Status in Younger Age, 39-year Weight Change and Physical Performance in Older Age: the Chicago Healthy Aging Study (CHAS)

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Background: Obesity is associated with serious medical complications and impaired quality of life. In older adults, obesity can aggravate the age-related decline in physical performance and lead to other forms of disability. However, the association of obesity status and weight change over decades with physical performance in older age has not been well studied. Methods: In 1,325 men and women who were initially examined in 1967-73 and re-examined in 2007-10 in the CHAS study, we stratified by baseline BMI and categorized weight change over 39 years (categories in table footnote). At follow-up (FU) when participants were ages 65+, muscle strength (hand grip) and performance [4m gait speed and Short Physical Performance Battery (SPPB)] were measured. We used multivariate logistic regression analysis to determine the association of baseline obesity status and weight change categories with categorized low strength and performance measures adjusted for baseline (BL) CVD risk status, FU age, sex, race, education, ankle-brachial index, SBP, total cholesterol, smoking status, diabetes, and cholesterol and BP medication use. Results: The mean age at baseline was 33 and at FU was 71, 28% were women and 9% were black. At follow-up, 10.3 % had SPPB score ≤ 8, 8.4 % had gait speed on 4 meter course < 0.8 m/s, and 23.8 % had low sex-specific handgrip strength (<18kg for women, <30kg for men). As compared with those who were normal weight at baseline with minimal weight change (-10lbs to 20lbs), participants who were overweight initially and gained the most weight (> 20lbs) were more likely to have a low SPPB score, gait speed <0.8
m/s, or sex-specific handgrip strength (ORs: 4.55, 4.58, and 1.86, respectively). Weight loss > 10 lbs is associated with SPPB score, and can be seen among those with BL BMI <25 kg/m² but not among those with BL BMI ≥ 25 kg/m².

**Conclusion:** Obesity and overweight in younger age and significant weight gain over time are each associated with poor physical performance in older age.

Disclosures: **T.T. Vu:** None. **M.R. Carnethon:** None. **K. Liu:** None. **D.M. Lloyd-Jones:** None. **G.I. Ogbole:** None. **D.B. Garside:** None. **M.L. Daviglus:** None.

Funding: No

**Funding Component:**

**P011**

**Predictive Ability of 35 Frailty Scores for Cardiovascular Events in the General Population**

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Introduction: Frailty is a state of vulnerability in elderly people linked to higher mortality risk. Cardiovascular disease (CVD) is highly prevalent in aged populations and associated with frailty. Thus, frailty state could predict higher risk of CVD. Many frailty scores (FS) have been developed, but none of them is considered the gold standard. We aimed to compare predictive and discriminative ability of an extensive list of FS with regard to incidence of CVD in a sample of the general elderly population in England. We assessed the hypothesis that some FS will have better predictive ability than others, depending on their characteristics.

Methods: We performed a prospective analysis of the association between 35 FS in participants free of CVD at baseline wave 2 of the English Longitudinal Study of Ageing (2004-2005), and incident CVD assessed until February 2012. The sample consisted of 4,177 participants (43.0 % men). Hazard ratios (HR) and 95% confidence intervals (95% CI) were calculated for each FS using Cox proportional hazards model, adjusted for demographic, lifestyle and comorbidity variables. FS were analyzed on a continuous scale and using original cutoffs. The added predictive ability of FS beyond a basic model consisting of sex and age was studied using Harrel’s C statistic (the higher the better).

Results: The median follow-up was 5.8 years, the incidence rate of CVD events was 301.2 /10,000 person-years and CVD represented 28% of the total cause of death. The mean age was 70.5 (SD: ±7.8) years. In fully-adjusted models with demographics, lifestyles and comorbidity, HRs ranged from: 1.0 (0.7; 1.6) to 12.7 (5.5; 29.3). Using cutoffs, HRs ranged from 0.7 (0.2; 1.9) to 1.8 (1.3; 2.5). Adjusted for sex and age, delta Harrel’s C statistic ranged from -0.8 (-3.4; 1.8) to 3.0 (-0.4; 6.4). The best CVD predictive ability was found for the Frailty Index with 70 variables and the Comprehensive Geriatric Assessment screening FS for continuous and cutoff analyses respectively. In conclusion, there is high variability in the association between different published FS and incident CVD. FS have better predictive ability used as continuous variable. Although most of the analyzed FS have good predictive ability with regard to incident CVD, they do not significantly improve on the discriminative capacity of a basic model. Our results will help to guide clinicians, researchers and public health
practitioners in choosing the most informative frailty assessment tool.

Disclosures: **G.A. Aguayo**: None. **A. Schritz**: None. **A. Donneau**: None. **M.T. Vaillant**: None. **S. Stranges**: None. **L. Malissoux**: None. **M. Guillaume**: None. **M. Muller**: None. **D.R. Witte**: None.

Funding: No

Funding Component:

**P012**

Three Biological Age Estimates May Capture Distinct Aspects of Aging

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**Background**: Biological age (BA) may reflect an individual’s aging process better than chronological age (CA). The objective of our study was to construct BA measures from different types of biomarkers and test their associations with mortality and age-related disease in a community-based sample.

**Methods**: We selected 6 clinical predictors that capture pulmonary, vascular, atherosclerosis, insulin sensitivity, inflammatory, and kidney domains of aging, and 9 inflammatory biomarkers measured in Framingham Heart Study Offspring cohort participants at exams 7 (1998-2001, N=3539, mean age 62±10) and 8 (2005-2008, N=3021, mean age 67±9). We used the Klemera-Doubal method to calculate a clinical variable BA and an inflammatory marker BA. We computed BA using DNA methylation (DNAm) data at exam 8 using Horvath’s method. For each of the measures we computed the difference (ΔAge) between BA and CA and modeled the effects of ΔAge after accounting for CA. We followed participants through 2014 for all-cause mortality (N=713), cardiovascular disease (CVD, N=412), coronary heart disease (CHD, N=223), stroke (N=129), and cancer (N=509).

**Results**: Inflammatory and clinical ΔAge were correlated (r=0.35, r=0.33, for exams 7 and 8 respectively), and also across exams (inflammatory ΔAge exam 7 vs 8: r=0.61; clinical ΔAge: r=0.76). DNAm ΔAge was not significantly correlated with exam 8 inflammatory or clinical ΔAge. After adjusting for CA and sex, larger inflammatory and clinical ΔAge, corresponding to older BA than CA, was associated with significantly increased hazards of all-cause mortality, CVD, and CHD (Table). The clinical and inflammatory ΔAge were significant (p<0.05) in models containing both measures. DNAm ΔAge was associated with increased hazards of all-cause mortality, CVD, cancer, and stroke, and remained significant in a model for mortality that also included inflammatory ΔAge (p<0.05).

**Conclusions**: Our findings suggest the three BA measures may be complementary in predicting risk for age-related disease.

Disclosures: **J.M. Murabito**: None. **Q. Zhao**: None. **D. Levy**: None. **E.J. Benjamin**: None. **M.G. Larson**: None. **K.L. Lunetta**: None.

Funding: No

Funding Component:

**P013**

Prevalence, Correlates and Prognosis of Healthy Vascular Aging in a Western Community-dwelling Population

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Introduction  Although hypertension in the elderly is no longer considered harmless, increasing arterial stiffness and blood pressure (BP) are still widely seen as inevitable parts of the aging process. However, these phenomena may not be unavoidable as they are nearly absent in populations leading traditional hunter-gatherer lifestyles. Our study had 3 aims: 1) to define a new concept - healthy vascular aging (HVA); 2) to assess prevalence and correlates of HVA in a sample acculturated to a western life-style; and 3) to estimate the magnitude of cardiovascular (CVD) risk associated with HVA vs. absence of HVA.

Methods  We studied 3197 Framingham Heart Study participants aged ≥50 years (62±9 years, 56% women) who underwent physical examination, interviews, and measurement of carotid-femoral pulse wave velocity (PWV) in 1999-2008. We defined HVA as no hypertension (BP <140/90 mmHg without antihypertensive treatment) and PWV <7.6 m/s (equivalent to +2 SD above mean of non-hypertensive reference sample aged <30 years with no CVD risk factors). We used logistic regression models that included physical activity, caloric intake, and classical CVD factors as covariates to assess the correlates of HVA. For each participant, we constructed a cardiovascular health score based on presence vs. absence of 6 modifiable risk factors (cholesterol, plasma glucose, healthy diet score, physical activity, body mass index (BMI), and smoking) defined as dichotomous variables according to the American Heart Association’s Life’s Simple 7 score (modified to exclude hypertension). We estimated odds ratios (OR) per 1-unit increase in cardiovascular health score for HVA. We used Cox regression models adjusted for classical CVD risk factors, including systolic BP, to assess the relationship between HVA and incident CVD events (CVD death, myocardial infarction, heart failure, stroke, and unstable angina). Results  In our sample, only 566 (17.7%) had HVA. Lower age (OR per 1-SD increase 0.18, 95% confidence interval [CI] 0.14-0.23), female sex (OR 2.03; 95% CI 1.54-2.68), lower BMI (OR per 1-SD increase 0.54; 95% CI 0.47-0.63) and no diabetes (OR 0.09; 95% CI 0.02-0.36) were significantly associated with HVA. A 1-unit increase in the cardiovascular health score conferred 1.55-fold (95% CI 1.38-1.74) odds of HVA. During follow-up (median 9.6 years), 391 participants had CVD events. HVA was associated with an age- and sex-adjusted hazard ratio (HR) of 0.36 (95% CI, 0.22-0.60) and a multivariable-adjusted HR of 0.45 (95% CI, 0.26-0.77) for CVD relative to absence of HVA.

Conclusions  One in 6 individuals experiences HVA in our sample. Individuals with HVA are at a considerably low risk of CVD. Prevention strategies targeting modifiable factors and behaviors included in Life’s Simple 7 are important for preventing or delaying vascular aging and the associated risk of CVD.


Funding: No

Funding Component:

P014

Lower eGFR and Proteinuria Were Independently Associated With Lower Cognitive Abilities in Community-dwelling Men in Japan: SESSA study

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**Introduction:** The relationship between chronic kidney disease (CKD) and cognitive function remains to be determined. Existing studies focused primarily on estimated glomerular filtration rate (eGFR) but not proteinuria in relation to cognitive function.

**Hypothesis:** In a community-based sample, lower eGFR and presence of proteinuria are cross-sectionally independently associated with lower cognition.

**Methods:** The Shiga Epidemiological Study of Subclinical Atherosclerosis (SESSA) randomly recruited and examined participants from Shiga, Japan in 2006-08 at baseline. Among 824 male participants in the follow-up exam (2010-12), we restricted our analyses to those who underwent the Cognitive Abilities Screening Instrument (CASI), age ≥65 years-old, free of stroke, with no missing pertinent covariates. We calculated eGFR (creatinine-based) according to the 2012 guideline by the Japanese Society of Nephrology. We then divided the participants into three groups by eGFR of ≥60, 59-40, and <40 (mL/min/1.73m²), and separately divided into three groups according to proteinuria using urine dipstick: (-), (-/+), and ≥(1+). We defined CKD as either eGFR <60 or proteinuria ≥ (-/+). In linear regression with CASI score being a dependent variable, we computed the score adjusted for age, highest education attained, smoking, drinking, body mass index, hypertension, diabetes, and dyslipidemia.

**Results:** We analyzed 541 men. The mean [standard deviation] of age and unadjusted score were 72.6 [4.3] years and 89.7 [6.0]. Prevalence of CKD was 56%. The score was significantly lower in participants with CKD than those without it (P=0.03). eGFR and proteinuria categories were separately and jointly associated with lower CASI score in a graded fashion (Ps for trend <0.05 in all the models tested. **Table 1**).

**Conclusions:** Lower eGFR and higher degree of proteinuria were independently associated with lower cognitive function in the community-based men. CKD even in its early phase may predispose to lower cognitive function.


**Funding:** No

**Funding Component:**

**P015**

A Novel Healthy Blood Pressure Phenotype is Associated With Better Cardiovascular Health Benefits and Neuropsychological Performance in the Long Life Family Study

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**Introduction:** We assessed the hypothesis that a novel healthy blood pressure phenotype is familial and sought to identify factors associated with this phenotype in the Long Life Family Study (LLFS). **Methods:** The LLFS is a unique multi-center, international study that recruited families demonstrating clustering for longevity. Families were recruited from four centers; three in the U.S.: Boston, New York, and Pittsburgh and one in Denmark. The pedigrees included two generations: 1) probands and their siblings and 2) offspring of participants in the proband generation. Offspring (n=2211, ages 32-88, mean age=60.5; 43% male) were classified as having healthy blood pressure if their age- and sex-adjusted systolic blood pressure z-score was between -1.5 and -0.5 (i.e., a systolic blood pressure lower than expected for their age and sex, but not “too low”). Offspring on anti-hypertensive medications were classified as not having healthy blood pressure. Families (n=419) were defined as having healthy blood pressure if ≥2 and ≥50% of their offspring met the healthy blood pressure phenotype. **Results:** There were 476 (22%) offspring who met the healthy blood pressure phenotype. These offspring tended to have a better health profile than remaining offspring. When examining families, only 44 (11%) families met the criteria for healthy blood pressure. Both offspring and probands from families with healthy blood pressure performed better on neuropsychological tests that place demands on complex attention and executive function than offspring and probands from remaining families. Among families with healthy blood pressure, a higher proportion of offspring met the American Heart Association ideal cardiovascular health definition compared to remaining families (11% versus 4%, respectively, p<0.0001; not including the diet component). There was also a larger proportion of probands (n=1164, ages 71-110, mean age=90.5; 45% male) who met the American Heart Association ideal cardiovascular health definition when compared to the U.S. prevalence for ≥6 components among those ages ≥60 (1% versus 0.1%, respectively). **Conclusion:** In this cohort of familial longevity, few families had a novel healthy blood pressure phenotype in multiple members. Families and individuals with healthy blood pressure performed better on neuropsychological tests that represent aspects of executive function and had a higher proportion with ideal cardiovascular health than the U.S. population. In summary, a novel healthy blood pressure phenotype was rarely familial in this cohort; however, when it was, it was associated with cognitive and cardiovascular health benefits. Blood pressure may be a key pathway for family longevity.


**Funding:** No
**Methods** – Our analysis included 12,665 individuals (23% black race, 56% female, mean age 57) who attended visit 2 in 1990-92. Cornell voltage (SV3 + RaVL) was derived from 12-lead ECG at visit 2 (1990-92), visit 3 (1993-95) and visit 4 (1996-98) as a continuous variable, and the gender-specific Cornell voltage criteria (SV3 + RaVL > 28mm for men, and >22mm for women) was used to define LVH as a dichotomous variable. Incident dementia was defined using a validated algorithm consisting of a full neuropsychological assessment, interviews, informant interviews, hospital discharge codes, or diagnostic codes from death certificates. A cox proportional hazards model was used to evaluate the association between LVH and incident dementia. LVH and Cornell voltage were modeled as time-dependent variables and covariates were updated at each visit. Follow-up time was from baseline until date of dementia, end of follow-up, or the end of 2013, whichever came first.

**Results** – During a mean follow-up of 18 years, we identified 544 participants with LVH and 1195 incident dementia cases. LVH was associated with a higher risk of dementia: multivariable hazard ratio (HR) 1.91, 95% confidence interval (CI) 1.48-2.46 (Table). A 1-standard deviation increase in Cornell voltage (5 mm) was associated with a higher risk of dementia, HR (95% CI) = 1.10 (1.04-1.17).

**Conclusion** – In this large population-based study, LVH measured in mid-life was associated with an increased risk of dementia. Additional research should confirm this association, and these results underscore the need for hypertension control to prevent subclinical brain injury.


**Funding:** Yes

**Funding Component:** National Center

**P017**

**Migraine and Cognitive Function: baseline Findings From the Brazilian Longitudinal Study of Adult Health: ELSA-Brasil**

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**Background:** Migraine and dementia are associated with higher vascular risk and both conditions have been linked with structural brain lesions. However, evidence on the possible association between migraine and cognitive performance is unclear. We aimed to analyze whether migraine is associated with cognitive performance within participants of the Brazilian Longitudinal Study of Adult Health, ELSA-Brasil. **Methods:** In this a cross-sectional analysis, we evaluated all participants without previous stroke, who were not taking medications that could impair cognitive performance and with complete data on cognitive tests or migraine at baseline assessment. Migraine based on International Headache Society classification was used as dependent variable in binary logistic models. The Consortium to Establish a Registry for Alzheimer’s disease scores for word list memory test (CERAD-WLMT), the semantic fluency test (SFT), and the Trail Making Test version B (TMTB) were categorized into poor cognitive performance as defined by a score below mean minus one standard deviation for a participant’s sex, age and educational-level group for memory and fluency tests and as a score above...
mean plus one standard deviation for the time
to perform the Trail Making Test Version B..
Multivariate analyses were adjusted for marital
status, alcohol consumption, smoking, physical
activity, body mass index, hypertension,
diabetes mellitus and depression. In women we
further adjusted for hormone replacement
therapy. **Results:** We analyzed 4993 men (51.6
±9.2 y) and 5028 women (51.9±8.9 y). Among
those, there were 131 men (2.6 %) and 926
women migraneurs (18.4%). The proportion of
participants in the poor cognitive category did
not differ significantly between migraneurs and
non-migraneurs for men or women in any of
the cognitive tests (p>0.072 for all). Fully
adjusted OR (95%) for poor performance in men
on immediate recall, late recall, recognition,
verbal fluency, and TMTB were
1.02(0.60;1.72), 1.15(0.69;1.91), 0.86(0.51;1.43),
1.08(0.51;1.43) and 1.75(0.64;1.82) respectively
and in women 1.06(0.69; 1.62); 0.89
(0.61;1.29);1.25(0.81;1.95) and 1.72(1.07;2.77)
respectively. **Conclusion:** Migraine was
associated with poorer executive function in
middle-aged women after multivariate
adjustment including HRT. No association was
found for middle-aged men, but this may be a
consequence of the lower number of men with
migraine compared to women.

Disclosures: **C.P. Baena:** None. **A. Goulart:**
None. **I. Santos:** None. **C. Suemoto:** None. **P.
Lotufo:** None. **I. Benseñor:** None.

Funding: No

Funding Component:

**P018**

**Lifestyle Interventions that Benefit the Heart
Also Improve Depression Among Geriatrics**

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**Objective** Plant-based nutrition, exercise,
proper rest, relaxation techniques and other
healthy behaviors can be beneficial to the
cardiovascular system. We assess the impact
that this healthy behaviors have before and
after an 8-week educational community-based
program. **Participants and Methods** The
program was developed by the Nedley Clinic in
Ardmore, Oklahoma, USA. This medical clinic
trained and certified lay and professional
people around the world in 4 continents. The
program does not create a doctor-patient
relationship. Recruitment is done by, for
example radio, TV, handouts, newspaper and
word of mouth. Those who chose to participate
met once a week for 8 weeks for a 2 hour
program, it consisted of a 45 minute DVD
presentation by a physician experienced in
lifestyle interventions and a facilitated small
group discussion together with weekly practical
assignments. The program was available in
Spanish and English. The Nedley Depression
Recovery Program Assessment Test
(registration TX 7-398-022) was used. It
assessed depression level based on DSM-5 [The
Diagnostic and Statistical Manual of Mental
Disorders Volume 5] criteria, demographics,
anxiety, emotional intelligence and patient
history. The depression was classified into 4
categories as the DSM-5, as none (0-6), mild (7-
10), moderate (11-19) or severe (20 or more).
Participants that finished the program from
2007 to 2016 that were of geriatric age (55
years old and older at baseline) were included.
Both depressed and non-depressed participated
on the program. **Results** From 5997 participants
that finished the program n=2928 were
geriatrics. Mean age 64.7 SD 7.2, n=2075
(70.8%) were females. Demographic were
White 2598 (88.7%), Black 107 (3.6%), Hispanic
144 (4.9%) and other (2.8%). Participants were
from Africa, Europe, Oceania and America. At
baseline mean group depression was 11.2
(Moderate), SD 7.3. That group was composed of
960 (32.7%) with none depression, 474
(16.1%) with mild depression, 981 (33.5%) with
moderate depression and 513 (17.5%) with
severe depression. By the end of the 8-weeks
mean depression was 6 (none), SD 5.7. That
group was composed of 1854 (69.3%) with none
depression, 476 (16.2%) with mild depression,
506 (17.2%) with moderate depression and 92 (3.1%) with severe depression. **Conclusion** It seems that the intervention effectively improves mental health in this geriatric population with different levels of depression responding well to the program. This seems to be an effective way to apply community wide interventions to improve population-wide health. A control group and further follow up would be recommended.

**Disclosures:** **F.E. Ramirez:** None. **N. Nedley:** F. Ownership Interest; Modest; Nedley Health Solutions.

**Funding:** No

**Funding Component:**

**P019**

**Family History of Cardiovascular Disease is Associated With Cognitive Function: The Emory Healthy Aging Study**

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**Background:** Family history of cardiovascular disease (CVD) is a readily available risk indicator of future CVD, combining the influence of shared genetic, environmental and behavioral risk factors. Though CVD risk factors have been associated with an increased risk of cognitive impairment and decline, less is known about the association between family history of CVD and cognitive function. Evaluating this association may further elucidate the role of cardiovascular health in cognitive health.

**Methods:** The Emory Healthy Aging Study is an ongoing prospective cohort study aimed at identifying predictors of healthy aging and age-related diseases. Participants are primarily residents of the Atlanta area, at least 18 years old, who completed an online baseline health survey. Multiple recruitment forums were used, including clinic waiting rooms, informational letters and emails, community events and online recruitment. Baseline information about demographic (age, race, gender), socioeconomic (education, household income), and health behavior factors (physical activity, smoking) as well as personal health (diabetes, hyperlipidemia, and hypertension) and family health history were collected by online survey. Family history of CVD was defined as self-reported history for any parent or sibling of coronary artery disease, myocardial infarction, or stroke. Cognitive function was measured using the validated Cognitive Function Instrument (CFI) with scores ranging between 0-14 (lower is better). The association between family history of CVD and CFI score was assessed using multivariable linear regression, adjusting for demographic, socioeconomic, lifestyle and CVD risk factors, as well as family history of mild cognitive impairment (MCI) or Alzheimer’s disease (AD).

**Results:** We studied 3801 participants (75% female, 85% white, 10% black, and 5% other), recruited between October 2015 and October 2016. Mean age was 59±13 years and 61% reported a family history of CVD. Adjusting for age, gender, race, education, household income, exercise habits, smoking status and family history of MCI or AD, family history of CVD was associated with poorer cognitive performance (β=0.26; 95% CI (0.12, 0.41)). Additional adjustment for hypertension, hyperlipidemia, diabetes and BMI only slightly attenuated estimates (β=0.22; 95% CI (0.08, 0.41)). In the same model, the estimated β for family history of cognitive impairment was similar: 0.22 (0.07, 0.37).

**Conclusion:** In this cross-sectional study of people from the community, family history of CVD was associated with poorer cognitive function, and this association was of the same magnitude as having a first-degree family member with a history of cognitive impairment. Although longitudinal data are needed, these results underscore the link between cardiovascular and neurocognitive health and potential role of shared genetic and behavioral factors.
Disclosures: M.E. Goetz: None. M. Marcus: None. V. Vaccarino: None. F. Goldstein: None. A. Levey: None. J. Lah: None.

Funding: No

Funding Component:

P020

Predictors of Depressive Symptoms Across the Spectrum of Hyperglycemia: the Atherosclerosis Risk in Communities (ARIC) Study

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Background: Determinants of depressive symptoms in older adults according to diabetes status have not been widely investigated. Here we examine correlates of depressive symptoms in persons without diabetes, with prediabetes, and with diagnosed diabetes.

Methods: We used data from visit 5 (2011-2013) of the ARIC Study. Depressive symptoms were ascertained using the 11-item CES-D, with scores $\geq 9$ indicating probable major depression, and via self-reported diagnosis of depression in the past 2 years. Diabetes was defined based on self-reported diagnosis or use of glucose lowering medication. We defined prediabetes as HbA1c of 5.7-6.4% in persons without diabetes. We examined demographic factors, markers of health status, and metrics of health care access as correlates of depressive symptoms. Prevalence ratios (PRs) were calculated using Poisson regression with robust variance estimation.

Results: Among 6319 participants (mean age 76 years, 59% female, and 77% white), the prevalence of depressive symptoms in persons with prediabetes (8.6%) and diabetes (14.7%) was significantly higher than in persons with no diabetes (6.9%). Correlates of depressive symptoms were similar across diabetes categories. In fully adjusted models, the strongest predictors of depressive symptoms were self-reported fair or poor health (compared to excellent health) and variables related to access to, and satisfaction with, health care. In persons with diabetes, insulin use, but not HbA1c control, was significantly associated with depressive symptoms. Measures of socioeconomic status (education, income) were significantly associated with depressive symptoms in all three groups (Table).

Conclusions: The strongest predictors of depressive symptoms were metrics of health care access and satisfaction, suggesting that system-level factors may be important in addressing depression in diabetes and prediabetes.


Funding: No

Funding Component:

P021

Association of AHA Cardiovascular Health Metrics With Cognitive Function, Depression, and Anxiety: The Emory Healthy Aging Study
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Background: The American Heart Association (AHA) has developed the Life’s Simple 7 metric (no smoking, high levels of physical activity, normal body mass index, no hypertension, no diabetes, no hyperlipidemia, healthy diet) to track behaviors and risk factors associated with cardiovascular health (CVH). Given the potential role that CVH has in cognition and psychological well-being, we aimed to study the association of the Life’s Simple 7 with cognitive function, anxiety, and depressive symptoms in the Emory Health Aging Study (EHAS).

Methods: EHAS is an ongoing cohort study with the overall goal of understanding determinants of healthy aging in the general population. Participants 18 years of age or older are recruited at primary care clinics, community events, and through social media, primarily from the Atlanta (GA) area. Information on sociodemographic variables (age, sex, race, education, income), anthropometrics (weight, height), lifestyles (smoking, physical activity), and clinical variables (history of hypertension, diabetes, hypercholesterolemia, cardiovascular disease [CVD]) was collected through online questionnaires. Life’s Simple 7 score (excluding diet; information not available) was defined based on self-reported data, giving 1 point per achieved metric [range 0 (lowest)-6 (highest CVH)]. Neurobehavioral variables were measured using validated scales (Cognitive Function Instrument (CFI), range 0-14, for cognition; Patient Health Questionnaire (PHQ)-8, range 0-24, for depressive symptoms; Generalized Anxiety Disorder (GAD) questionnaire, range 0-21, for anxiety; higher scores represent worse function/symptoms). Cross-sectional associations between Life’s Simple 7 score and these scales were assessed using multivariable linear regression adjusting for sociodemographic variables.

Results: We included 3,774 participants [mean age (standard deviation, SD) 58 (13), 79% women, 84% white, 9% African American, 7% other] free of self-reported CVD, recruited between October 2015 and October 2016. Levels of CVH in the cohort were relatively high, with 62% participants meeting at least 4 health criteria [mean (SD) score 3.9 (1.3)]. The mean (SD) of CFI, PHQ-8, and GAD were 1.9 (2.1), 3.2 (3.8), 2.4 (3.4), respectively. In analyses adjusted for age, sex, race, education, and income, higher values of Life’s Simple 7 score were related to better cognitive function and lower levels of depressive symptoms and anxiety: estimates (95% confidence interval) per 1-point in Life’s Simple 7 score were -0.16 (-0.22, -0.11) for CFI, -0.5 (-0.6, -0.4) for PHQ-8, and -0.3 (-0.4, -0.2) for GAD.

Conclusion: Higher levels of CVH, as assessed with the AHA Life’s Simple 7, were cross-sectionally associated with a beneficial neurobehavioral profile. Prospective studies should evaluate the impact of improving CVH on cognitive and emotional health.


Funding: No

Funding Component:

P022

Sex and Racial Differences in Cardiovascular Disease Risk in Patients With Atrial Fibrillation

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Background: Women and African Americans with atrial fibrillation (AF) experience higher rates of stroke compared to men and white AF patients, respectively. However, sex and race differences for cardiovascular outcomes other than stroke have not been specifically evaluated.
Methods: We studied patients with AF in the Optum Clinformatics database between 2009 and 2015 with at least 6 months of enrollment before AF diagnosis. The Optum Clinformatics database includes medical and pharmacy claims and sociodemographic information on privately insured and Medicare Advantage enrollees throughout the US. Endpoints (hospitalizations for ischemic stroke, heart failure (HF), myocardial infarction (MI)) and covariates were defined using validated algorithms. Multivariable Cox models were used to study the association of race and sex with endpoints of interest.

Results: The analysis included 380,636 eligible participants (mean age 73, women 45%). Of them, 82% were white, 9% African American, 7% Hispanic and 2% Asian American. During a mean follow-up of 23 months, 7,235 suffered ischemic stroke, 17,258 HF, and 5,585 MI. Crude rates of ischemic stroke and HF were higher in women than men, while men had higher rates of MI than women (Table). African Americans and Hispanics had higher rates of all studied outcomes than whites and Asian Americans. In models including age, sex, race, education and CHA2DS2-VASc score, women had higher risk of ischemic stroke and lower risk of HF and MI compared to men. Compared to whites, African Americans had 1.4 times the rate of HF and stroke, and 1.1 times the rate of MI, while Asian Americans had 16% lower rates of HF. No major differences were observed between rates in whites and Hispanics (Table).

Conclusion: In a large insured population of patients with AF, we observed differences in rates of selected cardiovascular outcomes by sex and race. Additional research should explore the mechanisms underlying these differences and develop strategies to eliminate them.


Funding: Yes

Funding Component: National Center

P023

Association of Sickle Cell Trait with Common Electrocardiographic Abnormalities in The REasons for Geographic and Racial Differences in Stroke (REGARDS) Study

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Introduction: Sickle cell disease (SCD) arises from an autosomal recessive mutation that leads to progressive vascular obstruction and early death. Sickle cell trait (SCT), the carrier status, is present in ~8% of African-Americans (AA) and is thought to be a benign condition, although evidence now suggests an association with worse cardiovascular and renal outcomes. Electrocardiogram (ECG) changes have been documented in SCD patients; however, similar studies in SCT individuals are lacking. We hypothesized that left ventricular hypertrophy (LVH), atrial fibrillation (AF) and QTc prolongation would be more common in SCT carriers than non-carriers. Methods: SCT was genotyped in 10,731 AA participants in the REasons for Geographic and Racial Differences...
in Stroke (REGARDS) study. Baseline risk factors were recorded from 2003-7. LVH was determined using Sokolow-Lyon criteria for all participants, and Cornell criteria in those with 12 lead ECGs (n = 8,690). AF was based on both self-report and ECG criteria. We assessed the association of SCT with LVH, AF, and QTc using multivariable logistic regression adjusting for age, sex, income, education, self-reported history of stroke, myocardial Infarction, diabetes, hypertension, and chronic kidney disease. Results: Among AA participants with ECG data and genotyping, 787 of 10,553 were SCT carriers (7.5%). AF was present in 814 (7.8%), LVH in 1,556 (14.7%) and QTc prolongation in 357 (3.4%). SCT status was associated with AF with an adjusted OR of 1.36 (95% CI 1.05, 1.76). SCT was not associated with LVH by Cornell criteria or Sokolow-Lyon (OR 1.16; 95% CI 0.94, 1.42). There was a significant age (continuous) by SCT interaction (p=0.02) with SCT associated with increased risk of LVH in younger but not older individuals. When stratified by the mean age of the cohort (65 years), younger individuals with SCT had an OR of 1.50 (95% CI 1.14, 1.97) for LVH, an association not seen in older individuals (OR 0.86; 95% CI 0.63-1.18). QTc prolongation was not associated with SCT (OR 0.97, 95% CI 0.64-1.47). Conclusions: SCT was associated with increased prevalence of AF in all individuals and with LVH in younger but not older individuals and was not associated with QTc prolongation. These data suggest SCT is not benign, and for the first time report the association of SCT with common ECG abnormalities. The association with AF and LVH is concerning with respect to increased stroke risk, especially the increased prevalence of LVH seen at younger ages in SCT. These data raise the question of whether individuals with SCT need more intensive monitoring and/or hypertension control than the general population.


Funding: No

Funding Component:

P024

Administrative Billing Codes Accurately Identify Occurrence of Electrical Cardioversion and Ablation/Maze Procedures in Atrial Fibrillation Patients

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INTRODUCTION: Administrative billing codes for electrical cardioversion and ablation/maze procedures may be useful for research on atrial fibrillation (AF) progression and treatment if the codes are sufficiently accurate relative to medical record documentation. HYPOTHESIS: We hypothesized that administrative billing codes for electrical cardioversion and ablation/maze procedures would accurately identify the occurrence of those procedures. METHODS: We studied adults ages 30-84 years who experienced new onset AF between 10/2001 and 12/2004, and were patients in Group Health, an integrated healthcare system in Washington state. Using medical record review as the gold standard, we assessed the accuracy of administrative billing codes for detecting the occurrence of electrical cardioversion and ablation/maze procedures. We calculated the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for each billing code separately, and collectively for each procedure.

RESULTS: Of 1953 study participants with new onset AF, during a mean of 1.5 (SD 0.7) years of follow-up after AF onset, 470 (24%) experienced electrical cardioversion and 44 (2%) experienced ablation/maze procedures according to medical records. For cardioversion, CPT code 92960 performed better than ICD-9 codes 99.61 and 99.62, with higher sensitivity, PPV, and NPV, but slightly lower specificity. For
ablation/maze, CPT code 93651 and ICD-9 code 37.34 performed identically, yielding higher sensitivity and PPV than ICD-9 code 37.33. For cardioversion and ablation/maze procedures, combining three codes improved sensitivity and NPV while maintaining high specificity and PPV relative to individual codes. (See Table.)

CONCLUSIONS: Administrative billing data accurately identify electrical cardioversion and ablation/maze procedures, and can be used in place of medical record review. Our findings apply to integrated health systems or other settings where administrative billing databases are available.


Funding: No

Funding Component:

P026

Incident Atrial Fibrillation in an African-American Cohort: The Jackson Heart Study

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Introduction: Although many risk factors for atrial fibrillation (AF) are more prevalent in African Americans (AA) than in whites, AF incidence appears to be lower. AF incidence data in AA come largely from US cohorts enrolled in the late 1980s, but the prevalence of risk factors including obesity and smoking has changed over recent decades. Until now, AF incidence information was not available from the Jackson Heart Study (JHS), a community-based cohort study of cardiovascular disease among AAs which enrolled 5,306 participants in 2000-2004. We ascertained AF using two methods, determined age- and sex-specific AF incidence rates, and studied associations of demographic, anthropometric, and cardiovascular risk factors with AF in this contemporary cohort.

Methods: Participant characteristics were ascertained at the baseline study visit. Incident AF cases through 2012 were identified from (1) study ECGs and (2) hospital discharge diagnosis code surveillance. As a second method, incident AF was ascertained from ECG and hospital surveillance supplemented by (3) Medicare claims data for inpatient and outpatient care for those enrolled in fee-for-service Medicare. Age- and sex-specific AF incidence rates in JHS were compared with those of AA participants in the Cardiovascular Health Study (CHS) and Multi-Ethnic Study of Atherosclerosis (MESA). Cox proportional hazards models were used to determine the association of risk factors with incident AF.

Results: Among the 4,557 JHS participants without prevalent AF at baseline and with complete data, prevalence at baseline was high for hypertension (56%, 2,546/4,557) and diabetes (22%, 985/4,557), but relatively low for current smoking (13%, 586/4,557). Among participants without prevalent AF, using all three AF ascertainment sources over an average of 8.5 years of follow-up, we identified 260 incident AF cases. Compared with AF ascertainment from ECG and hospital surveillance alone, the inclusion of Medicare claims data identified incident AF an average of 69 days earlier and led to an additional 41 prevalent and 36 incident AF cases. Compared with AF ascertainment from ECG and hospital surveillance alone, the inclusion of Medicare claims data identified incident AF an average of 69 days earlier and led to an additional 41 prevalent and 36 incident AF cases. Age- and sex-specific AF incidence rates in JHS were broadly similar to those among AAs in CHS and MESA. In a multivariable model, current smoking, hypertension, higher BMI, and a self-reported history of myocardial infarction were all associated with incident AF (HR, 1.70, 95%
CI, 1.16–2.51; HR, 1.77, 95% CI, 1.23–2.55; HR per 5 units, 1.19, 95% CI, 1.08–1.32; and HR, 2.19, 95% CI, 1.51–3.17; respectively).

Conclusions: In JHS, the inclusion of Medicare claims data in AF ascertainment moved the AF diagnosis date earlier on average and increased the number of AF cases identified, showing it to be a key tool in AF ascertainment. The associations of demographic, anthropometric, and cardiovascular risk factors with AF in this contemporary AA cohort were largely similar to those observed in earlier studies of AA participants.


Funding: No

Funding Component:
P027

Type 2 Diabetes Status Does nNt Impact Perceived Barriers to Healthy Eating Among Overweight/Obese Hispanic Women


Background: Hispanic women are disproportionately affected by cardiometabolic disease risk factors including increased adiposity. Addressing barriers to dietary change is an important strategy for ensuring success of behavioral weight loss interventions. However, perceived barriers to healthy eating among Hispanic women have not been thoroughly studied, and how a type 2 diabetes (T2D) or prediabetes (preD) diagnosis and HbA1c levels are related to those perceptions are unknown.

Objective: To examine the association of perceived barriers to healthy eating for weight loss with HbA1c and T2D status among Hispanic women.

Methods: Participants (n=197; 86.9±16.6 kg; 36.6±6.5 kg/m²) of De Por Vida, a culturally-tailored weight loss intervention for adult Hispanic women with or at risk for T2D, completed the Barriers to Healthy Eating (BHE) scale at baseline. The BHE scale was translated into Spanish and slightly modified for use with low-literacy participants. Possible BHE scores range from 22 to 110 for the overall scale, from 11 to 55 for the emotions subscale, from 8 to 40 for the daily mechanics subscale, and from 3 to 15 for the social support subscale, with higher scores indicating greater perceived barriers. Participants were categorized based on their baseline HbA1c concentration as follows: at risk for T2D (n=54; HbA1c <5.7% but history of gestational diabetes, hyperlipidemia or hypertension), preD (n=86; HbA1c ≥5.7% but <6.5%) or T2D (n=57; HbA1c ≥6.5%), regardless of diagnosis in the medical record.

Results: Among all participants, total BHE score was 65.3±20.7, and scores for the emotions, daily mechanics, and social support subscales were 33.3±11.7, 24.8±8.3, and 7.4±3.2, respectively. HbA1c concentrations were negatively correlated with BHE total (r=−.13; p=.06), emotional (r=−.14; p=.06), and social support scores (r=−.17; p=0.02). When HbA1c was examined as a categorical variable (i.e., T2D status) there were no significant associations with any BHE scale score.

Conclusions: In general, participants’ rated their perceived barriers to healthy eating as relatively important problems to their ability to lose weight. There was no evidence that having a preD or T2D diagnosis was associated with their perception of barriers. Given the significant health and economic consequence of a T2D diagnosis, interventions should better address perceived barriers to healthy eating in the preD and T2D population.

Funding source: NIH/NIDDK – 1R01DK099277.
Introduction:
Despite the physical benefits associated with cardiac surgery procedures, between 30-60% of all patients experience moderate to high levels of anxiety and/or depression, which can remain elevated up to 6 months post surgery. Traditional postoperative education classes do not provide an avenue for patients and families to deal with their physical and mental stress. Studies indicate that a holistic class, allowing individuals to focus on their inner-self would prove to have positive outcomes. We hypothesized that a modified yoga program (MY Program), tailored to the physical needs of post cardiac surgery patients, would have a positive effect on participants perceived stress, pain and anxiety levels.

Method:
Postoperative cardiac surgery patients at our institution were eligible to participate in our innovative MY Program during their hospitalization. Sessions were held twice weekly in an education room on the surgical ward, and were led by a certified yoga instructor. Participants were seated, with all positions and postures (asanas) being modified for a seated position. The forty-five minute sessions started and finished with relaxation and meditation, including the incorporation of breathing exercises that are modified to account for post-operative difficulties such as splinting. The patients completed two questionnaires: anxiety questions of the HADS (Hamilton Anxiety and Depression Scale) and a survey regarding their overall experience post-yoga.

Results:
There were 112 participants, of which 61% (68 of 112) were male, age range of 20 to 89. Female patients reported experiencing lower levels of state anxiety compared to men, although not statistically significant ($p = .11$). Overall feelings of anxiety were relatively low-moderate amongst the participants post-yoga anxiety scores. Post-yoga questionnaire data analysis indicated that 98.8% (110 of 112) of patients found the session helpful, 91.1% (102 of 112) thought the setting was comfortable, 93.7% (104 of 112) would attend the class again, 100% (112 of 112) of patients would recommend the class to others, 89.2% (99 of 112) found that the session helped with their pain after surgery, 97.4% (109 of 112) reported that the session helped with their stress, and 91.7% (102 of 112) of patients found that their breathing improved after the class. Overall, males and females agreed on their satisfaction with the yoga intervention.

Conclusion:
Cardiac surgery is physically and mentally challenging for patients and families. Educational sessions do not currently provide adequate stress and anxiety relief. The MY program demonstrated that a holistic yoga class, incorporating breathing exercises, meditation and relaxation techniques reduced levels of stress, pain and anxiety in participants.


Funding: No

Funding Component:
Factors Associated With Participation of Patients With Coronary Artery Disease in a Randomized Study of a Vegan versus American Heart Association-recommended Diet: Interim Analysis


Introduction:
Patients with coronary artery disease (CAD) who make healthy lifestyle changes can greatly impact their disease trajectories. However, the clinical profile of patients more likely to participate in programs aimed at improving lifestyle choices remains uncertain. The objective of this analysis was to examine the baseline clinical profile of patients with CAD motivated to enroll in an eight-week diet study versus those who chose not to enroll.

Methods:
The study population included patients with angiographically-defined CAD (>50% lesion in an artery >2 mm caliber or prior percutaneous coronary intervention) who provided informed consent to participate in a single-center, prospective, blinded end-point, randomized trial assessing the impact of a vegan versus AHA-recommended diet on inflammatory and glucometabolic profiles. Data collection was obtained by direct interview and exam of patients who chose to enroll in and complete the trial. Electronic medical records were reviewed for patients who provided informed consent but subsequently declined to participate in the study prior to any study intervention, including randomization. Normally distributed and skewed continuous variables were examined by enrollment status with independent samples t-test and Mann-Whitney U test, respectively. Categorical variables were examined by enrollment status by Fisher’s exact test or Chi-square test.

Results:
Of the 90 patients consented, 60 chose to enroll into the study while 30 chose not to enroll. Compared to those who chose to participate in the study, those who chose not to participate were less likely to be of white race (70% (21/30) vs. 85% (51/60), p=0.002). Other demographic variables including age, sex, ethnicity or BMI did not differ by enrollment. Regarding medical history, patients who chose not to participate were more likely to have diagnoses associated with cardiovascular risk, including hypertension (86.7% (26/30) vs. 56.7% (34/60), p=0.005), hyperlipidemia (96.7% (29/30) vs. 71.7% (43/60), p=0.005), and diabetes mellitus (43.3% (13/30) vs. 21.7% (13/60), p=0.048). Analyses of laboratory parameters revealed that patients who did not participate in the study also had poorer risk factor control, including higher hemoglobin A1c (6.0% (IQR 5.7-7.8%) vs. 5.8% (IQR 5.5-6.3%), p=0.043) as well as lower HDL cholesterol levels (42 g/dL (IQR 34-47) vs. 45 g/dL (IQR 37-55), p=0.046).

Conclusion:
Among this sample of patients with angiographically-defined CAD, those who chose not to participate in an eight week dietary intervention to lower disease risk were more likely to be of a minority race with a higher proportion of poorly controlled cardiovascular risk factors at baseline. This analysis emphasizes the need for health care teams to consider different strategies of encouraging these high-risk patients to enroll in programs aimed at healthy lifestyle changes.


Funding: No

Funding Component:

P030

Recruitment and Effectiveness by Cohort in a Case Management Intervention Among
American Indians and Alaska Natives with Diabetes

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Introduction: To determine the optimal strategies for effective large-scale implementation of evidence-based interventions, it is critical to investigate continued effectiveness as an intervention rolls out to large, diverse populations. The purpose of this study is to evaluate whether patient characteristics and intervention effectiveness differ by year of enrollment in a multi-year evidence-based translational intervention.

Hypothesis: We hypothesize the patients recruited early may have a higher level of readiness to change their behaviors and achieve more improvements in their intervention outcomes than patients enrolled in later years.

Methods: The Special Diabetes Program for Indians Healthy Heart (SDPI-HH) Demonstration Project is an intensive case management intervention designed to reduce cardiovascular disease (CVD) risk among American Indian and Alaska Native patients with diabetes. SDPI-HH participants recruited from 2006 through 2008 were included (n=2,910). Baseline characteristics were compared by year of enrollment. We also evaluated the differences in improvements in CVD risk factors among participants recruited in different years.

Results: The baseline characteristics of the three cohorts revealed significant differences in demographics, diabetes duration, health behaviors, level of motivation, and clinical measures. Improvements in 13 clinical and behavioral outcomes differed by enrollment year with the 2006 cohort having the greatest number of statistically significant improvements (Table 1). The 2006 cohort also had the highest rates of participant participation and retention.

Conclusions: The SDPI-HH participants recruited later had fewer improvements in CVD risk factors, potentially due to the decline in participant motivation over the three years. Further investigation into ways to modify the intensive case management model to address differences in levels of motivation and participation is warranted to improve the prevention of chronic disease in Indian health.


Funding: No

Funding Component:

P031

Mediation Effect of Abdominal Adiposity Between Sedentary Lifestyle and Blood Pressure in General Population From a Middle-income Country

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Background. Hypertension is a highly prevalent risk factor for cardiovascular disease (CVD). Middle-income countries have experienced
accelerated urbanization resulting in a growing prevalence of sedentary lifestyle (SL) behavior and a trend toward obesity that might explain population-level changes in blood pressure (BP). We aimed to evaluate the association of SL and adiposity on BP.

**Methods.** We analyzed data from two surveys conducted on representative samples (15-64 years old) from Santander (Colombia) in 2010 (n=2,419) and 2015 (n=2,158) following the WHO STEPwise approach to assess risk factors for CVD. Physical activity was measured using the GPAQ questionnaire and SL was defined as the lowest level of activity according to the WHO criteria. We measured waist circumference (WC [cm]) and calculated body mass index (BMI [kg/m²]) and waist-to-hip ratio (WHR) as indexes of adiposity. BP was measured using an Omron® automatic monitor in sitting position (average of two measurements). Associations were estimated, incorporating post-stratification weights, using censored normal multiple regression (accounting for antihypertensive therapy) and mediation approached by Baron’s criteria.

**Results.** Mean systolic/diastolic (S/DBP) were 119.2 (95%CI: 118.7-119.7) / 73.7 (95%CI: 73.4-74.1) mmHg and 1 out 6 participants were hypertensive (2015/2010 prevalence ratio=1.02, p>0.050). BMI, WC and WHR were positively and significantly correlated with systolic (r=0.16, r=0.39, and r=0.41) and diastolic BP (r=0.18, r=0.38, and r=0.33). Sedentary as compared to active participants had higher age- and sex-adjusted WC (1.1 cm, p=0.008) and WHR (0.01 units, p<0.001). SL prevalence was 62.0% (95%CI: 59.8-64.1) and changed across tertiles of SBP (66.4%, 60.3%, and 59.6%) and DBP (59.3%, 63.1%, and 63.1%); however, SL was only associated to higher DBP after adjustment by age, sex, and area of residency (0.8 mmHg, p=0.036). Further inclusion of BMI, WC, or WHR attenuated the strength of the association in 16.7%, 42.3%, and 61.7%, respectively. There was no survey-by-sedentary lifestyle interaction.

**Conclusion.** SL is highly prevalent in a middle income country such as Colombia. We confirmed the association of this behavioral risk factor and DBP but not SBP. Furthermore, the attenuation of such relationship by anthropometric indexes, particularly of abdominal obesity, suggests a mediation effect of adiposity that must be validated in longitudinal studies.

Disclosures: M.V. Herrera: None. J. Otero: None. C. Clausen: None. S. González-Gómez: None.

Funding: No

Funding Component:

**P032**

**Increased Abdominal Aortic Diameters on Multidetector CT Scan Are Independent Predictors of Incident Adverse Cardiovascular Events: The Framingham Heart Study**

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**Introduction:** Adverse aortic remodeling, such as dilation, is cross-sectionally associated with multiple cardiovascular disease (CVD) risk factors. We sought to determine whether increased, though not necessarily aneurysmal, abdominal aortic diameters augment prediction of incident adverse CVD events above standard CVD risk factors in a community-dwelling cohort. This may be useful since the aorta is often incidentally visualized on computed tomography (CT) body scans performed for indications other than CVD risk stratification.

**Methods:** Participants (N=3318, aged 50±10y, 51% M) from the Framingham Offspring and Third Generation Cohorts who were free of clinical CVD, had complete risk factor profiles (collected at the adjacent cycle exams), and had
non-contrast, abdominal multidetector CT scans (MDCT) during 2002-2005 were included in this study. Anteroposterior (AP) and left-right (LR) diameters were measured in the infrarenal (IAA) and lower abdominal (LAA) aorta. The IAA was measured at 5 cm above the aortoiliac bifurcation and the LAA was measured at one slice level (2.5mm) above the bifurcation of the abdominal aorta into the common iliac arteries. For each segment, the greater of AP and LR diameters was used in the analyses. Adverse events comprised CVD death, myocardial infarction, coronary insufficiency, index admission for heart failure, and stroke. For each aortic segment, hazard of an adverse event for enlarged IAA or LAA diameter (enlarged was defined as ≥ upper 90th percentile diameter for age, sex and BSA) was determined using multivariable (MV) adjusted Cox proportional hazards models.

Results: Over a mean 8.8±2.0y of follow-up, there were 149 incident adverse CVD events. In multivariable models adjusted for traditional CVD risk factors, enlarged IAA was associated with greater hazard of an adverse CVD event (HR 1.62; 95% CI 1.07-2.46; p=0.022). However, the association of enlarged LAA with adverse CVD events was borderline (HR 1.56; 95% CI 0.99-2.46; p=0.054).

Conclusion: Among community-dwelling adults initially free of clinical CVD, enlarged infrarenal abdominal (IAA) aortic diameter, as determined from noncontrast MDCT scans, augments prediction of incident adverse CVD events above traditional risk factors alone.


Funding: No

Funding Component: P034

Comparison of the Prognostic Value of 1,5-anhydroglucitol (1,5-AG) and the Oral Glucose Tolerance Test (OGTT) in the Atherosclerosis Risk in Communities (ARIC) Study

Bethany Warren, Alexandra K Lee, Johns Hopkins Univ, Baltimore, MD; Christie Ballantyne, Ron Hoogeveen, Baylor Coll of Med, Houston, TX; James S Pankow, Univ of Minnesota, Minneapolis, MN; Anna Kottgen, Elizabeth Selvin, Johns Hopkins Univ, Baltimore, MD

Introduction: 1,5-AG is a biomarker that reflects hyperglycemic excursions. Unlike the OGTT, 1,5-AG requires only a single blood draw and is a non-fasting test. It is unknown if 1,5-AG could serve as a substitute for OGTT and whether it provides complementary information to fasting glucose (FG) for prediction of diabetes and long-term clinical outcomes.

Methods: We included 6,711 ARIC participants without diagnosed diabetes, chronic kidney disease (CKD), and CVD that attended visit 4 (1996-98). Participants were followed for up to 18 years for incident diagnosed diabetes, CKD, CVD, and all-cause mortality. We used Harrell’s C-statistic from Cox models to compare the prognostic value of 1,5-AG to OGTT beyond a base model of demographic factors and body mass index. Restricted cubic splines (4 knots) were used to flexibly model the biomarkers with each of the outcomes.

Results: Both OGTT and 1,5-AG provided information beyond the base model for risk discrimination of incident diagnosed diabetes (p<0.05; Table). However, OGTT provided statistically significantly more information than 1,5-AG (difference in C-statistic: 0.087 (95%CI, 0.075, 0.099)). While 1,5-AG otherwise did not provide more information for future outcomes than the base model, OGTT statistically significantly improved the base model for prediction of CKD, CVD, and all-cause mortality. For incident diagnosed diabetes, inclusion of FG in the models maintained that OGTT provided more information than 1,5-AG for risk discrimination. Inclusion of all three biomarkers
(FG, 1,5-AG, and OGTT) was not statistically significantly better than a model with FG and OGTT for future diagnosed diabetes \((p=0.687)\).

**Conclusion:** 1,5-AG could not sufficiently substitute for the OGTT as a test to identify those at risk of future diabetes. Additionally, glycemic excursions captured by 1,5-AG did not provide additional prognostic value beyond glucose-based tests among those without diagnosed diabetes, suggesting the utility of 1,5-AG is limited to persons with overt diabetes.


**Funding:** No

**Funding Component:**

**P034**

**Comparison of the Prognostic Value of 1,5-anhydroglucitol (1,5-AG) and the Oral Glucose Tolerance Test (OGTT) in the Atherosclerosis Risk in Communities (ARIC) Study**

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**Background:** The potential role of the marine omega-3 fatty acids (FA) EPA and DHA in cardiovascular disease (CVD) is unclear. Diet- and biomarker-based prospective studies have shown cardioprotective associations while several recent (relatively low dose, short term) randomized trials have shown no benefit.

**Methods:** We examined CV outcomes and death in 2899 individuals in the Framingham Heart Study Offspring cohort (mean age 66 years, 54% women; 399 individuals had prior CVD) as a function of baseline levels of EPA+DHA in erythrocyte membranes (the Omega-3 Index). The latter is expressed as a % of total membrane FAs and is a validated surrogate for tissue EPA+DHA content. Clinical outcomes were monitored for up to 9.5 years (median follow up, 7.26 years). Cox proportional hazards models stratified by prior CVD were adjusted for a variety of demographic characteristics, clinical status and RBC omega-6 FA content.

**Results:** There were 296 CV events, 157 CHD events, 116 ischemic strokes, 76 CVD deaths, and 362 deaths from all causes. A 1-SD higher Omega-3 Index was associated with significantly lower risks for total CVD (29%), ischemic stroke (39%), and total mortality (24%) (Table). In individuals in the bottom 20% of Omega-3 Index (vs. the top 20%, i.e., <4.2% vs >6.8%) risk was reduced by 44% for any CV event, by 65% for ischemic stroke, by 65% for CHD death, and by 53% for death from any cause (Table). Relations with these outcomes for EPA and DHA separately were weaker than for the combined metric but in the same direction.

**Conclusions:** Higher circulating levels of the marine omega-3 fatty acid levels are associated with reduced risk for incident CVD and ischemic stroke and for death from CHD and all-causes. Evidence for a causal connection between omega-3 fatty acids and these outcomes must await the results of longer-term and/or higher-dose intervention studies that are currently in progress.

**Disclosures:** W. Harris: F. Ownership Interest; Significant; OmegaQuant Analytics, LLC. N. Tintle: None. S.J. Robins: None. R.S. Vasan: None.

**Funding:** No

**Funding Component:**

**P037**

**Epigenetic Markers of Cardiovascular Health Trajectories and Coronary Artery Calcification in the Coronary Artery Risk Development in Young Adults (CARDIA) Study**

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**Background:** Trajectory of AHA’s cardiovascular health (CVH) through young adulthood are associated with subclinical CVD. The human epigenome is modifiable by lifestyle and environmental factors and may be an important mechanism of CVH outcomes. We sought to determine associations of epigenetic markers with CVH trajectories and with coronary artery calcification (CAC) through young adulthood.

**Methods:** Among CARDIA ppts, we performed methylome analysis at follow up year (Y) 15 and
Y20 using Illumina Methylation EPIC array (~850K CpG loci). We compared methylation between those with optimal CVH at baseline and remained stable (optimal-stable, n=645) and individuals with baseline optimal but declining CVH during follow up (n=100) to identify methylomic biomarkers of CVH trajectories. Differentially methylated CpGs were further examined in association with incident CAC risk at Y25 (n=745), and for their potential mediating role in CVH-associated CAC risk. Results: In 1,087 CARDIA pts (mean age=25 at baseline), we identified 25 hypermethylated CpGs (18 at Y15, 13 at Y20, including 6 seen at both Y15 and Y20) significantly associated with optimal-stable CVH trajectories. The 6 common CpGs were stable (mean ICC = 0.66) whereas the remaining 19 CpGs were dynamic (mean ICC = 0.39) over a 5-year interval. Hypermethylation of 6 stable CpGs was associated with a decreased risk of having future CAC incidence (Table 1). Hypermethylation of 10 (out of 19) dynamic CpGs at Y20 was associated with a decreased risk for incident CAC while the associations was less pronounced at Y15. Mediation analyses showed that hypermethylation of these 16 CpGs at Y15 and Y20 contributed 15% and 23% reduction in the CVH-associated relative risks (RRs) of CAC incidence at Y25. Conclusion: We observed distinct methylomic patterns in young adulthood with stable optimal CVH trajectories relative to those with declining CVH. CVH associated methylomic marks may predict CAC incidence and potentially mediate the associations of CVH trajectories with incident CAC risk.


Funding: Yes

Funding Component: National Center

P038

Serum Calcium, 25-hydroxyvitamin D and Incidence of Abdominal Aortic Aneurysm: The Atherosclerosis Risk in Communities Study

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Introduction: Serum concentrations of calcium and 25-hydroxyvitamin D [25(OH)D] may potentially contribute to the development of abdominal aortic aneurysms (AAA), likely predominately through established AAA risk factors such as hypertension and inflammation. To date, no prospective epidemiologic studies have examined the association between calcium and 25(OH)D and AAA risk. Hypothesis: We hypothesized that 20-year risk of AAA is higher among individuals with elevated serum calcium and among those with low serum of 25(OH)D. Methods: Serum calcium and 25(OH)D were measured in Atherosclerosis Risk in Communities (ARIC) study participants without prior AAA and who attended visit 2 (1990-92) (N=13,452). Serum calcium was corrected for serum albumin. AAA events were identified through 2011 via annual follow-up phone calls for hospitalized AAAs, and through Medicare for both hospitalized and outpatient AAAs. Multivariable Cox proportional hazards models were
used. Calcium was modeled as quartiles and 25(OH)D as <10, 10–<20, 20–<30, ≥30 ng/ml. Additionally, sex-stratified analysis was conducted.

**Results:** The participants were mean±SD age 57±6y, 44% men and 75% white. Mean serum concentrations were 9.2±0.4 mg/dl for calcium and 24.3±8.5 ng/ml for 25(OH)D. Over a median 19.7 years of follow-up, 484 AAA cases were identified. High serum calcium was associated with an increased incidence of AAA [HR Q4 v Q1=1.60 (95% CI: 1.24-2.08)] after adjustment for demographics and with additional adjustment for height, weight and smoking [1.39 (1.05-1.82)], but not after other CVD risk factors were controlled for [1.20 (0.91-1.58)]. In the fully adjusted model, a sex-interaction was present [p-value sex*calcium interaction=0.03], whereby the association was present in women [2.28 (1.20-4.34)] not men [1.05 (0.75-1.47)]. Those with 25(OH)D ≥30 ng/ml vs. <10 ng/ml had a HR for AAA of 1.54 (1.03-2.29) after demographic adjustment, but the association was attenuated with further adjustment for height, weight and smoking [1.24 (0.82-1.88)]. No sex-25(OH)D interaction was detected. As such, stratified results are not presented.

**Conclusions:** In this large prospective cohort, there was little evidence that markers of vitamin D metabolism are associated with risk of incident AAA. The positive association of calcium with AAA among women may warrant further investigation and replication in other populations.


Funding: No

Funding Component: P039

**Factors in Those at Risk for Myocardial Infarction**

**Jonathan H Chung,** Amit K Dey, Abhishek Chaturvedi, Joshua P Rivers, Joseph B Lerman, Charlotte L Harrington, Mark Ahlman, Martin P Playford, Scott M Gordon, Aditya A Joshi, Alan T Remaley, Marcus Chen, David A Bluemke, Nehal N Mehta, Natl Insts of Health, Bethesda, MD

**Introduction:** Cholesterol efflux capacity (CEC), a measure of high density lipoprotein (HDL) function, has been shown to be associated with future cardiovascular (CV) events. Lipid rich plaque is associated with higher plaque rupture and future CV events, and can be readily phenotyped by coronary CT angiography (CCTA). Whether CEC associates with lipid rich plaque is not known.

**Hypothesis:** We hypothesize that CEC associates with lipid rich plaque in those at risk for myocardial infarction (MI).

**Methods:** Consecutively recruited patients (N=94) underwent CCTA (Toshiba 320 slice) to assess plaque burden within the coronary arteries by QAngio CT (Medis, The Netherlands); history was obtained and statin use was recorded. CEC was measured using an ex vivo validated assay.

**Results:** The study population mean age was 61 and had normal cholesterol, HDL, low density lipoprotein (LDL), and triglyceride levels (Table 1). CEC was 1.03 ± 0.17 while total plaque and lipid rich plaque were 1.05 (0.79-1.37) mm² and 1.00 (0.77-1.33) mm², respectively. Lipid rich plaque inversely associated with CEC beyond adjustment for age, gender, systolic blood pressure, statin treatment, total cholesterol, LDL, and HDL (β= -0.18, p=0.002).

**Conclusion:** CEC associated with lipid rich plaque independent of CV risk factors to provide additional risk stratification in those at risk for MI and early atherogenesis.

**Clinical Implications:** My study will help cardiovascular clinicians to better understand that HDL function may capture additional CV risk in those at risk for future MI.

**Lipid Rich Plaque by Coronary CT Angiography Associates With Cholesterol Efflux Capacity Independent of Traditional Cardiovascular Risk**


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Quitting Smoking Reduces Lectin-like Low-density Lipoprotein Receptor-1 index, an Independent Cardiovascular Risk Marker of Vascular Inflammation

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Background: Vessel walls Inflammation is involved in the destabilization of atherosclerotic plaques. Lectin-like low-density lipoprotein (LDL) receptor-1 (LOX-1) is an oxidized LDL receptor expressed in vascular cells and monocytes. The LOX index is calculated by multiplying the concentration of LOX-1 ligand containing apolipoprotein B with the concentration of soluble LOX-1. A high LOX index reflects an increased risk for stroke and myocardial infarction. Fortunately, the cardiovascular risk decreases within 2 years after smoking cessation. However, no study has investigated the potential of the LOX index as a cardiovascular risk marker in smokers, and the relationship between the LOX index and smoking cessation. Purpose: The present study investigated the change of cardiovascular risk marker, LOX index, after smoking cessation and the relationship between smoking-related factors and LOX index. In addition, the present study investigated the impact of smoking cessation on the LOX index. Methods: Relation of the clinical parameters to the LOX index was examined on 207 subjects (155 males and 52 females) at the first visit to our outpatient clinic for smoking cessation. All anti-smoking treatments were conducted according to the Standard Procedures for Anti-Smoking Treatment (originally issued in March 2006 by the Japanese Circulation Society, Japan Lung Cancer Society, and Japanese Cancer Association). The patients were treated with transdermal nicotine patches or the oral administration of varenicline. Among patients who attended our smoking cessation clinic, 94 subjects (62 males and 32 females) successfully quit smoking. We determined their LOX index at baseline on their first visit and repeated it 3 months after beginning smoking cessation to assess the impact of smoking cessation on the LOX index. Results: Sex-adjusted regression analysis and multivariate analysis identified three independent determinants of the LOX index, namely low-density lipoprotein-cholesterol (LDL-C; β = 0.273, p = 0.002), high-sensitivity C-reactive protein (β = 0.324, p < 0.001), and expired carbon monoxide concentration reflecting the amount of smoking (β = 0.225, p = 0.008). Body mass index (BMI) significantly increased 3 months after the onset of smoking cessation (p < 0.001). However, the LOX index significantly decreased from baseline to 3 months (from 3.31 to 2.57; p < 0.001), regardless of the rate of increase in BMI post-cessation. Conclusions: The LOX index is closely associated with hsCRP, a common inflammatory...
marker, suggesting that LOX-1 is involved in cardiovascular events by inducing vessel wall inflammation. Our results also suggest that the LOX index is useful for evaluating the effects of smoking cessation intervention on cardiovascular risk reduction. In addition, smoking cessation may induce a decrease in this cardiovascular risk marker, independently of weight gain.


Funding: No

Funding Component:

P041

New Biomarkers for Detecting and Subtyping Insulin Resistance

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Introduction: The metabolic abnormalities that precede type 2 diabetes progress slowly and in stages. Current evidence-based diabetes prevention programs target individuals in Stage 2 (impaired glucose tolerance or prediabetes). However, by that stage, 70% of pancreatic beta-cell insulin secretory capacity has been lost irreversibly. Thus, it is imperative to identify individuals in Stage 1 (early insulin resistance syndrome) in order to preserve pancreatic insulin secretion and prevent both diabetes and prediabetes. Early insulin resistance syndrome is characterized by compensatory hyperinsulinemia, dyslipidemia, sub-clinical inflammation and acid-base abnormalities. The nature of the association between these elements is unclear, and different subtypes of insulin resistance syndrome may exist.

Hypothesis: We have developed two novel and unconventional biomarkers for characterizing insulin resistance in non-diabetic subjects. One approach is based on dynamic light scattering (DLS) of human serum. The second approach measures the T2 relaxation time of water in human plasma using compact time-domain NMR relaxometry (TD-NMR). We hypothesize that these methods can detect subtypes, i.e., insulin resistance with or without inflammation, hypercholesterolemia, or acid-base abnormalities.

Methods: Seventy-two asymptomatic non-diabetic human subjects were recruited through an IRB-approved biomarker discovery protocol. Medical histories, anthropomorphic measurements and fasting blood samples were obtained, and over 1300 blood biomarkers were measured on each subject along with DLS and TD-NMR parameters. Bi-variate correlation analyses and multiple regression models were used to analyze continuous variables, and categorical variables were established for insulin resistance, inflammation, acid-base abnormalities and lipid abnormalities. Multiple means comparisons were performed using one-way ANOVA and Tukey-Kramer testing.

Results: Plasma water T2 from TD-NMR was strongly correlated with markers of early insulin resistance syndrome. Multiple regression analysis showed independent contributions from markers of hyperinsulinemia, hypercholesterolemia and inflammation. Multiple means comparisons showed significant differences for insulin resistance with and without inflammation. By contrast, DLS parameters were strongly correlated with insulin markers, but could not distinguish the inflammatory subtypes.

Conclusions: Both TD-NMR and DLS are able to detect early insulin resistance in individuals who do not meet the criteria for prediabetes or metabolic syndrome. However, TD-NMR has the unique ability to distinguish inflammatory vs. non-inflammatory subtypes of insulin resistance. Subtyping and risk stratification are important for the design of personalized
interventions to prevent diabetes, prediabetes and cardiovascular disease.

Disclosures: D.P. Cistola: None. I. Mishra: None. V. Patel: None. R. Patel: None. S. Deodhar: None.

Funding: No

Funding Component:

P042

Coffee Intake and the Risk of Subclinical Myocardial Damage, Cardiovascular Events and All-cause Mortality

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Introduction: Whether coffee intake is protective against cardiovascular disease (CVD) risk and mortality is controversial and putative mechanisms are incompletely understood, but prior studies may be confounded by a “healthy user” effect. Hypothesis: Habitual coffee consumption would not be associated with subclinical myocardial damage assessed using high-sensitivity cardiac troponin T (hs-cTnT), CVD events (coronary heart disease, heart failure or stroke) and all-cause mortality, after adjustment for rigorously measured confounders.

Methods: We evaluated 11,281 ARIC participants free of CVD at baseline (Visit 2, 1990-1992). Coffee consumption was assessed via a modified food frequency questionnaire at Visit 2 and categorized according to number of cups/day. We used logistic regression models adjusted for demographic characteristics, smoking status and traditional CVD risk factors to test the cross-sectional associations with hs-cTnT, and adjusted Cox models for incident CVD events and mortality.

Results: Mean age of participants was 57 years, 58% were women and 24% black. In cross-sectional analyses, compared to individuals reporting “almost never” having consumed coffee, no significant association was found between higher levels of coffee consumption and elevated hs-cTnT (OR for ≥6 cups/day vs. almost never 0.69; 95% CI 0.39, 1.21; Table). In prospective analyses, the association between coffee and incident CVD was not significant (HR for ≥6 cups/day vs. almost never: 1.15; 95% CI 0.99, 1.34; Table). Compared to almost never consuming coffee, 2-3 cups/day was associated with reduced risk of all-cause mortality and ≥6 cups/day with elevated risk of all-cause mortality (Table).

Conclusion: In this bi-racial cohort of middle-aged adults, coffee intake was not associated with subclinical myocardial damage or CVD. However, moderate coffee consumption may be associated with a modestly reduced risk of all-cause mortality and very high coffee consumption with a mild increase in all-cause mortality.
Higher Levels of CRP and IL-6 are Associated With Femoral Artery Plaque Presence, but Not Plaque Characteristics: The San Diego Population Study (SDPS)

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Introduction: The potential involvement of c-reactive protein (CRP), interleukin (IL)-6 and intracellular adhesion molecule (ICAM)-1 in the destabilization, erosion, or rupture of arterial plaque, particularly plaques in the lower extremity arteries is not well-established. Thus, we sought to determine whether circulating levels of CRP, IL-6, and ICAM-1 were associated with the presence, burden, and characteristics of femoral artery plaques. Methods: The San Diego Population Study is a prospective, population-based, multi-ethnic cohort of 1103 men and women averaged age 70 at a follow up exam taking place from 2007-11. At this exam, B-mode ultrasound was used to measure plaque presence, burden, and characteristics, including total plaque area (TPA), mean grey-scale median (GSM), and presence of calcification. Plaques were assessed in the left and right superficial and common femoral arteries. Plaque presence was defined as any plaque in any arterial segment, while plaque burden was total number of plaques summed over all four segments. Circulating CRP, ICAM-1, and IL-6 were also measured at this exam. Associations of CRP, IL-6, and ICAM-1 with plaque presence and burden were assessed using logistic and zero-inflated Poisson regression, respectively. Among those with plaque, linear and logistic regression were used to assess associations of the biomarkers with plaque characteristics. All models adjusted for age, sex, race/ethnicity, BMI, BP, statin use, smoking status, diabetes, peripheral artery disease, and chronic kidney disease. Results: Higher circulating CRP was significantly associated with plaque presence with participants in the highest quartile of CRP having 1.8 times higher odds of having femoral plaque compared to those in the lowest quartile. Participants in the highest quartiles of CRP and IL-6 were significantly more likely to have greater plaque burden compared to those in the lowest quartiles (CRP OR=1.64, 95% CI=1.09-2.44; IL-6 OR=1.65, 95%CI=1.06-2.55). No associations were observed between circulating biomarkers and plaque characteristics, including TPA, GSM, or calcification. Conclusions: Higher levels of circulating CRP and IL-6 are associated with greater plaque burden in the femoral arteries of participants in the SDPS; however, these biomarkers do not appear to be associated with characteristics of femoral artery plaques. These results are consistent with findings in the carotid and coronary arteries.


Funding: No

Funding Component:
Male Sex Synergistically Interacts with Serum Corin on Metabolic Syndrome in Chinese Adults

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Background
Metabolic syndrome is a key modifiable risk factor for cardiovascular disease (CVD). We previously found an increased level of serum corin in some metabolic disorders, such as diabetes, hypertension, dyslipidemia, and obesity. However, the association between serum corin and metabolic syndrome has not yet been studied in humans.

Methods
We examined serum soluble corin using immunoassays for 2,498 Chinese adults free of CVD. Metabolic syndrome was defined as ≥ 3 components of the 5 metabolic abnormalities - raised blood pressure, increased triglycerides, reduced high density lipoprotein cholesterol, hyperglycemia, and central obesity. Logistic regression model was applied to examine the association of serum corin with metabolic syndrome adjusting for age, smoking, and drinking in men and women, respectively.

Results
The mean age was 53 ± 9 years. Serum corin was significantly increased in participants with metabolic syndrome in both men (mean: 2457.8 vs. 2126.6 pg/mL, P < 0.001) and women (mean: 1607.4 vs. 1515.2 pg/mL, P < 0.001) compared with those without metabolic syndrome. Serum corin was significantly associated with metabolic syndrome in both genders but this association appeared stronger in men (OR = 1.69, 95%CI: 4.16-1.96, P < 0.001) than women (OR = 1.19, 95%CI: 1.06-1.33, P = 0.003). The OR of metabolic syndrome for participants with male sex and high corin (> median) was higher than the sum of ORs for those with either male sex or high corin only. About 42% (95% CI: 0.240-0.598) of metabolic syndrome risk could be attributed to the interaction between male sex and high corin.

Conclusions
Serum corin is significantly and positively associated with metabolic syndrome and its individual components in Chinese adults. Male sex could synergistically interact with Corin on metabolic syndrome. The relationship between serum corin and metabolic syndrome warrants further investigation.

Disclosures: H. Peng: None. Q. Zhang: None. X. Cai: None. X. Chao: None.

Funding: No

Funding Component:

P045

The Association Between Cigarette Smoking and Cardiovascular Inflammation: The Genetic Epidemiology Network of Arteriopathy Study

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Background: To assist in the regulation of novel and existing tobacco products, there is a need to identify biomarkers of early cardiovascular
damage following tobacco exposure. Our prior work suggests that inflammatory markers, in particular high-sensitivity C-reactive protein (hsCRP), may be sensitive markers of tobacco mediated cardiovascular damage. We aimed to further study the association of smoking and inflammation in a cohort with hsCRP and 11 other measures of inflammation associated with cardiovascular disease (CVD) risk.

Methods: We conducted a cross-sectional analysis on 2,550 siblings diagnosed with essential hypertension prior to age 60 years. Cigarette smoking was assessed by status, intensity, pack-years, and time since quitting. We modeled each biomarker per standard deviation after natural log transformation and evaluated the association between smoking and biomarkers using generalized estimating equations (GEE) to account for intra-familial correlations. Models were adjusted for demographics and CVD risk factors.

Results: The mean age of participants was 61±10 years; 64.5% were women and 54.4% African American. There were 12.2% current smokers and 32.2% former smokers. Compared to never smokers, current smokers had significantly higher levels of 8 inflammatory biomarkers (Table). In analyses of other smoking variables, there was a consistent association with hsCRP but not other biomarkers. HsCRP was positively associated with pack-years of cigarette smoked and inversely associated with time since quitting, but not with smoking intensity. There was a significant difference in hsCRP levels among current smokers by race (p for interaction=0.005). On average, hsCRP was higher among African American [0.445 (0.283, 0.606)] compared to White smokers [0.183 (0.011, 0.356)].

Conclusion: Biomarkers of inflammation, especially hsCRP, may allow for early detection of cardiovascular injury due to cigarette smoking and could be useful for the study and regulation of emerging tobacco products.


Funding: No

Funding Component: P046

Cardiometabolic Risk Liver Transplant Survivors

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BACKGROUND: Coronary heart disease (CHD) is an important cause of long-term mortality in liver transplant recipients (LTR). LTR are at increased risk for CHD-related mortality due to exposure to chronic immunosuppression contributing to cardiometabolic risk. Physical activity (PA) and nutrition are important lifestyle management tools used in clinical practice to reduce CHD risk, however, little is known about the long-term effects of these strategies in LTR. OBJECTIVE: The aim of this study was to evaluate PA and diet and correlate findings with the atherogenic lipoprotein profile, obesity and 10-year risk of CHD. METHODS: LTR (≥ 2 years post LT; stable immunosuppression) without documented CHD, diabetes, graft cirrhosis, physical limitations, and malignancy were included. PA was quantitated via International Physical Activity Questionnaire (IPAQ). Anthropometric assessment was used to obtain body mass index (BMI) and waist hip ratio (WHR). NMR Lipoprotein profile was used to
obtain athrogenic lipoprotein concentration and size followed by generic lipid profile. Food preferences were evaluated via Olbrisch Eating Style Questionnaire and Diet History Questionnaire. CHD risk was assessed by Framingham Risk Score (FRS).

RESULTS: Of 122 subjects screened, 27 met entry criteria. Most were overweight (N=11) or obese (N=8) with mean BMI 28.5 kg/m$^2$ ($SD=4.05$; range=20.2-37.8) and mean WHR= 0.94 ($SD=0.22$; range=0.65-1.85). According to IPAQ, 20 patients (75%) were sedentary. Eating style and food preference choices suggested that 23 (85.2%) were unable to control portion sizes and 14 (51.9%) preferred sugar, fat, or starches in their diet. Fasting glucose was 98.8mg/dL ($SD=14.2$, range=78-133) suggesting 7 participants were “pre-diabetes” and 2 undiagnosed type 2 diabetes. Four reported smoking; of these, one was highly nicotine dependent. FRS was 7.15% ($SD=6.15$, ranged 7-23). While the calculated total cholesterol 166.44 ($SD=34.15$), HDL 55.19 ($SD=15.31$), LDL 84.56 ($SD=26.58$), and TG 143.44 ($SD=76.29$)(all in mg/dL) were within normal range, numbers and sizes of lipoprotein particles indicate that LTRs were at moderate risk of CHD: LDL-C $1221.48$ ($SD=447.31$$)>1000$ nmol/L as reference), small LDL-P 799.81 ($SD=489.95$) $>527$ nmol/L, Large VLDL-P 2.93 ($SD=4.35$) $>2.7$ nmol/L, and VLDL size 51.07 ($SD=9.74$) $>46.6$ nm. PA (more time sitting) was associated with higher BMI ($r=0.394$, $P<0.05$) and WHR ($r=0.535$, $P<0.01$) but not with particle number or density. PA (MET minutes/week) was associated with WHR ($r=0.535$, $P<0.01$). Neither PA nor nutrition (Kcal/day) was associated with FRS.

CONCLUSION: LTR are generally inactive and make poor dietary choices which are reflected by the obesity indices and characterized by the atherogenic lipoprotein profile.


Funding: No
BIC and AIC. Model discrimination was assessed using Harrell’s c-index. **Results**: Within the FRS 10-year risk groups 0-<5%, 5-<10%, 10-<20%, and 20+%, the estimated 10-year CVD event rates were 3% (95%CI: 2-5%), 7% (5-10%), 15% (13-18%) and 22% (17-27%), respectively. Hand grip strength did not add predictive value above standard Framingham risk factors (p=0.25). CRP made a contribution to estimating global CVD risk (p=0.002). Both the BIC and AIC were reduced (4.9 and 7.9 units, respectively) and the c-index increased from 0.727 to 0.732 (SE=0.024). **Conclusions**: A global risk prediction model that includes serum CRP improves CV risk classification in men.


Funding: No

Funding Component:

P048

**Risk Factors for Severe Hypoglycemia Differ in Black and White Older Adults With Diabetes: the Atherosclerosis Risk in Communities (ARIC) Study**

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**Introduction**: Blacks with diabetes have roughly twice the rate of severe hypoglycemia compared to whites with diabetes; it is unclear whether hypoglycemia risk factors identified in studies of white participants are similarly associated with hypoglycemia in blacks. **Methods**: We included ARIC participants aged 65+ at Visit 4 (1996-1998) who had Medicare fee-for-service Part B and diagnosed diabetes. We identified severe hypoglycemic events
Introduction: In the United States, the rising number of adults with type 2 diabetes (T2D) is thought to be associated with the rise in obesity. Obesity may be associated with T2D through biologic pathways where excess weight strains the body’s metabolic machinery, such as mitochondria. Mitochondria are dynamic organelles whose regulation and function respond to cell stress, such as insulin resistance. Previous research reveals that insulin resistance is associated with obesity prior to hyperglycemia. Mitochondrial DNA copy number is a measure of mitochondrial DNA content, and correlates with both the number and size of mitochondria. We assessed the hypothesis that mitochondrial DNA copy number is associated with T2D in a community-based, prospective cohort study. A lower mitochondrial DNA copy number in these analyses represents worse mitochondrial function. Methods: We included 6,633 white ARIC participants without coronary heart disease who had mitochondrial DNA copy number measured from visit 2 (1990-1992). Our sample had a mean age of 57 ± 5.6 years, was 43% male, average BMI of 27 ± 4.9 kg/m², and 27% with hypertension. Those with diabetes had an average hemoglobin A1c of 7.2 ± 1.8 (n=681). The mitochondrial DNA copy number value used in analyses represents a sample’s standard deviation (SD) from a mean of zero for age- and sex-adjusted distributions. The mitochondrial DNA copy number data was then divided into quintiles, with the most negative mitochondrial DNA copy number in quintile 1 (Q1), the mean of zero in Q3, and the most positive in Q5. We defined T2D as self-report of doctor diagnosis, current use of glucose-lowering medication, or fasting blood glucose ≥ 126 mg/dL or non-fasting blood glucose ≥ 200 mg/dL measured at study visits. We used logistic regression to estimate the odds of prevalent T2D for each quintile group compared to Q3. Confounders considered in the base model included age at sample collection, sex, education level, and medication use (thyroid and estrogen). All analyses were done in Stata 14.1. Results: The prevalence of T2D was higher in the lower mitochondrial DNA copy number quintiles: 15% in Q1 (mean copy number: -1.40 SD), 11% in Q2 (-0.46 SD), and 9% in Q3-Q5 (0.04 SD, 0.52 SD, 1.33 SD). There was increased odds of T2D in lower mitochondrial DNA copy number quintiles, but with no additional benefit of copy number above the mean. The odds of


Funding: No

Funding Component:

P049

Mitochondrial DNA Copy Number and Diabetes in the ARIC Study

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T2D in each quintile compared to Q3 was 1.9 in Q1 (95% CI 1.49, 2.46), 1.36 in Q2 (95% CI 1.05, 1.77), 0.99 in Q4 (95% CI 0.76, 1.30) and 0.96 in Q5 (95% CI 0.74, 1.26). **Conclusion:** Examining the association of mitochondrial dysfunction and diabetes in a large community-based cohort connects results from experimental studies to epidemiologic studies and provides the opportunity to characterize the complex pathogenesis of diabetes using cohort data.

Disclosures: **B. DeBarmore:** None. **F. Ashar:** None. **D. Arking:** None. **R. Kalyani:** None. **E. Guallar:** None. **Y. Zhang:** None. **E. Selvin:** None. **J. Young:** None.

Funding: No

Funding Component:

**P050**

**Association Between Glycemic Control and Short-term Mortality Varies Across the Spectrum of Coronary Artery Disease**

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**BACKGROUND:** Diabetes is a significant risk factor for cardiovascular disease, but optimal glycemic control strategies remain unclear. In particular, trials of intensive glycemic control have highlighted a tension between increased mortality risk and macrovascular benefits. In this study we aimed to assess whether the burden of coronary artery disease (CAD) modifies the association between glycemic control and short-term mortality. **METHODS:** We studied veterans with diabetes who underwent elective cardiac catheterization between 2005 and 2013 in a retrospective analysis of data from the VA Clinical Assessment, Reporting, and Tracking (CART) Program. Primary exposures were time-varying HbA1c over two years of follow-up after index catheterization, categorized as <6%, 6-6.49%, 6.5-6.99%, 7-7.99%, 8-8.99%, and >=9%, and burden of CAD, categorized as no CAD, non-obstructive CAD, or obstructive CAD. Primary outcome was two-year all-cause mortality. A total of 17394 participants had, on average, five HbA1c measurements over two years of follow-up. We used multivariable Cox proportional hazards regression to estimate the association between HbA1c and mortality, adjusting for demographic and clinical covariates and CAD burden, and including a term for interaction between HbA1c and CAD burden. RESULTS: In adjusted models with 6.5 ≤ HbA1c ≤ 6.99% as the reference category, HbA1c < 6% was associated with increased risk of mortality (HR 1.55 [1.25, 1.92]), whereas HbA1c categories above 7% were not. We observed significant interaction between glycemic control and CAD burden (interaction p=0.0005); the increased risk of short-term mortality at HbA1c < 6% was limited to individuals with non-obstructive and obstructive CAD (Figure 1). **CONCLUSIONS:** HbA1c below 6% was associated with increased risk of short-term mortality, but only in individuals with any angiographically-defined CAD. CAD burden may thus inform individualized diabetes management strategies, specifically treatment de-escalation in individuals with any angiographically-defined CAD.

Disclosures: **S. Raghavan:** None. **W.G. Liu:** None. **P. Ho:** None. **M.E. Plomondon:** None. **A.E. Baron:** None. **D. Magid:** None. **S.M. Bradley:** None. **T.M. Maddox:** None.

Funding: No

Funding Component:

**P051**
Association of Subclinical Hypoglycemia with Incident Cardiovascular Disease and All-cause Mortality: The Multi-Ethnic Study of Atherosclerosis

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Trials of intensive glucose control have not improved cardiovascular disease (CVD) risk in type 2 diabetes; however data are inconsistent about the effects of maintaining below normal glucose levels in the general population. Further, it has been suggested that fasting glucose and HbA1c in the lower ranges have a different relationship with CVD and mortality. In 5992 participants from the Multi-Ethnic Study of Atherosclerosis, free of CVD at baseline, we used logistic regression to investigate the associations of low fasting glucose (<80mg/dL) and HbA1c (<5.0%), from baseline and averaged across follow-up over 13 years, with incident CVD and mortality. We used the normal range (80 to <100mg/dL and 5.0 to <5.7%) as reference. We excluded participants with diabetes at baseline from the low, normal, and impaired groups at baseline, and excluded participants with diabetes at any visit from those groups for averaged values. We matched covariates to the visit of glycemic data collection.

Participants with low fasting glucose were more likely to be younger, female, Asian, use glucose lowering medication, have lower BMI and be normotensive. Those with low HbA1c were more likely to be younger, Asian or Hispanic, and have higher income at baseline. Adjusted for age, sex, race/ethnicity, education, and income, glucose and HbA1c in the impaired (100 to <126mg/dL and 5.7 to <6.5%) and diabetic ranges (≥126mg/dL and ≥6.5%) at baseline were significantly associated with increased CVD and mortality. Low baseline glucose and low baseline HbA1c were positively, but not significantly, associated with mortality; while low average glucose and low average HbA1c were both strongly and significantly associated with increased risk of mortality (Figure).

The relationships between fasting glucose and HbA1c with mortality are J-shaped at baseline, but strongly and significantly U-shaped when average levels are used. Consistently low fasting glucose or HbA1c may be better markers for risk from subclinical hypoglycemia than a single low measurement.


Funding: No

Funding Component:

P052

Subgingival Dysbiosis Predicts Longitudinal Glucose Change

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Background: Microbial dysbiosis and translocation of microbial products across
digestive tract mucosal surfaces are hypothesized risk factors for impaired glucose regulation. We specifically investigated whether measures of subgingival dysbiosis predicted longitudinal fasting plasma glucose (FPG) change. **Methods:** The Oral Infections, Glucose Intolerance and Insulin Resistance Study (ORIGINS) enrolled 300 diabetes-free adults (77% female) aged 20-55 years (mean±SD=34±10). Subgingival plaque samples were collected and analyzed using 16S rDNA sequencing (Illumina MiSeq; NexGEN) using the Human Oral Microbe Identification using Next Generation Sequencing (HOMINGS) protocol. FPG was measured at baseline and after two years. Microbial community alpha-diversity was calculated using Simpson’s index. Multivariable linear regressions modeled 2-year glucose change on baseline relative abundance of 376 individual oral taxa (in separate models) with adjustment for age, sex, race/ethnicity, education, smoking status, BMI and baseline glucose levels. All taxa with a p-value<0.05 were used to construct a microbial dysbiosis-index (MD-index) defined as the ratio of taxa abundance in organisms positively vs. inversely associated with FPG change. The MD-index was subsequently used in regression models to predict glucose change. Statistical significance was based on a false discovery rate (FDR)<0.05 or a Bonferroni corrected p-value (1x10^-4).

**Results:** Mean 2-year FPG change±SD was 1.5±8 mg/dl. Mean±SD values of MD-index were 2.2±2.4. Baseline levels of 23 taxa were associated with FPG change (p<0.05), 11 of which had inverse associations. Among these 23 taxa, *Treponema* HOT238, *Leptotrichia* HOT498 and *Stomatobaculum* HOT097 had an FDR<0.05. The MD-index was inversely correlated with alpha-diversity (r=-0.19, p<0.01). Mean FPG-change±SE in the 3rd vs. 1st tertile of MD-index were 4.5±0.9 vs. -1.6±0.9 (p<1x10^-4).

**Conclusion:** Increased levels of microbial dysbiosis, reflecting decreased microbial diversity, were associated with increased 2-year glucose change among young, diabetes-free subjects.

Disclosures: **R.T. Demmer:** None. **P. Trinh:** None. **M. Rosenbaum:** None. **C. LeDuc:** None. **R. Leibel:** None. **P.C. Colombo:** None. **B. Paster:** None. **P.N. Papapanou:** None. **M. Desvarieux:** None. **D.R. Jacobs:** None.

Funding: No

**Funding Component:**

**P053**

**Diabetes Risk Prediction and Sickle Cell Trait in African Americans From CARDIA and the Jackson Heart Study**

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**Introduction:** Existing models to predict incident diabetes mellitus (DM) perform better in Whites than African Americans. In models that incorporate hemoglobin A1c (A1C) as a predictor of DM, the difference in model performance by race is more pronounced. In a recent study, we found that A1C was systematically underestimating glycemia in African Americans with sickle cell trait (SCT).

**Hypothesis:** Given the poorer performance of DM prediction models in African Americans than Whites and the impact of SCT on the A1C-glycemia association, we hypothesized that incorporating sickle cell trait into DM prediction models would improve the ability of the model to predict future risk of DM. **Methods:** We pooled data collected from 2000-2012 on 3,122 African Americans (8.6% with SCT) from the Jackson Heart Study (JHS; n=2,065; mean
Over 5 years of follow-up in CARDIA and 10 years of follow-up in JHS, 85 CARDIA participants (8.1%) and 342 JHS participants (16.6%) developed DM. Using generalized estimating equations to account for correlation of repeated measures, we compared the discriminative ability and net reclassification improvement (NRI) resulting from the addition of SCT for a series of prediction models. **Results:** Overall, the addition of SCT to prediction models did not result in significant improvement in the discriminative ability. However, by the NRI index, the addition of SCT to measures of glycemia and to a fuller risk prediction model did improve prediction of DM. In the full model, adding SCT*A1C as a predictor resulted in 2% of events being reclassified as higher risk and 45% of non-events being reclassified as lower risk. **Conclusion:** Our results suggest that incorporating SCT into DM prediction for African Americans may result in modest improvement in model performance.


Funding: No

Funding Component:

**P054**

Translation of Diabetes Interventions Into Community Settings: 12-month Results of the Lifestyle Intervention for the Treatment of Diabetes Trial

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**Objective:** Professionally delivered intensive lifestyle weight loss interventions (LWLs) have been shown to improve weight status and CVD risk factors among adults with diabetes in rigorously conducted trials. We report the 12-month results of a trial in which a LWL was delivered by community health workers (CHWs), among predominantly minority and/or lower socioeconomic status participants.

**Research Design and Methods:** We recruited overweight or obese adults with diabetes and without CVD primarily via review of electronic medical records and physician referrals. The study featured two 12-month interventions: (1) LWL delivered by trained CHWs in community settings which involved weekly group sessions and 3 individual sessions with an interventionist, or (2) diabetes self-management education (DSM) comprised of 12 monthly group sessions delivered at a primary care clinic. The main outcome was change in United Kingdom Prospective Diabetes Study (UKPDS) estimated 5-year CVD risk at 12 months; secondary outcomes included weight loss, UKPDS risk score components (hemoglobin A1c, blood pressure, lipids) and use of medications affecting these components.

**Results:** We screened 1102 and randomized 260 adults (age range 23-83, mean 55.9, 67% female, 48% black, 52% < college degree, mean A1c 7.6%, 37.3% A1c<7%, mean BMI 37.7 kg/m²). Baseline demographic and CVD risk factors were equally distributed between the 2 groups of 130 participants each. At 12 months, 92.3% of LWL and 98% of DSM participants were retained. There was not a significant difference in 5-year UKPDS estimated CVD risk by arm (increased from 5.1% to 5.9% in LWL, and 5.5% to 6.1% in DSM, group comparison p=0.61). There was no evidence of effect modification by the pre-specified parameters of gender, race/ethnicity or baseline BMI. Follow-up A1c, SBP, and total cholesterol did not
significantly differ by arm. Weight loss was greater in LWL compared to DSM participants (mean of 3.2% vs 1.1% of total body weight, p=0.02). At least 5% weight loss was achieved by 30.8% of LWL and 18.1% of DSM participants (p=0.02). Among LWL participants, 11.7% discontinued their diabetes medication compared to only 1.6% of DSM participants (p=0.005); 87.5% of those who discontinued medication had achieved an A1c<7% at follow-up, compared to 36.8% who continued using diabetes medication. Hypertension and lipid lowering medication use did not differ by arm.

Conclusions: In a diverse sample of adults with diabetes, a CHW-delivered LWL intervention produced greater weight loss compared to a monthly DSM education, but did not appreciably alter 5-year UKPDS-estimated CVD risk, A1c, or CVD risk factors. The average weight loss achieved (3.2%) may not have been sufficient to produce meaningful changes in metabolic functioning and CVD risk factors, however, some participants in both interventions achieved improved glycemic control without use of medications.


Funding: No

Funding Component:

P055

Cooking Methods for Meats and Risk of Type 2 Diabetes: Results From Three Prospective Cohort Studies

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Importance: The role of high-temperature cooking methods (broiling, barbequing, or roasting) on the association of meat consumption with risk of type 2 diabetes (T2D) is unknown.

Objective: To examine cooking methods for meats (chicken, fish, and red meat) in relation to T2D risk among men and women who consumed meats regularly (≥2 servings/week).

Design, Setting, and Participants: The prospective studies included 52,720 women from the Nurses’ Health Study (NHS 1996-2012), 60,809 women from the Nurses’ Health Study II (NHS II 2001-2013), and 24,679 men from the Health Professionals Follow-Up Study (HPFS 1996-2012) who were free of diabetes, cardiovascular disease, and cancer at baseline.

Main Outcomes and Measures: Incident cases of T2D were identified through self-report and confirmed by validated supplementary questionnaires.

Results: We documented 7,893 incident T2D cases during 1.74 million person-years of follow up. After multivariate adjustment of demographics, lifestyle factors, and total intake of chicken, fish, and red meat, a higher frequency of high-temperature cooking of meats was independently associated with an increased T2D risk. When comparing >15 times/month with ≤4 times/month, the hazard ratios (HRs) and 95% confidence intervals (CIs) of T2D were 1.36 (1.22, 1.52; P trend<0.001) in NHS, 1.82 (1.56, 2.12; P trend<0.001) in NHS II, and 1.10 (0.90, 1.36; P trend=0.78) in HPFS; and the pooled HR was 1.43 (1.32, 1.56; P trend <0.001). The results remained significant when analyzing by source of meats; and the pooled HRs (95% CI) were 1.64 (1.49, 1.81; P trend <0.001) for red meat and 1.22 (1.13, 1.32; P trend <0.001) for white meat. In addition, a higher frequency of high-temperature cooking of meats was associated with greater weight gain and higher risk of obesity, especially among women. Mediational analyses showed that the significant associations of high-temperature cooking with T2D risk were partially explained by changes in body mass index (41.6% in NHS and 46.6% in NHS II) in women.

Conclusions and Relevance: Our results suggest that, independent of meat consumption, high-
temperature cooking methods may further increase diabetes risk, especially in women.


Funding: No

Funding Component:

P056

Sex Differences in the Association of Diabetes With Cardiovascular Disease Outcomes Among African Americans in the Atherosclerosis Risk in Communities (ARIC) Prospective Cohort: 1987-2013

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Epidemiologic studies have consistently shown in whites that the relative risk of diabetes for coronary heart disease (CHD) is greater for women than for men. However, little is known whether this differential sex association is mirrored among African Americans. We hypothesized that, similar to whites, there would be a multiplicative sex by diabetes interaction for cardiovascular disease (CVD) incidence among African Americans in the ARIC cohort. We conducted a prospective cohort analysis of 14,058, 27% African American and 73% white, participants from the ARIC study initially recruited in 1987-1989 and followed for incident cardiovascular events through 2013. CVD was defined as CHD, total stroke, peripheral artery disease (PAD), or heart failure. Race-specific Poisson regression was used to calculate incidence rates of CVD stratified by diabetes status and sex. Race-specific Cox proportional hazards models were run in three stages; stage 1 examined baseline diabetes status, stage 2 examined baseline diabetes status with the competing risk of non-CVD death, and stage 3 incorporated a time-varying model that updated diabetes status during follow-up and included a competing risk of non-CVD death. At each stage, three sequential models were run adjusting for potential confounders including age, body mass index (BMI), smoking status, physical activity, alcohol consumption, education, hypertension, LDL cholesterol, HDL cholesterol, and kidney function. There were 1,073 incident CVD events among African Americans and 2,475 among whites. In stage 1 analysis among African Americans with baseline diabetes, the CVD incidence rate was nearly identical in women and men, 26.8 and 28.1 per 1000 person years, respectively. Women with diabetes were at 2.3-fold increased hazard (95% CI: 2.0 to 2.7) of CVD compared to women without diabetes after adjustment for age, whereas the corresponding hazard ratio for men was 1.8 (95% CI: 1.5 to 2.1) (p for sex by diabetes interaction=0.014). After full adjustment for potential confounders, the diabetes hazard ratio was attenuated to 2.0 (95% CI: 1.8 to 2.3) in women and remained at 1.8 (95% CI: 1.5 to 2.1) for men (interaction p-value =0.058). This finding of synergy between being a woman and having diabetes on CVD risk was consistent across stages 2 and 3 with marginally significant p-values for interaction. The interaction of diabetes by sex was somewhat weaker among whites. Efforts to prevent diabetes and control CVD risk factors are important to both African American men and women, but are particularly relevant in women. While diabetes and CVD risk factor management have improved over the last several decades, there is a higher relative risk of CVD among African American women with diabetes compared with diabetic men, mirroring the sex differences seen in whites.

Funding: No

Funding Component:

P057

Optimal Modifiable Lifestyle Risk Factor Scores Are Associated with Lower Risk of Type 2 Diabetes Mellitus in African Americans - The Jackson Heart Study

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Background: The associations of combined modifiable risk factors for incident diabetes (physical activity, television watching, dietary intake, sleep disordered breathing and smoking) are less well investigated in African Americans (AAs). Hypothesis: We hypothesized that an optimal modifiable lifestyle risk factor score would be inversely associated with incident diabetes among AAs. Design and Methods: Data on modifiable risk factors was collected by questionnaire at baseline (2000-2004) in a population-based sample of AAs in the Jackson Heart Study. Incident diabetes (fasting glucose $\geq 126$ mg/dl, physician diagnosis, use of diabetes drugs, or HbA1c $\geq 6.5\%$) was assessed over 12 years, among adults without prevalent diabetes at baseline. Participants were excluded for missing data on baseline covariates or diabetes follow-up. Incidence rate ratios (IRR) were estimated using Poisson regression modeling adjusting for age, sex, education, current occupation status, systolic blood pressure and body-mass index. Modifiable lifestyle factors (regular exercise, healthy diet, smoking avoidance, lower amounts of television watching and low sleep disordered breathing burden) were combined in risk score categories of poor (0-3 points), average (4-7 points), optimal (8-11 points). Results: Among 3,252 adults (mean age 53.3 years, 64% female) there were 560 incident diabetes cases (median follow-up 7.6 years). An average or optimal compared to a poor modifiable lifestyle risk score was associated with a 21% (IRR 0.79, 95% CI: 0.62, 0.99) and 31% (IRR 0.69, 95% CI: 0.48, 1.01) lower risk of diabetes, respectively, in a monotonic fashion ($p=0.03$). Body-mass index (BMI) and glycemic status at baseline modified the association of lifestyle risk score with diabetes - among participants with BMI $< 30$ kg/m$^2$, IRRs for average or optimal compared to poor categories were 0.60 (95% CI: 0.40, 0.91) and 0.53 (95% CI: 0.29, 0.97), respectively, compared to 0.90 (95% CI 0.67, 1.21) and 0.83 (95% CI: 0.51, 1.34) among participants with BMI $\geq 30$ kg/m$^2$. For participants with normoglycemia (normal fasting glucose and HbA1c) at baseline, the IRRs for average or optimal compared to poor categories were 0.64 (95% CI: 0.43, 0.96) and 0.57 (95% CI: 0.31, 1.04), respectively, compared to 0.90 (95% CI 0.69, 1.19) and 0.80 (95% CI: 0.52, 1.23) among participants with prediabetes at baseline. Conclusions: Modifiable lifestyle factors are associated with a lower risk of diabetes among AAs, with greater effects among those with lower adiposity and normoglycemia. Lifestyle interventions to reduce obesity have focused on individuals with high BMI and/or prediabetes (high risk approach). Our study suggests that AAs at the lower end of the diabetes risk spectrum may derive significant long-term benefit from diabetes prevention strategies focused on the outlined modifiable lifestyle risk factors.

Background: Hostility and diabetes mellitus (DM) share common determinants such as obesity, tobacco use and physical inactivity. Thus, we investigated their unstudied relationship at baseline and at 10 yrs after among Black adults in the Jackson Heart Study (JHS), a group with high rates of DM.

Hypothesis: Hostility and its subdomains (hostile affect, aggressiveness, and cynicism) correlate with DM at baseline or at 10 yr after.

Methods: From the JHS cohort (n=5301), we studied 3,434 Blacks who completed the Cook-Medley Hostility Scale. Hostility was measured in 3 subdomains: hostile affect, cynicism and aggressiveness; higher scores correlated with higher hostility levels. Participants were stratified into quartiles based on the hostility scale. Frequency of DM at baseline or at 10 yrs after was compared amongst quartiles and tested for trend. Using multivariate logistic regression, we studied the cross-sectional relationship between quartiles of levels of hostility and the combined outcome of presence of diabetes at present or at 10 yrs after, adjusting for known confounders of DM. Subanalyses were conducted at each hostility domain level.

Results: Our population was 35% men with a mean age of 54.3 (SD 12.6) yrs. Quartiles were associated with age, BMI, smoking, hA1c, caloric intake, hs-CRP, and alcohol intake (all p<0.05). Overall hostility quartiles and its subscales correlated with DM at baseline but only the subdomains of hostile affect and cynicism correlated with DM at 10 yrs. When prevalent or DM at 10 yrs were assessed as a combined risk, individuals in the last quartile of the hostile affect subdomain was associated with a higher DM risk versus first quartile (Table). Similar link was not found in other subdomains.

Conclusions: Hostility attitude was associated with DM risk factors and prevalent DM. Only 2/3 of the hostility subdomains correlated with DM at 10 yrs after. Individuals from the last quartile of hostile affect subdomain was related to a higher risk of prevalent or DM at 10 yrs when compared to the first quartile.

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<tr>
<th>Quartile</th>
<th>Prevalent DM</th>
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cause-of-death analysis shows the extent to which diabetes is associated with other leading causes of death.

**Hypothesis.** Analysis of multiple-cause-of-death will confirm prevalence rates of diabetes among racial/ethnic minority populations, demonstrate the impact of diabetes in association with other causes of death, and highlight variations of burden of disease among different racial/ethnic groups.

**Methods.** Causes of death were identified using the Multiple Cause Mortality Files of the National Center for Health Statistics from 2003 to 2012. Age-adjusted mortality rates were calculated for diabetes both as the underlying cause of death (UCD) and as multiple causes of death (MCD) by racial/ethnic groups (NHWs, Blacks, Asians, and Hispanic/Latinos). Frequencies and proportions were calculated by race/ethnicity groups. Linear regression model was used for number of causes per death.

**Results.** A total of 2,335,198 decedents had diabetes listed as MCD in the U.S. national death records from 2003-2012. Mortality rates of diabetes as MCD were 3.4 times than UCD for Asians, 2.9 times for Blacks, 2.9 times for Hispanics and 3.7 times for NHWs (Figure). Minority populations had higher proportion of deaths with diabetes reported as MCD than NHWs (1.7 times higher for Hispanics, 1.5 times higher for Blacks and Asians). Adjusting for age, gender, and race/ethnicity, there were 1.7 more causes per death co-occurred for diabetes decedents compared to decedents who died due to all other causes (95% CI: 1.714, 1.718).

**Conclusions.** Our findings underscore the importance of a multiple-cause-of-death approach in the analyses for a more comprehensive understanding of the impact of diabetes.

Disclosures: **K.G. Hastings:** None. **J. Hu:** None. **N. Marques:** None. **E.J. Daza:** None. **M. Cullen:** None. **L. Palaniappan:** None.

Funding: No

Funding Component:

**P060**

**A Point-based Prediction Model for Predicting 10-year Risk of Developing Type 2 Diabetes Mellitus in Japanese Men: Aichi Workers’ Cohort Study**

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**Objective:** Preventive services including screening for diabetes and its potential risk factors are available to more Americans under Obamacare Preventive Care. Stratifying individuals by the predicted risk of developing type 2 diabetes mellitus (T2DM) would be useful for improving public health with efficient interventions. Although a number of T2DM prediction models have been reported, there is little evidence in East Asians, especially that from long-term follow-up studies. They are reported to have lower ability of innate insulin secretion and develop diabetes at much lower body mass index (BMI) than Caucasians and African Americans. Thus, this study aims to
develop a point-based prediction model for 10-year risk of developing T2DM incidence in middle-aged Japanese men.

**Method:** We followed 3,540 males in a worksite in Japan who were aged 35-64 years and free of diabetes in 2002 until March 31, 2015. Relationships of baseline age (continuous), BMI (<23, 23-<25 [reference category (Ref)], 25-<27.5, ≥27.5 kg/m²), current smoking status (yes, no [Ref]), alcohol consumption (0 [Ref], <23, 23-<46, ≥46 g/day), regular exercise of a moderate or higher intensity, an interval of ≥3 days per week, and a duration of ≥30 minutes per time (yes [Ref], no), medication use for dyslipidemia (yes, no [Ref]), family history of diabetes (having the first degree's relatives with diabetes, not having [Ref]), serum triglycerides (<150 [Ref], >150 mg/dl), high density lipoprotein cholesterol (≥40 [Ref], <40 mg/dl), and fasting blood glucose (<100 [Ref], 100-110, 110-<126 mg/dl) with incidence of T2DM were examined by Cox proportional hazard model. Variables significantly associated with T2DM (p<0.10) in the univariate model were simultaneously entered into a multivariate model, and backward variable selection procedure was done to determine the final multivariate model. Points were assigned for each predictor according to the method used in the Framingham Study.

**Result:** During the median follow-up of 12.2 years, 342 males developed T2DM. The point-based model employing BMI, current smoking status, family history of diabetes, and blood levels of triglycerides and fasting blood glucose showed reasonable discrimination (c-statistics: 0.73) and goodness of fit (Hosmer-Lemeshow p=0.22).

**Conclusion:** Our point-based prediction model showed applicability in terms of identifying middle-aged Japanese men at high risk of developing T2DM. The present findings warrants further investigations to determine whether using the point-based prediction models is effective to reduce T2DM incidence.


Funding: No

**Funding Component:**

P061

**Blood Pressure Control in the Outpatient Setting Among Patients with Diabetes: The Guideline Advantage**

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Introduction. Blood pressure (BP) screening and control is often suboptimal in patients with diabetes, a population in whom cardiovascular disease (CVD) is the leading cause of morbidity and mortality. Hypertension in the context of diabetes uniquely increases risk for CVD incidence and mortality. The aim of this study was to describe the burden of uncontrolled BP among patients with diabetes seen in the outpatient setting and factors associated with BP control using data from a large, electronic health record (EHR) data registry.

Methods. Outpatient EHR data were analyzed from The Guideline Advantage™ (TGA), a joint quality improvement initiative of the American Heart Association, American Diabetes Association, and American Cancer Society. Data were compiled from patients aged ≥18 years seen at >70 individual clinics across the U.S. “Uncontrolled BP” was defined as measured BP ≥140/90mmHg at the most recent outpatient visit with or without a clinical diagnosis of hypertension. Logistic regression was used to examine factors associated BP control status. Results. We observed 1,710,702 BP
measurements among 216,947 unique patients. The population was 42% male (n= 91,062) with a mean age of 49 years; 19% (n=41,714) of patients had BP ≥140/90 mmHg at their most recent outpatient visit and 8% of the population had a history of diabetes (n= 18,242). Patients with diabetes had 1.15 times the odds of BP ≥140/90 mmHg at their most recent outpatient visit [aOR(95% CI): 1.15 (1.11-1.20)]. Among patients with a diabetes history, the following factors were associated with uncontrolled BP: race/ethnicity [(aOR: 2.81 (2.48-3.19) for non-Hispanic blacks compared to non-Hispanic whites, 1.44 (1.31-1.57) for multiracial patients versus non-Hispanic whites), sex [aOR: 1.28 (1.25-1.31)] for males compared to females], age [aOR per 10-year increase in age: 1.22 (1.21-1.23)], and time since diabetes diagnosis [aOR per 1-year increase in time since diagnosis: 0.99(0.98-1.00)].

Conclusions. Uncontrolled BP disproportionately impacts diabetes patients in the outpatient setting. Among these patients, BP control status differed by race/ethnicity, sex, and age. Additionally, patients were more likely to have uncontrolled BP ≥140/90 mmHg closer to the time of their diabetes diagnoses (i.e. time since diagnosis was inversely associated with BP control status). Additional investigation to identify underlying patient- and provider-level factors contributing to these observed differences will be particularly important moving forward for accountable care organizations to meet metrics for equitable quality care delivery across patient subgroups.


Funding: No.

Funding Component:

P062

Impact of Second-line Antidiabetic Treatments on the Risk of Microvascular Complications:

Analysis of Real-world Data for 94,685 Patients Type 2 Diabetes

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Objective: To compare the risk of microvascular complications associated with second-line anti-diabetic medications by analyzing the national health insurance claim database.

Methods: The Korean National Health Insurance (NHI) Service is the single payer which covers all Korean citizens and residents. We identified all patients who used sulphonylurea (SU), dipeptidyl peptidase-4 inhibitor (DPP4I), or thiazolidinedione (TZD) as a second-line oral anti-diabetic medication added to metformin (MET) therapy between January 2011 and June 2015 in the NHI database. Cox’s proportional hazard regression model was used to estimate hazard ratio and its 95% confidence interval for developing microvascular complications according to the types of second-line medications. Age, gender, calendar index year, duration of metformin treatments, comorbidities of hypertension and dyslipidemia, and Charlson Comorbidity Index were adjusted as potential confounders.

Results: A total of 94685 initiators of a second-line add-on to MET of either a SU (n = 28887), DPP4I (n = 60780) or TZD (n = 5018) were identified. Diagnoses of diabetic retinopathy (n=7139), diabetic nephropathy (n=5290), and diabetic neuropathy (n=4265) were identified from the NHI claim database over a mean of 1.3 years of follow-up. Compared to the SU+MET, adjusted hazard ratio (95% confidence interval) for diabetic retinopathy was 1.03 (0.96-1.10) for the DPP4I+MET and 1.26 (1.10-1.44) for the TZD+MET. Adjusted hazard ratio (95% confidence interval) for diabetic nephropathy was 1.30 (1.19-1.42) for the DPP4I+MET and...
1.63 (95% CI: 1.40-1.91) for the TZD+MET, compared with the SU+MET. Adjusted hazard ratio (95% confidence interval) for diabetic neuropathy was 0.78 (95% CI: 0.71-0.85) for the DPP-4i+MET and 0.81 (95% CI: 0.66-0.99) for the TZD+MET, compared with the SU+MET. 

**Conclusion:** In this analysis of nationwide real-world data, DPP4i+MET and TZD+MET therapies were associated with higher risk of diabetic retinopathy and nephropathy, but lower risk of diabetic neuropathy compared to SU+MET therapy.

**Disclosures:** K. Ha: None. B. Kim: None. H. Choi: None. D. Kim: None. H. Kim: None.

**Funding:** No

**Funding Component:** P063

**The Overall Burden of Pre-diabetes and Diabetes in Luxembourg: Resembling the US Scenario**

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**Background:** Type 2 diabetes is an increasingly prevalent disease affecting 422 million adults in the world in 2014. Its surveillance and timely detection are necessary steps to control associated comorbidities. While several national population-based studies in Western European countries have reported diabetes prevalence and associated risk factors, there has been a limited focus on pre-diabetes. Therefore, the aim of this study was to determine the prevalence and associated risk factors of pre-diabetes and diabetes in the general adult population of Luxembourg. **Methods:** Within the framework of the Luxembourg European Health Examination Survey (EHES-LUX), a cross-sectional study was conducted between 2013 and 2015, based on a random sample from the general population. 1451 residents of Luxembourg (25-64 years old) were included. Diabetes, unknown diabetes and pre-diabetes participants were defined by glycemia measures, self-reported medication over the last 2 weeks and medical diagnosis. Logistic regressions analyses adjusted on sex, age and region were performed to determine the factors associated with pre-diabetes and diabetes. Multivariable-adjusted odds ratios (MVOR) were calculated. The explanatory variables were biological and anthropometric indicators as well as patient’s socio-economic status and lifestyle. We considered P < 0.05 to be statistically significant. **Results:** The national standardized prevalence of pre-diabetes and diabetes in Luxembourg was 23.7% and 5.8% respectively. We observed a deleterious association between diabetes status and age (MVOR=1.05 [1.01-1.09]), family history of diabetes (MVOR=3.25 [1.95-5.40]), abdominal obesity (MVOR=2.62 [1.53-4.49]), hypertension (MVOR=3.20 [1.78-5.73]), and triglycerides (MVOR=1.08 [1.05-1.12]) whereas a protective association occurred with total cholesterol (MVOR=0.84 [0.78-0.92]). Moreover, we observed a deleterious association between pre-diabetes status and age (MVOR=1.04 [1.02-1.06]), male sex (MVOR=1.83 [1.30-2.58]), family history of diabetes (MVOR=1.52 [1.13-2.05]) and abdominal obesity (MVOR=1.44 [1.06-1.96]) whereas a protective association occurred with second generation immigrants (MVOR=0.63 [0.41-0.98]) and serum HDL (MVOR=0.83 [0.72-0.95]). **Conclusions:** In Luxembourg, an unexpectedly high number of adults may be affected by pre-diabetes and unknown diabetes. These values are close to US prevalence estimates, and are certainly among the highest values in Western European countries, emphasizing even more that these
conditions should be prioritized as a public health threat for the country, requesting measures for improved detection and surveillance, especially in the primary care setting.


Funding: No

Funding Component:

P064

Associations Between Signs and Symptoms of Androgen Excess With Prediabetes and Diabetes in Hispanic/Latina Women of Reproductive Age in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)

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Background: Androgen excess is a characteristic of polycystic ovary syndrome (PCOS). Signs and symptoms of androgen excess are associated with cardiometabolic risk factors and diabetes, however the characterization is incomplete among premenopausal women and high risk groups such as Hispanic/Latina women.

Methods: HCHS/SOL is a community-based cohort study of 16,415 self-identified Hispanic/Latino adults from diverse backgrounds in the US at the baseline visit (2008-2011; 3,801 women age 18-44 years). This preliminary cross-sectional analysis is from 994 reproductive-aged women who attended the ongoing visit 2 (Oct. 2014-Sept. 2017) by Sept. 2016. Signs and symptoms of androgen excess included menstrual cycle irregularities, self-reported PCOS, and oral contraceptive use to regulate menstrual cycles or acne. Impaired fasting glucose (prediabetes) was defined as fasting glucose 100-125 mg/dL (excluding diabetes), and diabetes as fasting glucose ≥126 mg/dL, glucose post oral glucose tolerance test ≥200 mg/dL, or hemoglobin A1c ≥6.5%. Design-based estimates are presented and adjusted for site, age, Hispanic/Latina background, education, smoking status, and body mass index. Results: The mean age was 34 years. The prevalence of any sign or symptom of androgen excess was 28%, of which 19% self-reported having PCOS. Signs and symptoms of androgen excess was not significantly associated with the odds of prediabetes or diabetes (see table). Women self-reporting PCOS or oral contraceptive use to regulate cycles or acne had a higher odds of diabetes compared to those that did not, although not statistically significant. Conclusion: In this sample of Hispanic/Latina women, the association between signs and symptoms of androgen excess and the odds of prediabetes or diabetes were not statistically significant. Future analyses will include the whole cohort of reproductive-aged women that will improve statistical power and be critical to further characterize these relationships.


Funding: No
Introduction: Exposure to air pollution has been positively associated with systemic inflammation. However, few large scale studies were conducted in regions with low levels of air pollution. We therefore studied the associations of air pollution with systemic inflammation biomarkers among participants in the Framingham Offspring and Third Generation cohorts in Greater Boston area.

Methods: We measured C-reactive protein (CRP), fibrinogen, interleukin 6 (IL6), and tumor necrosis factor receptor 2 (TNFR2) in 3943 participants living within 50 km of a central site monitor in Boston. We calculated the 1-, 2-, 3-, 5-, and 7-day moving averages of fine particulate matter (PM$_{2.5}$), black carbon (BC), sulfate (SO$_{4}^{2-}$), nitrogen oxides (NO$_x$), and ozone (O$_3$) prior to the exam visits. We used linear mixed effects models and linear regression models to evaluate repeated measures and cross-sectional associations respectively, adjusting for age, sex, individual and area level measures of socioeconomic position, lifestyle and clinical factors, time trend, and weather. We examined effect modification by age (>$/\leq$ 65 years), sex, and diabetes history.

Results: The mean age was 53(±14) years and 54% were women. PM$_{2.5}$, BC, and SO$_{4}^{2-}$ were positively associated with CRP across multiple moving averages, and were statistically significant at 5-day moving averages: a 5 µg/m$^3$ higher PM$_{2.5}$ or a 0.5 µg/m$^3$ higher BC was associated with 3.9% (95% CI: 0.5, 7.3) or 5.3% (95% CI: 0.1, 10.9) higher CRP, respectively. Positive associations were observed for PM$_{2.5}$, BC, and NO$_x$ with IL6; and for BC, SO$_{4}^{2-}$, and O$_3$ with TNFR2. SO$_{4}^{2-}$ and O$_3$ were negatively associated with fibrinogen. Associations of BC and NO$_x$ with CRP and of BC with IL6 were of a larger magnitude among participants with diabetes than those without.

Conclusions: In a region in compliance with current US-EPA regulation, we find positive associations of short-term exposure to ambient air pollution with CRP, IL6 and TNFR2 but not for fibrinogen.
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Introduction: Long-term air pollution may be a risk factor for CVD mortality, but few studies have investigated its effect on subclinical atherosclerosis. Moreover, data among women transitioning the menopause are lacking.

Hypothesis: We hypothesized that mid-life women exposed to higher levels of air pollution across a 5-year period may have a greater burden of subclinical atherosclerosis (higher common carotid intima-media thickness (CIMT), inter-adventitial diameter (AD) and plaque) 5 to 7 years later compared to women exposed to lower levels.

Methods: This longitudinal study was conducted among 1,188 women from the Study of Women’s Health Across the Nation (SWAN) with available data on both air pollution exposure and CIMT. We excluded participants who had an MI and stroke before the carotid ultrasound scan. Yearly cumulative exposure levels of two air pollutants, particulate matter ≤2.5 µm (PM$_{2.5}$) and ozone (O$_3$), were collected from monitors 20km within the participant’s residential address at SWAN visit 3 – 7 (1999-2005). Corresponding years cumulative levels of continuous CVD risk factors were used as covariates. CIMT, AD and plaque presence were assessed at visits 12/13 (2010-2012). Linear regression models were used to estimate the effect of early exposure to PM$_{2.5}$ and O$_3$ on mean and maximum CIMT. Logistic regression was applied to assess the effects of air pollutants on plaque presence. Full models were adjusted for CVD risk factors, including BMI, smoking, cholesterol, triglyceride, HDL-C, menopause status, hormone use, fasting blood glucose, insulin, diabetic medication and hypertension, and the extended models were further adjusted for SBP and inflammatory biomarkers (tPA, PAI-1 and CRP).

Results: At time of carotid scan, women were on average 59.6±2.7 years old and a majority were postmenopausal (88.4%). The women were White (48.4%), Black (31.2%), Chinese (13.3%) and Hispanic (7.1%). Cumulative PM$_{2.5}$ significantly predicted maximum CIMT adjusting for CVD risk factors such that 1 µg/m$^3$ higher cumulative exposure to PM$_{2.5}$ over 5 years was associated with a 7.4 µm (95% CI: 0.4 – 14.4) greater maximum CIMT. The association was not significant after adjusting for SBP but was not attenuated by adjusting for inflammatory biomarkers. PM$_{2.5}$ was related to mean CIMT and AD when adjusting for site, SES and age, but not after adjusting for other CVD risk factors. Ozone levels were not associated with any of the outcomes. No association was found between air pollution exposure and plaque presence.

Conclusion: Early cumulative PM$_{2.5}$ exposure was associated with maximum CIMT later in the post-menopausal period. This association was largely explained by SBP suggesting that early exposure to air pollutants may relate to higher values of CIMT potentially by increasing SBP.


Funding: No

Funding Component:

P068

Cigarette Smoking and Peripheral Arterial Disease in African Americans of the Jackson Heart Study

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Introduction: African Americans are more than twice as likely to develop peripheral arterial disease (PAD) compared to whites. Increased rates of hypertension, obesity and diabetes may account for some of these differences; however other factors such as cigarette smoking, which is understudied in African Americans, may play an important role. Aim: To evaluate the relationship between cigarette smoking and PAD in African Americans in the Jackson Heart Study (JHS).

Methods: JHS participants (n=5,301) were classified by self-reported smoking status into current, past (smoked at least 400 cigarettes/life) or never smokers. Multivariate logistic and robust linear regression models were used to estimate the associations between smoking status at baseline and measures of subclinical PAD [carotid intimal medial thickness (CIMT, visit 1), ankle-brachial index (ABI, visit 1) and aortic calcium by computed tomography (visit 2)] to yield odds ratios (OR) and β-coefficients (estimated adjusted difference) to compare each smoking status to never smokers (reference group). Results: There were 3579 never smokers, 986 past smokers and 693 current smokers identified at baseline. After adjustment for covariates, past and current smokers had an increased risk of ABI < 1, increased CIMT and increased abdominal aortic and aorto-iliac calcium (all p<0.05, Table). Furthermore, current smokers smoking more than 20 cigarettes daily (1 pack) had a higher risk of PAD by all of these measures compared to current smokers smoking 1-19 cigarettes daily suggesting a dose-dependent relationship. Conclusions: In a large prospective African American cohort, current cigarette smoking was independently associated with measures of PAD in a dose-dependent manner. Furthermore, cigarette smoking was most strongly associated with abdominal aortic and aorto-iliac calcification. Current smoking is a strong predictor of subclinical PAD in African Americans and smoking cessation should be recommended.


Funding: No

Funding Component:

P069

Heat, Heat Waves and Hospital Admissions in Indianapolis, Indiana

Yi Wang, Indiana Univ, Indianapolis, IN

Background The association between heat and hospital admissions is well studied, but in Indiana where the regulatory agencies cites lack of evidence for global climate change, local evidence of such an association is critical for Indiana to mitigate the impact of increasing heat. Methods Using a distributed-lag non-linear model, we studied the effects of moderate (31.7 °C or 90th percentile of daily mean apparent temperature (AT)), severe (33.5 °C or 95th percentile of daily mean apparent temperature (AT)) and extreme (36.4 °C or 99th percentile of AT) heat on hospital admissions (June-August 2007-2012) for cardiovascular
(myocardial infarction, myocardial infarction, heart failure) and heat-related diseases in Indianapolis, Indiana located in Marion County. We also examined the added effects of moderate heat waves (AT above the 90th percentile lasting 2-6 days), severe heat waves (AT above the 95th percentile lasting 2-6 days) and extreme heat waves (AT above the 99th percentile lasting 2-6 days). In sensitivity analysis, we tested robustness of our results to 1) different temperature and lag structures and 2) temperature metrics (daily min, max and diurnal temperature range). Results: The relative risks of moderate heat, relative to 29.2°C (75th percentile of AT), on admissions for cardiovascular disease (CVD), myocardial infarction (MI), heart failure (HF), and heat-related diseases (HD) were 0.98 (0.67, 1.44), 6.28 (1.48, 26.6), 1.38 (0.81, 2.36) and 1.73 (0.58, 5.11). The relative risk of severe heat on admissions for CVD, MI, HF, and HD were 0.93 (0.60, 1.43), 4.46 (0.85, 23.4), 1.30 (0.72, 2.34) and 2.14 (0.43, 10.7). The relative risk of extreme heat were 0.79 (0.26, 2.39), 0.11 (0.087, 1.32), 0.68 (0.18, 2.61), and 0.32 (0.005, 19.5). We also observed statistically significant added effects of moderate heat waves lasting 4 or 6 days on hospital admission for MI and HD and extreme heat waves lasting 4 days on hospital admissions for HD. Results were strengthened for people older than 65. Conclusions: Moderate heat wave lasting 4-6 days were associated with increased hospital admissions for MI and HD diseases and extreme heat wave lasting 4 days were associated with increased admissions for HD.

Disclosures: Y. Wang: None.

Funding: No

Funding Component:

P069

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Disclosures: **Y. Wang:** None.

Funding: No

Funding Component:

P069

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**Conclusions:** Moderate heat wave lasting 4-6 days were associated with increased hospital admissions for MI and HD diseases and extreme heat wave lasting 4 days were associated with increased admissions for HD.

Disclosures: **Y. Wang:** None.

Funding Component:

P070

**Glucose, Insulin, Insulin Resistance and Exposure to Ambient Air Pollution**


**Background:** Numerous studies suggest that long-term exposure to ambient particulate matter (PM) and nitrogen oxide (NOx) air pollution may be diabetogenic, but little is
known about the effects of shorter-term exposures on markers of diabetes risk. Therefore, our objective was to determine whether short- and long-term ambient PM and NOx exposures are associated with glucose, insulin, and insulin resistance measures. **Methods:** We studied a stratified, random minority oversample of non-diabetic Women’s Health Initiative (WHI) clinical trials participants for whom estimates of fasting glucose, fasting insulin, insulin resistance, and geocoded address-specific daily mean concentrations of PM < 10 μm (PM$_{10}$), PM < 2.5 μm (PM$_{2.5}$), and NOx were available at screening and up to three follow-up visits between 1993-2004 (total n=4,019; mean age: 62.2 yr; 24% black; 12% Hispanic; 51% white). We measured insulin resistance using the homeostatic model assessment [HOMA], triglyceride to high-density lipoprotein cholesterol ratio, and the triglyceride-glucose index. We log-transformed the glucose, insulin, and insulin resistance measures, then used multi-level, mixed, longitudinal models weighted for sampling design / attrition and adjusted for sociodemographic, clinical, and meteorological covariates to estimate their associations with 2- and 365-day mean PM$_{10}$ and NOx and 365-day mean PM$_{2.5}$ concentrations. **Results:** Measures of glucose homeostasis decreased with short-term exposure to ambient PM$_{10}$. For example, we found a -0.2% (95% confidence interval: -0.4%, 0.1%), -0.9% (-1.7%, -0.1%), and -1.1% (-2.0%, -0.3%) change in glucose, insulin, and HOMA per 10 μg/m$^3$ increase in the 2-day mean PM$_{10}$ concentration. In contrast, we found generally null results per 10 μg/m$^3$ increase in 365-day mean PM$_{10}$ concentration. Measures of glucose homeostasis similarly did not appear to be associated with short- and long-term increases in mean NOx or PM$_{2.5}$ concentrations. **Conclusion:** The findings suggest that responses to ambient exposure to PM$_{10}$ in women may be adaptive (i.e. capable of re-establishing normal glucose homeostasis and improving insulin sensitivity) over the short-term. Endoplasmic reticulum stress-response mechanisms involving decreases in protein misfolding may help explain this observed phenomena. Contrary to previous studies, results also suggest that sustained exposure to ambient PM and NOx has nominal influence on glucose homeostasis.


**Funding:** No

**Funding Component:**

**P071**

**Moderate Exposure to Inorganic Arsenic in Drinking Water is Associated with Elevated Pulse Pressure: Results from Chihuahua, Mexico**

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**Background:** Though levels of arsenic >100 μg/L in drinking water have been consistently associated with increased risk of cardiovascular disease (CVD), evidence of an association at
lower levels of exposure is more inconsistent. We used data from a cohort from Chihuahua, Mexico to examine whether relatively low levels of arsenic in drinking water were associated with elevated pulse pressure, a marker linked to arterial stiffening and CVD risk. **Methods:** We used concentrations of arsenic in household drinking water from 931 adults not taking hypertensive medication to examine the association between water arsenic categories as low as 25-50 µg/L and mean increases in systolic, diastolic and pulse pressure (systolic - diastolic pressure). We also examined the association between water arsenic categories and elevated pulse pressure, defined as >70 mm Hg. Associations between arsenic exposure and blood pressure measures were obtained from multivariable linear or logistic regression models that adjusted for age, gender, education level, ethnicity, BMI, waist circumference, smoking status and alcoholic beverage intake. **Results:** After multivariable adjustment, compared to lower levels, water arsenic concentrations of 25-50 µg/L and above were associated with statistically significant increases in systolic blood pressure (SBP) and pulse pressure, but were not associated with diastolic blood pressure (DBP). Multivariable-adjusted associations [β (95% confidence interval)] with water arsenic concentrations of 25-50 µg/L were: 4.3 (1.2-7.4) mm Hg for SBP; 3.3 (0.8-5.7) mm Hg for pulse pressure; and 1.3 (-0.6-3.3) mm Hg for DBP. For elevated pulse pressure (16.1% of the sample), the association [odds ratio (95% CI)] with water arsenic levels of 25-50 µg/dL was 2.5 (1.3-4.9). **Conclusions:** Results support potential adverse effects of exposure to moderate levels of arsenic in drinking water on CVD risk through pathways that may involve widening pulse pressure.


**Funding:** No

**Funding Component:**

**P072**

**Association of Occupational Exposures with Cardiovascular Disease among Hispanics/Latinos: Results from the Hispanic Community Health Study/Study of Latinos**

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**Background:** Cardiovascular disease (CVD) is a leading cause of mortality and morbidity in the US. Acute, high-dose exposures to some solvents, metals, and pesticides can be cardiotoxic, but little is known about the cardiovascular effects of chronic, low-level exposures. Thus, we evaluated cross-sectional associations of self-reported occupational exposures to solvents, metals, and pesticides with CVD prevalence among diverse Hispanics/Latinos in the US. **Methods:** The analyses included baseline data from 7,404 currently employed participants, ages 18-74 years, from the HCHS/SOL. CVD was defined as the presence of one or more of the following: coronary heart disease (self-reported angina, myocardial infarction, coronary bypass surgery, balloon angioplasty, or stent placement in coronary arteries, or electrocardiogram [ECG] evidence of major Q wave abnormalities or minor Q, QS waves with ST, T abnormalities); atrial fibrillation (self-reported or ECG evidence of atrial fibrillation or flutter); heart failure (self-reported); or cerebrovascular disease (self-
Survey-weighted Poisson regression models were used to estimate prevalence ratios (PR) and 95% confidence intervals (CIs) for each occupational exposure, adjusted for sociodemographic (age, gender, field center, Hispanic/Latino background, health insurance), acculturation (language, years of duration in the US), lifestyle (smoking, alcohol, physical activity, diet), and occupational (full- or part-time employment) characteristics. **Results:** Overall, 6.1% of participants had any prevalent CVD; coronary heart disease (4.3%) was most common, followed by cerebrovascular disease (1.0%), heart failure (0.8%), and atrial fibrillation (0.7%). Current occupational exposures to solvents, metals, and pesticides were reported by 6.5%, 8.5%, and 4.7% of participants, respectively. The prevalence of any CVD (PR: 2.18, 95% CI: 1.34-3.55), coronary heart disease (PR: 2.20, 95% CI: 1.31-3.71), and atrial fibrillation (PR: 5.92, 95% CI: 1.89-18.61) were significantly elevated for participants who reported current occupational pesticide exposure compared to no exposure. Current occupational metal exposure was associated with a greater prevalence of atrial fibrillation (PR: 3.78, 95% CI: 1.24-11.46). Further adjustment for hypertension, hypercholesterolemia, diabetes, or body mass index did not appreciably change the results. Current occupational solvent exposure was not associated with CVD prevalence. **Conclusions:** Occupational exposure to pesticides and metals is associated with higher CVD prevalence at baseline. These cross-sectional associations do not appear to be attenuated by hypertension, hypercholesterolemia, diabetes, or obesity. Further research is needed to examine other biologic mechanisms that may underlie these associations.


**Funding:** No

**Funding Component:**

**P073**

**Co-morbidities and Cardiac Associated Mortality in Smokers**

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**Background:** Chronic Obstructive Pulmonary Disease (COPD) is a complex syndrome involving all aspects of the lungs which is strongly associated with cigarette smoking. Parenchymal destruction and remodeling are disease processes involving inflammatory pathways likely to have systemic vascular effects outside of the lungs. Indeed cardiovascular disease (CVD) is a leading cause of mortality in people affected by COPD and many co-morbid conditions are also associated with the disease. We explored CVD mortality in smokers considering aspects of COPD as well as co-morbidities in the longitudinal follow-up of the COPDGene study. **Methods:** The COPDGene study includes baseline and longitudinal assessment of mortality for 8,157 participants with (3,604) and without COPD (4,553) all of whom reported >10 pack-years smoking exposure. Aspects of COPD including CT phenotyping and pulmonary function were combined using Principal Components Analysis (PCA), co-morbidities were combined using Latent Class Analysis (LCA) and cause specific mortality was assessed using study center reports, SSRI searches and single clinician adjudication. Cox Proportional Hazards models accounting for the effects of competing risks were used to assess the association between PCA factors and CVD mortality and PCA factors plus LCA classes and CVD mortality.
Results: PCA analysis resulted in 5 factors describing emphysema, airway disease, gas trapping, BMI and its effect on CT measurement and hyperinflation and LCA analysis identified 7 classes of co-morbidities. CVD associated mortality occurred in 128 participants and competing causes of mortality occurred in 605. The PCA factor describing airway disease predicted CVD mortality in the PCA only model (HR 1.8, 95% C.I. 1.4-2.3, p<0.0001), as well as in the LCA model (HR 1.7, 95% C.I. 1.3-2.2, p<0.0001). LCA classes associated with CVD mortality include a class describing diabetes, high BP and high Cholesterol (HR 3.5, 95% C.I. 1.8-6.8, p=0.0003) and a class describing known CVD (HR 2.9, 95% C.I. 1.3-6.7, p=0.01).

Conclusions: Co-morbidities of COPD represent independent predictors of CVD associated mortality in smokers accounting for pulmonary disease and competing mortality risks. Clustering of comorbidities using LCA is an approach that may be informative in complex diseases.


Funding: No

Funding Component:

P074

Smoking Status and Incidence of Cancer After Myocardial Infarction: a 20-year Follow-up Study

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Objectives: We compared cancer incidence after acute myocardial infarction (MI) of never smokers, pre-MI quitters, post-MI quitters and persistent smokers, and assessed whether cigarette reduction among continued smokers is associated with lower cancer risk. Methods: Consecutive patients aged ≤65 years discharged from 8 hospitals in central Israel after first MI in 1992-3 were followed for cancer through 2013. Extensive data, including self-reported smoking habits, were obtained at the index hospitalization and 4 times during follow-up. Cox proportional hazards and Fine & Gray competing risks models were constructed to assess the hazard ratios (HRs) for cancer associated with baseline smoking categories. Smoking categories were also modeled as time-varying variables using extended Cox models. Results: Overall, 1,486 cancer-free participants at baseline were studied (mean±SD age, 54±8 years; 81% male). Smokers were younger than nonsmokers and more likely to be male and of lower socioeconomic status. Over a median follow-up of 21.4 years, 273 incident cancers were diagnosed. Baseline smoking was associated with ~40% increased risk of cancer; ~25% after accounting for death as a competing event. Taking changes in smoking during follow-up into account, the increased risk was largely confined to persistent smokers, whereas the risk in post-MI quitters was close to that of never smokers (Figure). Among patients who continued smoking after MI, each reduction of 10 cigarettes relative to pre-MI consumption was associated with an adjusted HR of 0.86 (95% CI: 0.74-1.00). Conclusions: Smoking cessation either before or after MI is associated with lower risk of cancer. Reducing consumption among persistent smokers appears also to be beneficial.


Funding: No
Introduction: The HCHS/SOL demonstrated that diabetes mellitus (DM) was associated with elevated risk for CVD in a diverse Hispanic/Latino (H/L) cohort. However, the nature of these relationships as a function of H/L background, sex and other relevant variables is still unknown.

Objective: We examined across approximately 6 years, the prevalence and incidence of DM and CVD and the CVD-DM relationship in diverse H/L.

Methods: Participants at Visit 1:V1 (2008-2011) were 16,386 individuals with DM relevant data, whereas participants at Visit 2:V2 (2014-2016) were 8,401 individuals with similar data who attended the ongoing examination, constituting approximately 60% of the cohort to be studied. Descriptive characteristics were age-standardized to the 2010 U.S. population, and stratified by sex and H/L background. Prevalence estimates were weighted to the known population distribution, adjusting for sampling probability and nonresponse, and trimmed to handle extreme values of weights. Age-adjusted incidence rates /100 person years were estimated across Visit 1, based upon Poisson regression with robust variance taking into account the complex survey design. Both prevalence and incidence values are presented as % (95% CI). Prevalence and incidence of DM were examined by sex, age, H/L background, field center and BMI. We also examined the prevalence and incidence of CVD in those with and without DM by sex, H/L background, age and BMI.

Results: Overall prevalence of DM was 17.8 (17.0, 18.6) at V1 and 19.4 (18.3, 20.5) at V2. The prevalence of DM at V2 was lowest, 11.2 (8.2, 15.3) for those of South American and highest for those of Puerto Rican, 22.5 (19.5, 25.8) background. While the prevalence of DM did not differ between women and men, the overall incidence rate for DM was significantly higher for men, 1.53 (1.32, 1.76) than for women, 1.06 (0.94, 1.18). The overall prevalence of CVD was significantly higher for DM than for non-DM individuals at V2: 9.2 (7.9, 10.7) vs. 4.5 (3.9, 5.2). The incidence rate across Visits, 0.71 (0.55, 0.92) vs. 0.20 (0.15, 0.27) was also higher for DM individuals. At V2 the CVD prevalence for DM men, 12.0 (9.7, 14.6) was greater than for DM women, 7.2 (5.6, 9.2). The relationship of CVD prevalence to DM status revealed different patterns among H/L background groups. At V2, for example, those of South American background showed relatively low CVD prevalence: 5.3 (2.6, 10.4) with DM vs. 4.2 (2.3, 7.5) without DM. In contrast, those of Puerto Rican background showed relatively high CVD prevalence: 15.6 (11.0, 21.6) with DM vs. 5.7 (4.1, 8.0) without DM.

Conclusions: Overall prevalence and incidence of CVD was significantly higher for DM than for non-DM individuals and these CVD-DM relationships varied markedly across H/L background groups. 10/17/2016 3:55 PM

Racial Differences in Maintaining Optimal Healthy Lifestyles Until 50 Years of Age: Prospective Data From the Coronary Artery Risk Development in Young Adults Study

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Introduction: Racial disparities in healthy lifestyles may begin in youth and increase over the lifespan.

Hypothesis: Maintaining healthy lifestyles until 50 years of age will be lower in blacks compared with whites.

Methods: The population-based Coronary Artery Risk Development in Young Adults (CARDIA) study enrolled 5115 blacks and whites aged 18-30 years in 1985-1986. Eight exams were completed over 25 years of follow-up. At each exam, optimal lifestyles were defined as body mass index (BMI) < 25 kg/m², never smoking status, moderate or vigorous physical activity ≥ 150 minutes per week, no or moderate alcohol intake (drinks per week [women / men]: 0-7 / 0-14) and Dietary Approaches to Stop Hypertension (DASH) adherence score ≥ 15. Optimal cardiovascular health (CVH) was defined as having ≥ 4 optimal lifestyles. The age-specific percentage of blacks and whites maintaining optimal lifestyles was calculated using a modified Kaplan Meier method. Hazard ratios (HR) were calculated for maintaining optimal lifestyles over 25 years in blacks compared with whites.

Results: At the baseline exam, 4900 participants (mean age: 26 years; black: 51%) had ≥ 1 optimal lifestyle. By 50 years of age, maintaining BMI < 25 kg/m², never smoking status, moderate or vigorous physical activity ≥ 150 minutes per week, DASH diet adherence and optimal CVH were lower in blacks versus whites while maintaining no or moderate alcohol intake was higher (Table). The multivariable adjusted HR (95% confidence interval) comparing blacks to whites for maintaining BMI < 25 kg/m² was 0.57 (0.52-0.63), never smoking status was 0.82 (0.66-1.01), moderate or vigorous physical activity ≥ 150 minutes per week was 0.83 (0.76-0.91), no or moderate alcohol intake was 1.19 (1.03-1.37), DASH diet adherence was 0.71 (0.61-0.82) and optimal CVH was 0.63 (0.56-0.72).

Conclusion: Blacks were less likely to maintain optimal lifestyles until 50 years of age. Reducing racial differences in the maintenance of optimal CVH may help prevent racial disparities in cardiovascular disease.

Disclosures: J.N. Booth: B. Research Grant; Significant; 1F31 HL129701-01 (PI: J.N.Booth). N.B. Allen: None. D. Calhoun: None. A.P. Carson: B. Research Grant; Significant;...
Validation of the Pooled Cohort Equations for CVD Risk Assessment in African Americans: The Jackson Heart Study

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Background Cardiovascular disease (CVD) risk assessment tools such as the Framingham Risk Score are useful to identify population high risk subgroups for targeted intervention. However, no CVD risk score specific for African Americans (AAs) were available until the Pooled Cohort Equations (PCE) was introduced in 2013 for calculating sex- and race-specific10-year predicted risk of atherosclerotic cardiovascular disease (ASCVD). This study evaluated the performance of PCE in the Jackson Heart Study (JHS), a prospective cohort study of CVD in AAs.

Methods The analytic sample included 2,191 JHS participants who were 40-79 years old without a history of CVD or CVD procedures at baseline (2000-2004) and who were not a shared participant in the Atherosclerosis Risk in Communities (ARIC) Study. ASCVD events (CHD and stroke) were ascertained by active surveillance with medical records abstraction. Because all participants were followed at least 8 years through 2012, validation of the PCE was based on 8-year observed and predicted risks of ASCVD. The PCE was evaluated for discrimination and calibration properties using c-index and Hosmer-Lemeshow (HL) $x^2$ statistic, respectively. Overall and subgroup analysis among participants (no diabetes, LDL between 70 and 189 mg/dL and not taking statins) for whom CVD risk assessment may be applied to guide treatment for high blood cholesterol were performed. Stratified analyses evaluating the performance of PCE by baseline characteristics, including sex, age (<50/≥50 years), income (affluent*/not affluent), education (high school/≥high school), BMI (<30/≥30), diabetes status (yes/no), self-reported use of hypertension medications (yes/no), self-reported use of statins (yes/no) and current smoking status (yes/no) were also performed.

Results There were a total of 63 incident ASCVD events (29 CHD; 34 stroke). The PCE predicted total number of event was 130, with a c-index=0.78 (95% CI 0.54-0.96) and a HL $x^2$=38.2 (p<0.001). The PCE showed a similar discrimination but better calibration property in the subset of participants for whom CVD risk assessment may be applied to guide treatment for high blood cholesterol (n=1,576, c-index=0.78, 95% CI 0.43-1; HL $x^2$=21.9, p=0.005). In stratified analyses, PCE had better calibration in participants who were younger (n=831, HL $x^2$=10.5, p=0.23), not affluent (n=1,120, HL $x^2$=12.6, p=0.12), less educated (n=186, HL $x^2$=6.6, p=0.58), those with lower BMI (n=833, HL $x^2$=8.5, p=0.39), those with diabetes (n=287, HL $x^2$=11.1, p=0.20), and statin users (n=159, HL $x^2$=10.8, p=0.21).

Conclusions Overall, the PCE showed good discrimination but did not calibrate well and overestimated the risk of ASCVD. In the subset of participants for whom CVD risk assessment may be applied to guide treatment for high blood cholesterol, the PCE showed improved calibration but still overestimated risk.


Funding: No
Funding Component:

P078

Childhood Social Determinants Explain Ethnic Disparities in Obesity Among Black American Women

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Introduction: Black American women have the highest prevalence of obesity in the United States (US). Ethnic disparities in this risk factor for cardiovascular disease have been found; Afro-Caribbean women have lower rates of obesity compared with African American women. Contributing factors of the ethnic disparity in adult obesity have yet to be fully elucidated. However, the emergence of the ethnic disparity in adolescence suggests a potential role for childhood social determinants.

Hypothesis: Childhood social determinants are hypothesized to explain the ethnic disparity in obesity between African American and Afro-Caribbean women in the United States.

Methods: Multiple logistic regression models were used to examine childhood social factors and adult social, health and lifestyle risk factors that explain the ethnic disparity in obesity between African American (N = 2299) and Afro-Caribbean women (N = 978), 18 years and older, in the National Survey of American Life (2001-2003). Adult socioeconomic factors included marital status, education, occupation, home ownership and poverty status. Adult health and lifestyle risk covariates included hypertension, diabetes, menopausal status, smoking, alcohol use and physical activity. Childhood social factors included measures of parental education, receipt of public assistance prior to 18 years of age, and type of high school attended (private/parochial vs. public). Odds ratios (OR) of the association between ethnicity and adult obesity were estimated after adjusting age and adult socioeconomic measures, adult health and lifestyle measures and childhood social factors within the models.

Results: The prevalence of obesity was 40.5% among African American women and 30.8% among Afro-Caribbean women. Afro-Caribbean women had 34% lower odds of obesity than African American women; age-adjusted OR = 0.66; 95%CI: (0.52, 0.82). Adjusting for age and adult socioeconomic factors slightly decreased the ethnic disparity; adjusted OR = 0.70; 95%CI: (0.53, 0.94). Adjusting for age and adult health and lifestyle factors decreased the disparity by 11%; adjusted OR = 0.73; 95%CI: (0.55, 0.97). Adjusting for age and childhood social factors eliminated the ethnic disparity; adjusted OR = 1.00; 95%CI: (0.82, 1.23).

Conclusions: These findings suggest that childhood social factors are key contributors to the ethnic disparities in obesity between African American and Afro-Caribbean women in the US.

Disclosures: D. Barrington: None.

Funding: No

Funding Component:

P079

Biological Markers of Stress and Unhealthy Assimilation Behaviors Vary According to Reason for Immigration: the Africans in America Study

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The relationship between the biological effect of stress, reason for immigration and unhealthy assimilation behaviors has not been studied in African immigrants to the United States. Therefore, in 88 African immigrants to the United States (age 41±10, (mean±SD), range 22-61y, male 65% (57 of 88)) we used the allostatic
load score (ALS) to assess the biological response to stress. ALS was calculated using 10 variables from 3 domains; cardiac (SBP, DBP, cholesterol, triglyceride, homocysteine), metabolic (BMI, A1C, albumin, eGFR) and immunological (hsCRP). High-risk was defined by the highest quartile for each variable, except for albumin and eGFR, which used the lowest quartile. One point was assigned if the variable was in the high-risk range and 0 if not. Participants were grouped by reason for immigration: asylum, work, study, marriage, lottery and family reunification. Unhealthy assimilation behaviors were: smoking and alcohol intake. ALS was highest for asylum seekers (3.21±2.16) and lowest for family reunification (1.78±1.35). For the other reasons of immigration, ALS was in the range between these two scores (Figure). Thirty-six percent of asylum seekers were smokers (5 of 14), whereas all other African immigrants were non-smokers (0 of 74) (P<0.001). Similarly, self-reported alcohol intake was higher for asylum seekers than for the other reasons for immigration (43% (6 of 14) vs.22% (16 of 74), P=0.05). In conclusion, as demonstrated by ALS, asylum seekers experience the highest degree of stress and the most unhealthy assimilation behaviors. However, Africans who come to the United States for family reunification have a low prevalence of unhealthy assimilation behaviors and the lowest ALS. Therefore, reason for immigration may have a significant impact on both health and behavior.


Funding: No

Funding Component:

P080

Self-reported Experiences of Everyday Discrimination are Associated With Shorter Leukocyte Telomeres in African-American Women With Coronary Heart Disease

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Rationale: Leukocyte telomere length (LTL) is an indicator of biological aging. Telomere shortening may be sensitive to social stressors such as discrimination, but this has not been previously examined in a biracial cohort of patients with coronary heart disease (CHD).

Objective: To explore differences in LTL by race and gender and examine whether discrimination was associated with accelerated cellular aging (shorter telomere length).

Methods: Data were from 367 White and African American patients in the Mental Stress Ischemia Mechanisms and Prognosis Study (MIPS) which enrolled patients with a diagnosis of stable CHD from Emory University-affiliated hospitals and clinics. LTL was measured by quantitative polymerase chain reaction (qPCR) and expressed as a ratio of the amount of telomeric DNA to the amount of single-copy
control gene (T/S). The T/S ratios were then converted to kilobase pairs. Discrimination was measured using the 10-item Everyday Discrimination Scale (EDS), where participants reported their experiences of everyday mistreatment during the previous 12 months. Responses were rated using 4-point Likert scales ranging from never = 1 to often = 4 which were summed. Due to the potential batch effect in telomere length, we modeled telomere plate as a random effect. Multiple linear regression models were stratified by race/ethnicity and gender to estimate differences in mean LTL and associations with discrimination, adjusted for potential confounding factors.

**Results:** African American women had longer mean LTL (5.58; SD: 0.05) compared to African American men (5.28; SD: 0.04), White women (5.22; SD: 0.05) and White men (5.24; SD: 0.03). Reports of discrimination were higher among African American men (16.1; SD: 6.5) compared to African American women (15.4; SD: 4.9), White women (14.9; SD: 4.4), and White men (13.5; SD: 3.8). The association between discrimination and accelerated cellular aging was statistically significant among African American women [β = -0.02; 95% CI: (-0.04, -0.001); p=0.0377] after models were adjusted for demographics, smoking history, BMI, and disease history. Discrimination was not significantly associated with accelerated cellular aging among African American men [β = -0.01; 95% CI: (-0.02, 0.01)], White men [β = -0.003; 95% CI: (-0.02, 0.01)], or White women [β = -0.01; 95% CI: (-0.03, 0.01)]. The association between discrimination and accelerated cellular aging remained statistically significant for African American women after further adjusting for depression and perceived stress.

**Conclusions:** Although African American women with CHD have longer telomere length, they may experience greater telomere shortening in relation to discrimination. Accelerated telomere shortening secondary to discrimination stress may be a potential mechanism of health related disparities among African American women with CHD.


Funding: No

Funding Component:

**P081**

Are Racial Differences in Cardiovascular Health Factors Explained by Cardiovascular Health Behaviors? The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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**Background:** Cardiovascular health (CVH) is worse among African Americans than whites, yet it is unclear whether differences in health behaviors fully account for these racial disparities. We investigated whether racial differences in CVH factors (blood pressure, glucose, and cholesterol) were explained by body mass index (BMI) and CVH behaviors (smoking and physical activity) in CARDIA.
Methods: This cross-sectional analysis included 2,866 African-American and white CARDIA participants from four field centers (Birmingham, AL; Chicago, IL; Minneapolis, MN; and Oakland, CA) who completed the year 30 examination (2015-2016; 71% retention). We created a summary CVH factor score (range 0-6) using poor, intermediate, and ideal levels of blood pressure, glucose, and cholesterol, with higher scores indicative of better CVH. Linear regression was used to evaluate the association of race with the summary score in unadjusted and adjusted models.

Results: Mean age (SD) was 55 (3.6) years, 57% were women, and 47% were African-American. The mean CVH factor score (SD) was 4.4 (1.2) for whites and 3.9 (1.3) for African Americans (p<0.0001). After adjustment for age and sex, African Americans had a lower CVH factor score than whites (Table). This difference was attenuated but persisted after adjustment for BMI. Findings were further attenuated after taking into account smoking, physical activity, and education.

Conclusion: The racial disparity in CVH factor score persisted after accounting for BMI and CVH behaviors. Thus, roles of other factors, such as social determinants of health and diet, warrant further investigation.

Table. Difference in mean CVH score* for African Americans compared with whites in the CARDIA study, 2015-2016

<table>
<thead>
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*The mean CVH score was defined as Blood pressure, blood pressure (BP), and cholesterol levels at discharge minus blood pressure, blood pressure (BP), and cholesterol levels at admission.


Funding: No

Funding Component:

P082

Racial Disparities in Stroke Recovery: A Large Study Versus Meta-Analysis

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Background: It is well known that Blacks have a higher stroke-related mortality compared to their White counterparts, but evidence on the influence of Black race on recovery after a stroke is not apparent. Objective: To verify our understanding on post-stroke rehabilitation trends between Blacks and Whites with the use of systematic review and meta-analysis.

Methods: We performed literature search for cohort studies that investigated racial variation issues in stroke motor recovery between January 1970 and March 2016, in which outcome was measured by Functional Independence Measures (FIM) scale. We compared change scores (the difference score between discharge and admission) or endpoint scores (at the time of admission and discharge) as well as length of stay in days between Whites and Blacks by calculating standardized mean differences (Hedge’s g) to derive a summary effect size. Random Effects model was used to account for data heterogeneity. Results: We identified 7 studies with a total 152,421 subjects, of which one influential study (Ottenbacher et al, 2008) offered a significant weight with 148,871 subjects. So, we performed meta-analysis on the remaining 6 studies (black diamond on the Figure) and compared the results with this influential study (maroon square on the Figure). We found that Blacks have higher FIM scores at admission and discharge, but poor change FIM scores, despite their shorter stay (about ¾ day) in rehab facility when compared to Whites. Our results contrasted findings of Ottenbacher et al., which did not report change scores, that Whites have
higher FIM scores at admission and discharge in spite of their comparable rehab facility stay.

**Conclusions:** This meta-analysis identifies a significant evidence gap for current understanding of racial disparities in stroke recovery. At AHA SFRN WISSDOM (Wide spectrum Investigation of Stroke Outcome Disparities on Multiple Levels) center, we aim to address this gap by first-hand analyses of multiple datasets in the near future.

Disclosures: **P.Y. Chhatbar:** None. **H. Bayona:** None. **Y. Zhao:** None. **B. Ovbiagele:** None. **W. Feng:** None. **R.J. Adams:** None. **D.T. Lackland:** None.

Funding: Yes

**Funding Component:** National Center

**P083**

**Qualitative Evidence Supporting a New Model of Health Behavior Change for African American Men in a Faith-Based Community**

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**Purpose:** Programs of behavior change with education targeting application to lifestyle habits may result in changes in risk-related behavior and improved cardiovascular disease (CVD) outcomes. The purpose of this abstract is to describe the changes, as evidenced in the qualitative analyses of transcripts of 14 sessions of a 6-month peer support group intervention to foster risk-related behavioral change, and in final program interviews.

**Method:** African American men (N=8), aged 45-83 years, from one Baptist church in NE U.S. participated in a peer-led behavior change program targeting Life’s Simple 7 (get active, control cholesterol, eat better, manage blood pressure, lose weight, reduce blood sugar, stop smoking), over a 6-month period. Research staff monitored the hour-long peer intervention sessions by phone and recorded and transcribed the sessions. Qualitative analysis comprised thematic analyses of the textual content of the peer group sessions and transcripts of follow-up interviews to identify evidence in the text supporting the existence of shifting stages of change within the group over time. Self-reported stages of readiness to change related to the 7 CVD behavioral risk areas were also quantified using 7 contemplation ladders with rungs ranging from zero (“no thoughts of changing”) to 10 (“taking action to change”).

**Results:** Over the course of the 6-month intervention, changes in group participants’ stages of change were evident. Six key themes emerged from the group sessions, including: (1) individuals’ resistance to change behaviors (weeks 1-2); (2) engagement through peer discussion of challenges and barriers (weeks 2-5); (3) awareness of physical benefits of change (weeks 2-24); (4) peer group cooperation for problem solving (weeks 3-24); (5) initiating health promotion inclusive of family and community (weeks 11-24); and (6) teaching others (weeks 18-24). The median difference in change in the contemplation ladders was <0; likely due to a ceiling effect due to the recruitment of motivated men who were ready to change. In the 6-month interviews, although men have changed behaviors positively over time, participants still reported challenges to changing and maintaining behaviors in different areas. This reveals that behaviors are continuing to evolve, and that in this shifting, behavior change is still an ongoing process as the men become more aware of their behaviors and increasingly view them in context of family and community.
community.

Conclusions: In this 6-month, intensive peer-led intervention, the micro-culture of the peer support group transformed from self-focused resistance to cohesion, then to other-oriented action. The data moved beyond Prochaska’s Stages of Change Model to break out and define a new paradigm of change that affected family and community and which will likely lead to longer term, continued changes and ongoing reinforcement.

Disclosures: S. Lee: None. R. Lindquist: None.

Funding: No

Funding Component:

P084

Racial Variation in Stroke Risk by Stroke Risk Factors

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Background: Black American adults exhibit a greater risk of stroke and disproportionate burden of stroke risk factors; however, it is unclear whether these stroke risk factors differentially impact stroke risk by race.

Methods: In total, 126,018 participants of the Women’s Health Initiative (11,389 black women and 114,629 white women), free of stroke and coronary heart disease at baseline (1993-1998), were followed for up to 17 years through 2010. Participants completed baseline clinical exams with standardized measurements of blood pressure and anthropometrics, medication inventory and self-reported questionnaires on socio-demographic, lifestyle/behaviors, diet and medical history. Incident total strokes were updated annually by questionnaire and confirmed by medical records. Multivariable Cox models estimated racial disparities in stroke overall and by across stroke risk factors.

Results: We observed 4,344 stroke events over 1,496,314 person-years (py). In age-adjusted analyses, black women exhibited a 47% greater risk of total stroke compared to white women (hazard ratio [HR]=1.47, 95% CI: 1.33-1.63), which was attenuated toward the null (HR=1.05, 95% CI: 0.94-1.17) by further adjustment for stroke risk factors, which may be considered to be on the biological causal pathway. Disparities in stroke were two-fold higher for younger black (50-<60 years) compared to white women, with an incidence rate difference (RD) of 119/100,000 py. These disparities remained statistically significant after adjustment for stroke risk factors. For those 60-<70 years, the risk of stroke was 34% higher among black compared to white women, with a RD of 81/100,000 py No significant variation by other stroke risk factors was observed.

Conclusions: Black women exhibited a significantly greater risk of total stroke compared to white women. Importantly, racial disparities were greatest among younger women aged 50-<60 years. Interventions targeted at younger black women may provide the greatest benefit in reducing disparities.
Introduction:
The relationship between cardiometabolic syndrome (CMS) and various risk factors has been studied in a variety of populations. Previously published research using 2007 Behavioral Risk Factor Surveillance System (BRFSS) data from Pennsylvania found that black and Hispanic adults had a significantly higher prevalence of CMS compared with whites. However, CMS has not been presented at the state level for the purpose of comparing the prevalence between states and between subpopulations within states.

Hypothesis:
This descriptive study examines the variation in prevalence of CMS by state and by race/ethnicity. We assessed the hypothesis that significant racial disparities exist in CMS prevalence between and within states.

Methods:
The sample size for this study included 2,380,047 noninstitutionalized adults aged 18 and older. A composite variable for CMS was created using BRFSS variables measuring obesity, hypercholesterolemia, angina (as a proxy for decreased high-density lipoprotein), prehypertension or hypertension, and prediabetes or diabetes. CMS was defined as having 3 or more of the 5 variables. Within BRFSS, obesity is defined as having a body mass index >=30kg/m*m based on self-reported height and weight. Self-reported diagnosis of high cholesterol was used as a surrogate for elevated triglycerides. Self-reported diagnosis of angina or CHD was used as a surrogate for reduced HDL. Five years of BRFSS data (2011-2015) were aggregated to ensure adequate sample size for stratification by demographic variables. The survey weight used in the analysis was adjusted to represent the average population over the 5-year period. Both unadjusted and age-adjusted prevalence estimates were calculated. All statistical analyses were performed using STATA v14.1.

Results:
Unadjusted prevalence of cardiometabolic syndrome varied from 10.5% (95% CI: 10.0%-10.9%) of adults in Colorado to 23.1% (95% CI: 22.3%-24.0%) in Mississippi. Within Colorado, prevalence of CMS was 7.7% (95% CI: 7.2%-8.1%) among adults aged 18 to 64, and 21.7% (95% CI: 20.7%-22.7%) among adults aged 65 and older. In Mississippi prevalence of CMS was 19.8% (95% CI: 18.8%-20.7%) among adults aged 18 to 64 and 34.3% (95% CI: 32.8%-35.8%) among adults aged 65 and older. CMS prevalence is significantly higher among black adults compared with whites and Hispanics in almost all states (unadjusted for age). Age-adjusted comparisons between states are presented.

Conclusions:
Understanding the burden of CMS relative to other states and among select demographic groups within the state is vital to prevention efforts. Black adults are disproportionately afflicted with poor cardiometabolic health and the degree of affliction is dependent on state of residence. In conclusion, when it comes to CMS, it matters where you live, your age, and your racial/ethnic status.
The Association between Psychological Distress and Diabetes Prevalence among Foreign-Born Blacks in the United States: An Examination of the 2010-2014 National Health Interview Survey

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Background: Psychological distress, a leading cause of disability globally, is highly prevalent in people diagnosed with diabetes. Blacks in the U.S. are disproportionately affected by chronic conditions such as diabetes. Taken together, psychological distress and diabetes constitute an immense health burden and result in poor health outcomes, increased mortality and decreased quality of life. While the association between psychological distress and diabetes is documented among U.S.-born Blacks, this relationship remains poorly examined among the growing foreign-born Black population in the U.S.

Hypothesis: We hypothesized that psychological distress (non-specific) would be associated with a higher prevalence of diabetes among a sample of foreign-born Blacks in the U.S.

Methods: We analyzed data on adult foreign-born Blacks in the 2010-2014 National Health Interview Survey which is a national in-person survey of non-institutionalized persons in the U.S. The main independent variable was psychological distress which was defined as a score of ≥12 on the Kessler Psychological Distress Scale (K-6 Scale). The main outcome variable was diabetes. Multivariable logistic regression was performed to examine the association between psychological distress and diabetes prevalence adjusting for known confounders.

Results: A total of 2,974 foreign-born Blacks were included in this study. The mean age (±SE) was 43.9 (±15.3) and nearly half (53.3%) were female. Among the individuals who received the K-6 Scale, 13.3% indicated experiencing symptoms of depression within the last 30 days and 10% had diabetes. After adjusting for age, sex, body mass index, poverty status, and marital status, we observed that foreign-born Blacks with higher levels of psychological distress had 2.30 (95% CI: 1.69-3.12) higher odds of being diabetic in comparison to those without psychological distress.

Conclusion: In a sample of contemporary foreign-born Blacks in the U.S., we observed that psychological distress was associated with prevalence of diabetes, such that individuals with elevated levels of psychological distress were twice as likely to be diabetic. Additional barriers may be associated with managing diabetes when a co-morbid mental health condition such as depression is present. Thus, culturally-tailored behavioral health interventions should be developed and utilized among foreign-born Black sub-populations to help promote adherence to complex behavioral and medical regimens associated with diabetes management.

Disclosures: N. Ukonu: None. R. Turkson-Ocran: None. Y. Commodore-Mensah: None.
Background. Cigarette smoking has been reported to be high among Lesbian, Gay, Bisexual, Transgendered and Queer (LGBTQ) populations. However, in-depth information on perception, knowledge, attitudes and behaviors, is limited.

Methods: We analyzed 2016 data from the AHA-Tobacco Regulatory Addiction Center (A-TRAC) study on multi-ethnic LGBTQ groups living primarily in Chicago and New York City, ages 18-64, smokers and non-smokers. Twenty-nine focus groups and 99 individual surveys were conducted to obtain socio-demographic-economic characteristic and in-depth information on tobacco use, including cigarette smoking. Atlas.ti and SAS 9.4 were used for data analyses.

Results: Of 99 participants, 58.8% of LGBTQ individuals reported smoking 100+ cigarettes during their life time; 49.5% (n=49) reported current cigarette smoking; and 17% reported frequent or occasional use of e-cigarette, e-hookah and/or other types of vaping. Age (25+) and low household income (<$20,000) were significantly associated with the use of cigarette smoking. While 70.2% stated that cigarette smoking is very dangerous to health and 43.2% of respondents said that tobacco use is a very serious problem in the LGBTQ community, current smokers were unlikely to quit smoking (67%). Focus group discussions revealed that smoking a cigarette is a form of stress relief, a way of “expressing yourself”, and a way of “fitting in”. Heavy marketing by the tobacco industry as well as stress associated with social discrimination, family and friend rejections and limited income, were also factors identified with tobacco use. These findings were particularly true among transgender women and bisexual men and women.

Conclusions: Cigarette smoking was high among the LGBTQ individuals in our sample and they seems unlikely to quit. Social stressors appear to be a strong contributing factor. Educational efforts and culturally appropriate messages to this population, are critical.


Funding: Yes

Funding Component: National Center

P088

The Association of Religious Affiliation With Cholesterol Levels Among South Asians: The Mediators of Atherosclerosis in South Asians Living in America (MASALA) Study

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Background: South Asians have disproportionately high rates of cardiovascular disease. Dyslipidemia is a common and
Objective: We hypothesized that lifestyle behaviors are influenced by religious beliefs and may be associated with cholesterol levels. We determined the associations between religious affiliation and LDL-cholesterol, HDL-cholesterol, and triglycerides among South Asians in the U.S.

Methods: We performed cross-sectional analyses of the 2010-2013 baseline data from the MASALA study (n=906). Using multivariate linear regression models, we examined the associations between self-reported religious affiliation (Hinduism/Jainism, Sikhism, Islam, Other and None) and lipid levels after controlling for age, sex, and cholesterol medication use. We determined whether smoking, alcohol use, physical activity, and dietary pattern would explain the association.

Results: The mean age was 55±9 years, 46% were women, and 29% were taking cholesterol medications. The majority of respondents were Hindu and/or Jain (74%), followed by 8% Sikh, 7% Islamic, 6% no religious affiliation, and 5% other (Christian, Buddhist, Zoroastrian, and multiple religious affiliations). The mean LDL was 111±32 mg/dl, median HDL was 48 mg/dl (IQR: 40-57), and median triglycerides was 119 mg/dl (IQR: 88-157). The table shows the associations of religious affiliation with lipid levels in serially adjusted models. The majority of the effect of religious affiliation was attenuated by physical activity for LDL; by alcohol use, physical activity and smoking for HDL; and by alcohol use and physical activity for triglycerides. Conclusions: Islamic religious affiliation was associated with higher LDL, triglycerides and lower HDL, and Hinduism was associated with lower HDL. However, lifestyle behaviors completely explained these associations. Thus, religion-specific tailoring of interventions designed to promote healthy lifestyle changes to reduce cholesterol levels among South Asians may be useful.

Disclosures: G. Hirode: None. N. Bharmal: None. N. Kandula: None. A.M. Kanaya: None.

Funding: No

Funding Component:

P089

Early CVD Events by Race and Sex: Does Risk for Atherothrombotic- and Hypertension-related Events Differ by Race and Sex? The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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African Americans (AA), both men (M) and women (W), have higher CVD mortality rates than European Americans (E), but AAM have lower prevalence of coronary calcified plaque than WM. AAs also have higher blood pressure (BP) and HDL-C than W; HDL-C is lower in M than W. We tested the hypotheses that AA race is related to higher risk of hypertension (HTN)-related events, and being male is related to higher risk of atherothrombotic (ATH)-related events, placing AAM at particularly high risk for
CVD.

Methods: We used baseline risk factor data, and adjudicated events through 28 years of follow-up from the CARDIA study which recruited 5,115 participants aged 18-30 years at baseline (1985-6). ATH-related events included acute coronary syndrome with or without MI, coronary revascularization, and CHD and other atherosclerosis death. HTN-related events included heart failure, end-stage renal disease (ESRD), stroke, and death due to cardiomyopathy. CVD events excluded ESRD and included peripheral artery disease procedures. We analyzed time to first event censoring at death without incident CVD and at follow-up end. We built adjusted Cox models with forward selection including race, sex, age, education, and smoking status as forced predictors and selecting among physical activity, anthropometry, glycemia, lipid, and blood pressure risk factors.

Results: In unadjusted analyses, risk of HTN-related events was related to race (p<0.01) but not sex (p=0.35), ATH-related events to sex (P<0.01) but not race (p=0.44), and CVD events to race (p<0.01) and sex (P<0.01). Unadjusted, all risk factors were associated with both HTN- and ATH-related events, except physical activity was not related to ATH and CVD events. After adjustment (table), AAM had higher risk of HTN- and ATH-related events, EM had higher risk of ATH-related events, AAW had higher risk of HTN-related events, and all had higher risk of CVD events than EW.

Conclusion: Race and sex are differentially associated with early HTN- vs ATH-related events, and AAM were at increased risk for both.


Funding: No

Funding Component:

P090

Non-Hospital Factors Exacerbate Racial Disparities in In-Hospital Outcomes Among Patients with Coronary Artery Disease

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BACKGROUND: Racial disparities in coronary artery disease (CAD) can worsen patient outcomes. While a number of studies have investigated racial disparities in CAD risk factors, the underlying mechanisms of racial disparities in the treatment outcomes in hospitalized CAD patients remain unclear.

HYPOTHESIS: We hypothesized that racial disparities in in-hospital CAD mortality are, at least partially, attributed to non-hospital factors that are external to quality of in-hospital care.

METHODS: We conducted a retrospective cohort study of in-hospital mortality in 9,128,116 hospitalized CAD patients (mean±SD age 72.4±13.0 years; 56.7% males) over a five-year time period. Multivariable logistic regression was used to obtain adjusted odds ratios (aOR) for in-hospital death in relation to patients’ race, adjusting for major clinical and demographic covariates.

RESULTS: A total of 349,688 deaths occurred among 9,128,116 hospitalized CAD cases (3.8% mortality). Mortality in patients admitted through the emergency department was higher than in non-emergency admissions (4.3% vs. 2.8%, p<0.001). Deceased patients had more severe comorbidities than patients who were discharged alive: mean Elixhauser-Walraven comorbidity scores were 10.6±7.7 and 4.9±6.5, respectively (p<0.001), with higher scores indicating a more severe comorbidity status.
African Americans were more likely to experience an emergency admittance than any other racial group, with 79.8% of African Americans admissions being through emergency department, compared to 70.9% of Asians admissions and 70.3% of Caucasians admissions (p<0.001, ANOVA with post-hoc analysis and correction for multiple comparisons). Asians had higher Elixhauser-Walraven scores (5.8+6.8) than African Americans (5.4+7.1) and Caucasians (5.0+6.5) (p<0.01). However, when adjusted for multiple confounders, African Americans were less likely to die than patients of other races (aOR = 0.91, 95% CI 0.90-0.92, p<0.001).

CONCLUSION: Racial disparities in in-hospital mortality for CAD patients do exist. These disparities are attributed to several factors, including the non-hospital factors external to quality of in-hospital care, such as lack of access to a high-quality primary care resulting in emergency admissions with more severe forms of CAD and severe comorbidities.

Disclosures: A.V. Sergeev: None.

Funding: No

Funding Component:

P091

The Association of Socioeconomic Status and Subclinical Atherosclerosis in a Rural Bangladesh Population


Background: Cardiovascular mortality has risen 30 fold in South Asia yet there is little data on how socioeconomic status (SES) contributes to the rising cardiovascular disease (CVD) burden. In Bangladesh, CVD accounts for the majority of non-communicable mortality. The purpose of this study was to determine the role of SES on subclinical atherosclerosis measured as carotid intima media thickness (cIMT) in a rural Bangladesh population.

Methods: cIMT was measured in 1022 participants (average age 46, 40% male) randomly selected from the Health Effects of Arsenic Longitudinal Study (HEALS), a population-based prospective cohort study based in rural Bangladesh. SES was measured with survey data as occupation type, land ownership, educational attainment, and television ownership. We assessed the association between each of these SES indicators and cIMT adjusting for potential confounders.

Results: Over half of the participants received formal education (53%) and under half owned land (48%) and a television (44%). Women were primarily homemakers (95%) and men worked as factory workers (24%), laborers (18%), or in business (55%). In univariate analysis, those owning greater than one acre of land (p = 0.03), owning a television (p =0.02), or laborers and business owners when compared to factory workers had higher levels of cIMT (p<0.01). Educational attainment was not an independent predictor of cIMT (p = 0.7). In multivariate analysis after adjustment for potential confounders, men employed in the business sector had a 26.7 µm (95% CI 6.7 - 46.9, p < 0.01) significantly greater level of cIMT when compared to factory workers. The association was strongest in older men (50.8 µm, 95% CI 9.0 - 92.6, ≥50 years old compared to younger men (19.4 µm, 95% CI -2.0 - 40.9, <50 years old). Other SES indicators were not predictors of cIMT after multivariate adjustment.

Conclusion: Working in the business sector was positively associated with subclinical atherosclerosis after adjustment for confounders. This finding is consistent with evidence from other developing nations suggesting that certain SES factors are independent predictors of CVD.

Disclosures: M. Garshick: None. F. Wu: None. A. Ahmed: None. G. Sarwar: None. Y. Chen: None.
Patient Ethnicity Predicts Poor Health Access and Gaps in Perception of Personal Cardiovascular Risk Factors

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BACKGROUND: Focus of health literacy campaigns has centered around raising awareness. It is unknown whether awareness of cardiovascular risk factors accurately reflects personalization of one’s own cardiovascular risk especially in different ethnic groups.

METHODS: A cross-sectional survey was performed in consecutive patients presenting with chest pain and admitted to a large, urban Chest Pain Center at Yale-New Haven Hospital. A 32-item multiple item questionnaire was administered in English or Spanish to examine knowledge of CHD risk factors. Separately, the personalization of coronary risk factors was determined by having patients list [write in] their individual risk factors for having a heart attack. Multivariate logistic regression model and odds ratios were used to evaluate predictors of misperception, defined as gap between knowledge and personalization of risk. Primary outcome was the evaluation of ethnic disparities in awareness of cardiovascular risk factors and the patient’s misperceptions on personal risk factors. Secondary outcome was the assessment of access to information in the same population by gender and ethnicity.

RESULTS: Between Oct 2006-April 2008, 1584 consecutive patients admitted to the Chest Pain Center were screened for eligibility, and 1051 patients were enrolled. Between Hispanic, White, and African American patients, Hispanic patients were least aware of major CHD risk factors. In addition, misperception about personal risk was significantly higher in nonwhite compared to the white participants.

This disparity persisted for the major modifiable coronary risk factors including hyperlipidemia and diabetes even when controlled for age, gender, employment, marital status, prior history of CAD and sources of health information.

CONCLUSION: Knowledge of CHD risk factors vary by ethnicity. In addition, there are major gaps between awareness and personalization of risk in major modifiable CHD risk factors in different ethnic groups.

Disclosures: Y. Kim: None. G. D’Onofrio: None. B. Safdar: None.

Analysis Commons: Team Science in a Big-data Environment for Genetic Epidemiology

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The growing volume and complexity of whole-genome sequence (WGS) and multi-omic data
requires new analytic approaches beyond those developed for the GWAS era. In response to this challenge, we present an Analysis Commons, which brings together genotype and phenotype data from multiple studies along with a suite of powerful and validated analysis tools into a secure cloud-computing framework that is equitably accessible by associated investigators. This framework is designed to address the emerging challenges of multi-center WGS analyses—data sharing mechanisms, phenotype harmonization, -omics integration, annotation—and the need for flexible, secure, efficient, high-performance computing for numerous users. The Analysis Commons is built on the DNAnexus cloud platform, which provides large parallel compute resources and robust security protocols. To permit multi-center data sharing, we implemented two parallel data sharing approaches: (1) a multi-lateral consortium agreement that enables data sharing across multiple studies, and (2) coordinated dbGaP applications among groups of institutions. Investigators with detailed knowledge of the phenotypes and contributing studies harmonize data from multiple sources for maintenance in a central database. The Analysis Commons supports multiple association-analysis software packages, as well as tools for annotation and visualization. Importantly, approved investigators have full access to the combined data sets, facilitating the rapid development and deployment of new methods. We demonstrate the Analysis Commons model with an analysis of fibrinogen in 3999 participants from the Old Order Amish Study and the Framingham Heart Study with WGS from the Trans-Omics for Precision Medicine (TOPMed) Program. We performed and validated single-variant and SKAT analyses using GENESIS and MMAP pipelines, accounting for relatedness with linear mixed models. We confirmed a known association of a nonsynonymous variant in FGG (p=2.5e-9, MAF=0.34%, rs148685782). No other single variant or SKAT association was significant after correcting for the number of tests. Analyses were run in parallel across 1408 cores and took less than one hour of wall-clock time. The Analysis Commons offers the necessary infrastructure support for analysis of WGS and multi-omic data in a setting that empowers phenotype, analytic, and computational experts to transform raw data into knowledge of the determinants of cardiovascular health.


Funding: No

Funding Component:

P094

Genetic Risk, Incident Coronary Heart Disease Events, and the Benefits of a Healthy Lifestyle: Joint and Interacting Effects Across Four US Cohorts

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Background: Recent GWAS revealed single nucleotide polymorphisms (SNPs) that cumulatively increase risk of CHD in those of European ancestry. We quantified the magnitude of preventive effects of healthy lifestyle against the countervailing effects of genetic risk on incident CHD, and assessed potential interactions.

Methods: We extracted SNPs of genome-wide significance (<5 x 10^-8) for CHD from CARDioGRAMplusC4 GWAS, and created a weighted 57-SNP genetic risk score (GRS). Baseline covariates, healthy lifestyle score (including diet pattern, physical activity, smoking and BMI), and incident CHD were harmonized across 4 US cohorts (WHI, ARIC, CHS, and MESA) using dbGaP data. Pooled analyses were run using one-step individual participant data multivariate regressions in
Caucasians without prevalent CVD.

**Results:** Among 22,412 adults, the GRS was associated with incident CHD (n = 3001 cases) across each cohort (pooled GRS quintile (Q)5 vs Q1, RR (95% CI): 1.59 (1.41-1.79)), independent of all demographic and lifestyle variables. The lifestyle score was more strongly associated with CHD (pooled Q1 vs Q5, RR: 1.94 (1.71-2.20)) than the GRS, and better discriminated those who had a CHD event (P=0.025 for difference in AUROC curves). When compared to population-level analysis, joint effects analysis revealed significant heterogeneity within quartiles of lifestyle score on risk of incident CHD (Table). Interactions between the GRS and diet pattern (P=0.022) and trans fats (P=0.046) were observed. Effects of trans fats on CHD risk appear to be concentrated in those with a higher GRS: for trans fats >2.4% of energy, RRs for increasing GRS quartiles are 0.92 (0.62-1.36), 1.13 (0.79-1.62), 1.43 (1.01-2.01), and 1.84 (1.30-2.61), compared to those in the lowest quartile of trans fat (<1.3% of energy) and lowest GRS quartile.

**Conclusion:** A joint effects approach reveals significant inter-individual variability in lifestyle on CHD risk by underlying genetic risk that is obscured by a conventional population-level effects approach.

Disclosures: **L.C. Del Gobbo:** None. **E. Salfati:** None. **J. Li:** None. **C.D. Gardner:** None. **J.P.A. Ioannidis:** None. **T.L. Assimes:** None.

Funding: No

Funding Component:

**P095**

**Diet Quality and Genetic Association With Body Mass Index**

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**Background** Whether dietary quality modifies genetic association with body mass index (BMI) is unknown. **Methods** We examined the interactions prospectively of a genetic risk score (GRS) based on 97 BMI-associated variants with three diet quality scores (alternative healthy eating index 2010 (AHEI-2010), Alternative Mediterranean Diet score (AMED) and Dietary Approach to Stop Hypertension (DASH) diet score) on BMI in 30,904 participants from three large US cohorts. According to the enrichment of genes near the BMI-associated loci in the central nervous system (CNS), we further created two subsets of GRSs: CNS GRS based on 54 variants and non-CNS GRS based on 43 variants. **Findings** We found significant interactions between total GRS and all three diet scores on BMI assessed after 2 to 3 years, with an attenuated genetic effect observed in individuals with healthier diets (AHEI: P for interaction = 0.003; AMED: P = 0.001; DASH: P = 0.004). For example, the difference in BMI per 10 unit increment of the GRS was smaller among participants in the highest tertile of AHEI score compared to those in the lowest tertile (0.84 [95% CI: 0.72, 0.96] vs. 1.14 [0.99, 1.29] kg/m²). Results were consistent across the three cohorts with no significant heterogeneity. The interactions with diet scores on BMI appeared more significant for CNS GRS (AHEI: P = 0.009; AMED and DASH: P < 0.001) than for non-CNS GRS (AHEI: P = 0.10; AMED: P = 0.50; DASH: P = 0.68). Among individual components of diet scores, higher consumption of red/processed meat, sugar-sweetened beverages, and trans fat accentuated genetic associations with BMI (P <0.01), while higher consumption of fruit and moderate alcohol attenuated genetic associations with BMI (P < 0.01). **Interpretation** A higher diet quality may mitigate genetic predisposition to obesity. These findings
provide insights into complex interplays between diet and genetic influences and underscore the importance of adopting a healthful diet for the prevention of obesity, particularly those individuals with a strong genetic predisposition to obesity.


Funding: No

Funding Component: P096

The Genetics Architecture of the Serum Metabolome

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Introduction: The metabolome is a collection of small molecules in a biologic sample, and may serve as biomarkers or predictors of heart disease. Whole genome sequence analysis offers the opportunity to investigate rare and low-frequency annotated variants across the human genome. We used whole genome sequence analysis to characterize the genetic architecture of the serum metabolome.

Methods: Whole genome sequencing and measurement (chromatography and mass spectrometry) of 245 serum metabolites were done in 1,458 European Americans and 1,679 African Americans from the Atherosclerosis Risk in Communities (ARIC) study, and these data were used to perform a trans-ethnic meta-analysis. Common variants (MAF>5%) were analyzed individually using an additive genetic model. Rare and low-frequency protein-altering variants (MAF≤5%) were aggregated by genes. In order to determine the contribution of regulatory and non-protein coding regions of the genome, we conducted aggregate tests across the entire genome using a 4kb sliding window as well as in predefined regulatory elements, which includes enhancers, promoter, and 3’ and 5’ untranslated region of a gene.

Results: We identified 119 significant associations between genetic variants and metabolite levels (significance threshold p<2.0*10^-10 for single variants, p<2.9×10^-10 for aggregate tests), of which 49 were novel, including genes involved in known Mendelian conditions, protein biological processes, and disease related pathways. Six genes (DMGDH, AGA, ACY1, PRODH, DDC and CPS1) causing rare inborn errors of metabolism were associated with amino acid levels in the general population. A predicted regulatory variant in the AGA gene, encoding a protein involved in asparagine generation, was associated with serum asparagine levels independent of any coding variants in this gene. Seven genes (ABCC2, PKD2L1, SLC10A1, FDX1, CYP3A43, UGT2B15 and SULT2A1) related to lipid-related metabolite levels were identified, whose gene products are involved in secretion, channeling and transportation. Analysis of regulatory regions unraveled associations between three steroid lipids and a member of the cytochrome P450 family, CYP3A43. Five genes within the kinin-kallikrein pathway were identified to be related to small peptide levels, including KLKB1, KNG1, F12, ACE and CPN1. Variants in CPN1, which is known to bind to fibrinogen, were associated with DSGEGDFXAEGGGVR, a peptide which is produced during fibrinogen to fibrin conversion.

Conclusion: This study outlines an approach to characterize the genetic architecture of the human serum metabolome and shows that sequence variants affect multiple human metabolites. Using the principle of Mendelian randomization, the next step is to determine
whether any of these metabolites are in causal pathways to disease.

**Key words**: Whole genome sequence analysis; Metabolomics.

Disclosures: **Z. Wang**: None. **B. Yu**: None. **P.S. De Vries**: None. **E.V. Feofanova**: None. **F. Yu**: None. **R.A. Gibbs**: None. **A.C. Morrison**: None. **E. Boerwinkle**: None.

Funding: No

Funding Component:

**P097**

**Soluble TNF Receptor II Levels are Associated With Leukocyte DNA Methylation in the Major Histocompatibility Complex Region in the Framingham Heart Study**

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**Background** - Transmembrane TNF receptors are involved in signal transduction for inflammatory, apoptotic, and proliferative processes, and can be shed into the bloodstream in response to various stimuli. Soluble TNF receptor II (sTNFR2) levels are predictive of incident cardiovascular disease events. We speculate that sTNFR2 is associated with ‘epigenetic priming’ of leukocytes in community dwelling adults, which may relate to the pathophysiology underlying atherogenic risk.

**Methods** - We conducted a methylome-wide association study of sTNFR2 levels among participants in the Framingham Offspring cohort (examination 8; 2005-2008). Methylation of whole-blood derived DNA was assayed by microarray (Infinium HumanMethylation450 BeadChip, Illumina). sTNFR2 was quantitated by an enzyme-linked immunoassay (Quantikine, R&D Systems). We excluded individuals with known autoimmune diseases or on medications that affect inflammatory response. We conducted linear mixed effects models adjusting for age, sex, body mass index, smoking, imputed cell count, and technical covariates. A Bonferroni-adjusted p-value for 485k tests (p<1x10^{-7}) was considered significant.

sTNFR2-related CpGs were tested for enrichment in DNAse I Hypersensitivity (DHS) hotspots and overlapping chromatin marks across various cell and tissues lines from ENCODE, Epigenomics Roadmap and Blueprint data. Genes annotated to sTNFR2-related CpGs were tested for overrepresentation for protein class and biological process gene ontologies.

**Results** - Our study included 2472 participants (mean±SD: age 66±9 years, 54% female, sTNFRII 2658±1093 pg/ml). In the multivariable-adjusted model, methylation at 168 CpGs was associated with sTNFR2 levels (p<10^{-7}, λ_GC=1.4). Identified CpGs were enriched in active regulatory regions (DHS hotspots) across most blood cell lines (especially inflammatory macrophages, p<10^{-15}), but also vascular and cardiac tissues (p<10^{-4}). sTNFR2-related CpGs were enriched in loci that overlapped histone modifications indicative of enhancers (H3K4me1), and to a lesser extent, promoters (H3K4me3) and actively transcribed gene bodies (H3K36me3). A substantial proportion of the identified CpGs (27 CpGs; 16%) were located in the major histocompatibility complex (MHC) region. Overall, there was enrichment in the protein class ‘MHC antigen’ (p=3x10^{-5}) and the biological process ‘antigen processing and presentation’ (p=2x10^{-4}). Other top loci were in gene regions involved in NF-κB/cytokine pathways, such as *NLRC5*, *SOCS3*, *BCL3*, and *SBN02*. **Conclusions** - We identify numerous loci in the MHC region and near specific NF-κB pathway genes that are differentially methylated in blood in relation to sTNFR2 levels. We present a foundation of candidate loci for future studies to determine relevance.
for targeting to prevent, treat, or improve risk prediction for cardiovascular disease.


Funding: No

Funding Component:
P098

An Epigenome-wide Study of Obesity in African American Youth and Young Adults: Novel Findings, Replication in Neutrophils and Relationship With Gene Expression

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Background: Several large-scale epigenome wide association studies on obesity-related DNA methylation changes have been published and in total identified 46 CpG sites. These studies were conducted in middle-aged and older adults of Caucasians and African Americans (AAs) using leukocytes. To what extent these signals are independent of cell compositions as well as to what extend they may influence gene expression have not been systematically investigated. Furthermore, the high prevalence of obesity comorbidities in middle-aged or older population may hide or bias obesity related DNA methylation changes. Methods: In this study of healthy AA youth and young adults, genome wide DNA methylation data from leukocytes were obtained from three independent studies: EpiGO study (96 obese cases vs. 92 lean controls, aged 14-21, 50% females, test of interest is obesity status), LACHY study (284 participants from general population, aged 14-18, 50% females, test of interest is BMI), and Georgia Stress and Heart study (298 participants from general population, aged 18-38, 52% females, test of interest is BMI) using the Infinium HumanMethylation450 BeadChip. Genome wide DNA methylation data from purified neutrophils as well as genome wide gene expression data from leukocytes using Illumina HT12 V4 array were also obtained for the EpiGO samples. Results: The meta-analysis on the 3 cohorts identified 76 obesity related CpG sites in leukocytes with p<1×10^-7. Out of the 46 previously identified CpG sites, 36 can be replicated in this AA youth and young adult sample with same direction and p<0.05. Out of the 107 CpG sites including the 36 replicated ones and the 71 newly identified ones, 71 CpG sites (66%) had their relationship with obesity replicated in purified neutrophils (p<0.05). The analysis on the cis regulation of the 107 CpG sites on gene expression showed that 59 CpG sites had at least one gene within 250kb having expression difference between obese cases and lean controls. Furthermore, out of the 59 CpG sites, 6 showed significantly negative correlations and 1 showed significantly positive correlation with the differentially expressed genes. These CpG sites located in SOCS3, CISH, ABCG1, PIM3 and PTGDS genes. Conclusion: In this study of AA youth and young adults, we identified novel CpG sites associated with obesity and replicated majority of the CpG sites previously identified in middle-aged and older adults. For the first time, we showed that majority of the obesity related CpG sites identified from leukocytes are not driven by cell compositions and provided the direct link between DNA methylation-gene expression-obesity status for 7 CpG sites in 5 genes.


Funding: No

Funding Component:
A Methylome- and Transcriptome-Wide Study of Dietary Fructose Intake in Humans

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Background: Animal model studies reported robust associations between fructose intake, a known determinant of metabolic health across species, and DNA methylation/ gene expression patterns. To date, these associations have not been comprehensively investigated in humans.

Methods: Using DNA methylation data on ~470,000 cytosine-phosphate-guanine (CpG) sites in the Genetics of Lipid Lowering Drugs and Diet Network (GOLDN, n=991) quantified in CD4+ T-cells, we have interrogated the cross-sectional relationships between fructose intake (ascertained using a validated food frequency questionnaire) and epigenome-wide methylation. We fit linear mixed models adjusted for age, sex, study site, technical covariates (fixed effects) and family relatedness (random effect). We have supplemented the methylation analyses with a transcriptome-wide scan on 98 unrelated GOLDN participants with available RNASeq data in whole blood. For the RNASeq data analysis, we used negative binomial models of read counts as a function of fructose intake, adjusted for age, sex, study site, technical covariates (including differential white blood cell counts).

Results and Conclusions: The top loci differentially methylated with respect to fructose intake mapped to SNED1 (regression coefficient +/- SE= 0.002 +/- 0.0005, P=5x10^-6) and FARSB (regression coefficient +/- SE= 0.002 +/- 0.0004, P=5x10^-6) on chromosome 2. SNED1 is an insulin responsive transcription factor that has previously been shown to be downregulated in the setting of metabolic syndrome. FARSB encodes an aminoacyl-tRNA synthetase implicated in cell growth. Additionally, two genes reached transcriptome-wide significance in the RNASeq analysis: MTATP8P1 (P=1x10^-7) and PDXDC1 (P=6x10^-7). Sequence variation in PDXDC1 (pyridoxal-dependent decarboxylase isoform) has previously been linked to lipid metabolism, while MTATP8P1 is a pseudogene for a mitochondrially encoded ATP synthase. Upon future replication and functional validation, our preliminary findings offer promising insights into the link between fructose intake and metabolic health.


Funding: No

Funding Component:

Heritability of Atrial Fibrillation

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Background: Atrial fibrillation (AF) is a common and heritable arrhythmia associated with substantial morbidity. Previous reports have implicated over 30 genes and 16 loci in the pathogenesis of AF, but the genetic architecture of the arrhythmia has not been systematically characterized.

Methods: We assessed AF heritability in 120,286 unrelated individuals of European ancestry (2,981 with AF) from the population-based UK Biobank. We ascertained AF based on self-reported disease history and/or billing codes from medical record data. To validate the phenotype definition, we examined genetic associations with AF for variants at known susceptibility loci reported in prior independent genome-wide association studies. We then estimated the proportion of AF variance explained by additive genetic variation (heritability) using a variance components method (BOLT-REML) based on ~800,000 independent high quality imputed variants with minor allele frequencies (MAF) ≥ 1%. We further evaluated the heritability of AF by sex, allele frequency, and established AF loci from association studies (+/- 500 kb of a top associated variant). All analyses were adjusted for baseline age, sex, array, and 15 principal components of ancestry.

Results: The average age was higher in AF cases than in referents (62.3 years vs. 56.8 years), and more AF cases were male (69% vs. 47%). We observed expected associations between genetic variation and AF, validating our AF definition. The heritability of AF was 22.3% (95% confidence interval [CI] 15.8%-28.8%), and no substantive difference was observed between males and females. We observed that the AF variance was mainly explained by common variants with MAF ≥ 5% (20.6%, 95%CI 15.2%-25.9%) rather than low-frequency variants with MAF between 1%-<5% (0%, 95%CI 0.0%-0.06%). Only 4.7% (95%CI 3.7%-5.7%) of AF variance was explained by known AF susceptibility loci.

Conclusions: Using a population-based sample of European ancestry, we observed that a substantial proportion of variance in AF risk is attributable to additive genetic variation. AF variance is predominantly accounted for by common variants. Only a small proportion of AF variance is attributable to known AF loci. Our findings suggest that further genetic discovery, with an emphasis on common variation, is warranted to understand the causal genetic basis of AF.


Funding: No
Harmful use of alcohol results in 3.3 million deaths annually and 139 million disability-adjusted life years, and is a risk factor for obesity, hypertension, cardiomyopathy, and stroke. According to the NIAAA, while some minority groups (African Americans and Hispanics) are more likely to abstain from alcohol, those who do drink have higher rates of alcohol consumption and binge drinking. In addition, most genetic studies of alcohol have focused on dependence phenotypes. In populations of European and East Asian ancestry, genes related to alcohol metabolism, including ADH and ALDH, have been identified, and AUTS2 and SLC6A1 have been associated with alcohol consumption. Studies focused on diverse populations are necessary to provide insight into population-specific genetic variability and guide precision screening and intervention efforts.

We aim to further efforts in precision medicine using The Multi-Ethnic Genotyping Array (MEGA), a custom array designed to capture genetic variants in minority populations to allow for imputation to low minor allele frequencies (MAF) across ancestries, as well as clinically relevant variants and deep genotyping of previously identified GWAS regions associated with complex diseases.

We performed the first discovery study for alcohol traits using MEGA genotype data in African American, Hispanic, Asian, Native Hawaiian, and Native American PAGE participants to discover novel genetic variants influencing alcohol consumption. Our preliminary results focus on non-pregnant women over 21 (N=21,641), with phenotype data on drinks/week in study-specific single variant additive regression models controlling for age, PCs, and study center. Study-specific results were then meta-analyzed in METAL. Four variants on chromosome 8 (R²=0.33-0.81) passed our chip-wide significance threshold of p=2.8E-8. Of these, rs115165977 showed the strongest association with drinks/week (beta=1.93, se=0.32, p=1.70E-09). This variant is monomorphic in European and East Asian reference populations, but has a MAF between 0.01-0.03 in non-Asian PAGE populations. Rs115165977 is near ZFPM2, a gene previously associated with cardiomyopathy that codes for a transcription factor regulating GATA proteins important for heart morphogenesis. This mouse ortholog of ZFPM2 has also been associated with alcohol acceptance and alcohol-induced loss of the righting reflex. Future work will focus on analysis of alcohol consumption using PAGE imputed data in the full sample, as well as fine-mapping known alcohol-related loci typed on the MEGA chip.


Funding: No

Funding Component:

P102

Epigenome-wide Association Study of Measures of Fasting Glucose, Fasting Insulin, and Hba1c in Non-diabetic Individuals of European, African, and Hispanic Ancestry in the Charge Consortium

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Epigenome-wide association study of measures of fasting glucose, fasting insulin, and HbA1C in non-diabetic individuals of European, African, and Hispanic ancestry in the CHARGE Consortium.

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Abstract
Background: Fasting glucose, fasting insulin, and hemoglobin A1c are important glycemic biomarkers and elevated levels of these markers predict future glycemic dysfunction and type-2 diabetes. Several studies have identified DNA methylation sites associated with quantitative glycemic traits and T2D. However, these studies have generally been limited in size. In this project, we aim to identify blood cells methylation signatures associated with three quantitative glycemic traits - fasting glucose (FG), log-transformed fasting insulin (logFI) and hemoglobinA1c (HbA1c) through meta-analysis of DNA methylation data from participating CHARGE Epigenetics Working Group cohorts.

Methods: We conducted an epigenome-wide meta-analysis of DNA methylation assessed with Illumina BeadChip 450K array on blood-based DNA samples, including 12,681 for FG, 11,224 for logFI, and 6358 for HbA1c, from non-diabetic participants of European, African, and Hispanic ancestry in 10 cohorts from the CHARGE Epigenetics Working Group. Mixed linear regression analyses were performed adjusting for age, sex, smoking status, cell composition, and technical covariates, with and without adjustment for BMI. A Bonferroni corrected P value of $1.1 \times 10^{-7}$ was considered significant.

Results: In combined multiethnic analysis, methylation at a total of 208 cytosine guanine dinucleotides (CpGs) were significantly associated with FG, 761 CpGs with logFI, and 109 CpGs with HbA1c. Adjustment for BMI substantially reduced the number of DNA methylation loci that met epigenome-wide significance. Biologically putative genes include CPT1A and TXNIP (FG), ABCG1 and CPT1A (logFI), and ABCG1 and MAFG (HbA1C).

Conclusion: Our findings suggest that methylation of CpG sites within multiple genes are cross-sectionally associated with glycemic biomarkers. Our results also confirm findings from prior and smaller studies, meriting further evaluation of these methylation sites and genes as novel disease risk markers.


Funding: No

Funding Component:

P103
Introduction: Mean corpuscular volume (MCV) of red blood cells (RBCs) is a heritable index commonly used in clinical workup of anemia. Macrocytosis, or high MCV, is associated with cardiovascular events in chronic kidney disease patients and all-cause mortality. Genome-wide association studies (GWAS) of MCV have been conducted primarily in European and Asian populations; few have included populations of African or American ancestry. The Multiethnic Genotyping Array (MEGA) was designed to improve variant discovery and fine-mapping in US minorities by better capturing population-specific genetic variation. To identify novel MCV loci and examine evidence of generalization of previously reported MCV loci to populations with African and Amerindian genetic admixture, we conducted a GWAS of African American and Hispanic/Latino Population Architecture using Genomics and Epidemiology (PAGE II) participants on the MEGA array.

Methods: We employed Illumina MEGA genotype data to evaluate the association between ~1.5 million SNPs and MCV. Generalized estimating equation models were adjusted for age, sex, current smoking status, study, study center, and the top 10 study-specific principal components of genetic ancestry. Race/ethnic-stratified analyses were combined using inverse-variance weighted fixed-effects meta-analysis to evaluate the entire study sample. Significance thresholds of $1.8 \times 10^{-3}$ and $5 \times 10^{-8}$ were used to define generalization and genome-wide significance, respectively.

Results: The study population of 3,734 African Americans and 15,505 Hispanic/Latinos was 62% female with a mean age of 50 (range: 18 to 94 years); 19% of participants were current smokers. Trans-ethnic meta-analysis identified 12 genome-wide significant loci for MCV, including two associations at previously unreported loci: FIGNL1/IKZF1 (chromosome 7p12.2, co-ded allele frequency [CAF] range=51 to 57%), and LRP6 (chromosome 12p13.2, CAF range=0.3 to 1.7%). FIGNL1 is involved in DNA double-strand break repair, and IKZF1 is a zinc-finger protein that functions in the hemolympopoietic system. LRP6 encodes an LDL receptor involved in the Wnt/beta-catenin signaling cascade. Ninety-three percent of previously reported MCV loci generalized to the combined PAGE study population, ten at genome-wide significant levels. No previously unreported MCV loci were detected in race/ethnic stratified analyses.

Conclusion: Generalization of previously reported MCV loci to African Americans and Hispanic/Latinos highlights the shared genetic architecture of MCV. The potentially novel associations identified at chromosomes 7p12.2 and 12p13.2 also underscore the benefits of performing GWAS in ancestrally diverse populations using arrays that better capture global genetic variation.
Elevated levels of fasting glucose and fasting insulin precede the development type 2 diabetes (T2D). While T2D and cardiovascular disease share common risk factors, dysregulation of glucose metabolism is of particular concern because it can result in end-organ damage including the heart, nerves, kidneys, and eyes. The prevalence of diabetes is higher in American minority populations. Through genome-wide association studies, approximately 60 loci have been identified for fasting glucose, fasting insulin, and glycated hemoglobin. To better understand the genetic basis of glucose dysregulation, the Population Architecture using Genomics and Epidemiology (PAGE) Consortium genotyped 12,801 Hispanic/Latinos, 5,696 African Americans, 1,405 Native Hawaiians, 398 Native Americans, and 1,727 Asians without diabetes using the approximately 1.3 million variants on the Multi-Ethnic Global Array (MEGA), which is enriched for coding variation and ancestral diverse content. Through ancestry-combined single variant association testing with fasting glucose, fasting insulin, and glycated hemoglobin (HbA1c), we identified a novel potential association between decreased HbA1c and the minor A allele of rs11887523 (p = 4.51x10^{-9}, MFSD2B p.A60T, minor allele frequency (MAF) 7% in African Americans, MAF 2% in Hispanics). Other associations with HbA1c included hemoglobin genes, further highlighting the importance of considering variation in hemoglobin and red-blood cell lifespan when using HbA1c as a measure of glucose control. We also replicated several known associations including between fasting glucose and variants near G6PC2, GCKR, MTNR1B, and FOXA2; and between fasting insulin and the GRB14/COBL1 locus. Further analyses including imputing the data out to 1000 Genomes phase3 and gene-based tests of rare variants are underway. These will increase power to detect associations with ancestry-specific rare variants.
Weighted Multi-marker Genetic Risk Scores for Incident CHD Among Individuals of African, Latino or East-Asian Ancestry

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BACKGROUND: GWAS have identified genetic variants associated with coronary heart disease (CHD). One of the potential uses of these genetic biomarkers is to improve the predictive capacity of existing risk functions. We studied the clinical utility of four multi-locus genetic risk scores (GRS’s), previously validated in European subjects, among persons of African (AFR), Latino (LAT) and East-Asian (EA) ancestry.

METHODS: We used data from the GERA cohort of Kaiser Permanente in Northern California (30-74 years old, 69 to 73% female) that included 2,079 AFR, 4,329 LAT and 4,801 EA. We generated four GRSs based on 8, 12, 36 and 51 SNPs, respectively, associated with CHD weighted by the magnitude of the association reported by the CardiogramplusC4D Consortium. We used the Framingham Risk Score (FRS) to estimate 10-year CHD risk (<10%=low, 10 to 20%=intermediate, >20%=high).

RESULTS: After a mean (± SD) follow-up of 5.9 (± 1.5) years, 77, 109 and 101 incident CHD events (AMI, angina pectoris, revascularization procedures and/or CHD death) were documented in AFR, LAT and EA, respectively. In models adjusted for individual FRS risk factors and principal components, GRS_8 and GRS_51 were significantly associated with CHD among LAT while GRS_36 and GRS_51 were significantly associated with CHD among EA. In fixed effects meta-analysis there was no evidence of heterogeneity (all p>0.53). The inclusion of the GRS on top of the FRS did not improve the Harrel's C-statistics in any of the ethnic subgroups nor in the meta-analysis. The bias-corrected NRI in the intermediate FRS group (c-NRI) was statistically significant for GRS_8 and GRS_12 in EA and in the meta-analyses.

CONCLUSIONS: All four GRS’s were linearly and directly associated with an increased risk of CHD events among minority subjects in GERA. Reclassification was overall better for GRS_8 and GRS_12 than for GRS_36 or GRS_51. These results support the consideration of the inclusion of genetic information in classical functions for risk assessment among subjects of minority background.

Disclosures: C. Iribarren: B. Research Grant; Modest; Grant from GenDiag., Inc. M. Lu: None. E. Jorgenson: None. M. Martinez: A. Employment; Significant; member of the board of Gendiag and has a services contract relationship with Gendiag. C. Lluis-Ganella: A. Employment; Significant; Carla Lluis-Ganella is an employee of Ferrer in Code, company that commercializes a product based on GRS_12. I. Subirana: None. E. Salas: A. Employment; Significant; employee of Gendiag.exe (company participated by Gendiag). Inventor in a patent application based on the GRS_12, which applicant is Gendiag.exe. R. Elosua: G. Consultant/Advisory Board; Significant; Roberto Elosua is a member of the scientific advisory
board of Gendiag and inventor in a patent application based on the GRS_12, whose applicant is Gendiag.exe.

Funding: No

Funding Component:

P106

Epigenetic Age Acceleration and Postprandial Lipemia in the Genetics of Lipid Lowering Drugs and Diet Network Study

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Background: Calculated ‘epigenetic age,’ a novel biomarker based on DNA methylation levels of 353 CpGs, has been demonstrated to accurately predict chronological age across a broad spectrum of tissues and cell types. Recently epigenetic age acceleration or older epigenetic age in comparison to chronological age has been robustly associated with all-cause mortality independent of chronological age in multiple human cohorts. However, accelerated epigenetic aging has not been associated with lipids levels, including postprandial lipid levels which are linked to prothrombotic and proinflammatory processes that may precipitate aging. In the current study we aimed to evaluate the association between epigenetic age acceleration and lipid levels. Methods: We used the Horvath DNA methylation age calculator to estimate epigenetic age in 988 Caucasian participants from the Genetics of Lipid Lowering Drugs and Diet Network (GOLDN) using Illumina Infinium HumanMethylation450 BeadChip array data derived from CD4+ T-cell DNA. GOLDN participants did not take lipid lowering drugs for at least four weeks prior to enrollment and underwent a standardized high fat meal challenge after fasting for at least 8 hours followed by timed blood draws at 3.5 and 6 hours following the meal. Epigenetic age acceleration was calculated as the residual from regressing methylation age on chronological age. We used linear mixed models to examine the association of age acceleration quartiles with fasting and postprandial (3.5 and 6 hour time points) low density lipoprotein (LDL), high density lipoprotein (HDL) and triglyceride (TG) levels after adjusting for age, study site, sex, fasting lipid level (if applicable), deconvolution estimated T-cell type percentages and a random effect of family relationship. Results: The correlation between calculated methylation age and chronological age was 0.91. The difference between methylation age and chronological age (methylation age - chronological age) was on average -5.8 (5.9), -0.5 (4.7), 2.9 (4.3), and 7.8 (5.0) years for the first through fourth quartiles of age acceleration, respectively. After adjustment for covariates neither fasting nor postprandial lipids were associated with age acceleration quartile. Conclusions: Evidence from the current study suggests lipid levels in the fasting and postprandial state are not related to accelerated epigenetic aging, however given the association between epigenetic age acceleration and mortality observed in previous studies the relationship of other metabolic parameters with age acceleration may be worthy of investigation.


Funding: No

Funding Component:

P107

Leucocyte Telomere Length and Cardiovascular Disease in the Jackson Heart Study
Background: In European descent populations, shorter leucocyte telomere length (LTL) has been associated with clinical and subclinical atherosclerosis, while longer LTL has been associated with greater left ventricular hypertrophy (LVH). We evaluated the relationship of LTL with subclinical indices of cardiovascular disease (CVD) (coronary artery calcification [CAC], abdominal aorta calcification [AAC], carotid intima media thickness [CIMT], left ventricular mass [LVM], and ankle-brachial index [ABI]) in African Americans (AAs). We also examined whether LTL is associated with CVD events and mortality.

Methods: Analyses included participants of the Jackson Heart Study (JHS), a prospective cohort study of AAs, with LTL data (n=2,573) measured by Southern blot analysis in DNA from the baseline exam (2000-2004). Adjudicated CVD events (coronary heart disease [CHD], heart failure [HF] and stroke) and mortality were identified through December 2012. Relationships were assessed using linear, logistic regression models, or Tobit model (CAC and AAC due to left censoring) in STATA 14.

Results: In an age and sex adjusted model, longer LTL was significantly associated with lower CAC (P=0.049, β=-0.535; 95% confidence interval [CI], -1.066, -0.003); this association was no longer significant after adjusting for body mass index, current smoking and other CVD risk factors. There were no significant associations between LTL and AAC, CIMT, or LVM. LTL was associated with higher ABI (P=0.017, β=0.023; 95% CI, 0.004, 0.042) when the highest was compared to the lowest LTL quartile in models adjusted for CVD risk factors. After a median follow-up of 9 years, longer LTL was associated with lower risk of incident ischemic stroke and total mortality in age and sex adjusted models, but these associations were no longer significant in models fully adjusted for CVD risk factors.

Conclusions: In conclusion, among a community-based cohort of AAs, LTL was associated with increased ABI, indicative of increased risk of peripheral arterial disease, but there were no significant associations with other CVD indices and mortality after adjustment for established risk factors.


Funding: No

Funding Component:

P108

Genome-wide Association Study of Activated Partial Thromboplastin Time in Multi-Ethnic Populations

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BACKGROUND: Activated partial thromboplastin time (aPTT) is a clinical test used to measure the clotting time between the activation of factor XII and the formation of a fibrin clot. Prolonged aPTT indicates a deficiency in the coagulation pathway while shortened aPTT is associated with
prothrombotic risk factors and venous thromboembolism. Despite the high heritability of aPTT (40-80%), previous genome-wide association studies (GWAS) of aPTT have been limited to European descent populations, with only a smaller candidate gene study conducted in African Americans. **METHODS:** We included 13,803 participants of European ancestry (EU) and 2,724 participants of African American ancestry (AA) from the Cohorts for Heart and Aging Research in Genetic Epidemiology (CHARGE) consortium. aPTT, in seconds (s), was measured using standard protocols in plasma with the use of automated coagulometers. Genotype data were imputed to the 1000 Genomes Phase 1 reference panel, and associations were examined using linear regression assuming an additive genetic model and adjusting for global ancestry, age, sex, and study design. Study-specific results were combined using a fixed-effects, inverse variance weighted meta-analysis. **RESULTS:** We identified seven loci associated with aPTT in EU populations (F5, FRMD5, KNG1, F11, F12, HLA, ABO) and three loci associated with aPTT in AA populations (KNG1, F12, ABO) at genome-wide significant levels ($P < 5 \times 10^{-8}$). These results are consistent with previously reported genetic studies in EU and AA populations. Effect sizes were larger in AA populations (1.08 to 1.32 s) than in EU populations (0.40 to 1.00 s). **CONCLUSIONS:** We successfully replicated associations with aPTT at seven loci in EU populations and three loci in AA populations. Our results suggest that genetic determinants of aPTT are consistent across race/ethnicity but that studies in AA populations are currently underpowered relative to EU populations. Future work in aPTT genetics should consider more diverse populations.

Disclosures: **A.A. Seyerle:** None. **S. Basu:** None. **C. Fuchsberger:** None. **M. Germain:** None. **W. Guan:** None. **T. Kacprowski:** None. **A. Greinacher:** None. **M.E. Kleber:** None. **G. Delgado:** None. **W. März:** None. **P. Morange:** None. **N. Pankratz:** None. **D. Tregouet:** None. **J.S. Pankow:** None. **W. Tang:** None.

**Funding:** No

**Funding Component:**

**P109**

**Detection of Haplotypes Underlying a Coronary Artery Calcification Linkage Peak in the Family Heart Study**

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Coronary artery calcification (CAC) is the buildup of calcium deposits in the arteries leading to the heart, and is an indicator of atherosclerosis. CAC is known to have a genetic component, and a genome-wide linkage screen in the Family Heart Study identified significant evidence of linkage on chromosome 9 in the area near rs13293430, but no common variant in the linkage region showed significant evidence of association.

Linkage screens attempt to identify covariance due to common ancestry at a genomic locus. This is robust to the presence of rare variation or multiple variants in a region, but is unable to identify the genomic feature causing the signal and additional research is needed to identify potential causative variants.

Pairs of individuals who have inherited a locus from a common ancestor will share an identical sequence of alleles (a haplotype) within the region. To identify haplotypes influencing the trait in the region, a mixed effects model was used. CAC was modeled as a trait influenced by polygenic effects and locus-specific haplotype effects. This model has the benefit of jointly estimating the effect of each haplotype while separating the haplotype effect from the background polygenic effect.

From the study, 2,687 individuals of European descent from 508 pedigrees with CAC scores were genotyped on the Illumina Human 1M-DuoV3 single nucleotide polymorphisms (SNP) array. Of these, 180 individuals from 23 pedigrees were for subsequent analysis due to
membership in a pedigree contributing to the linkage signal. CAC scores were determined by cardiac CT scan and adjusted for age, sex, and principal components before analysis. Phased haplotypes were generated for 906,856 common SNPs across the genome using SHAPEIT. The region between 25Mb and 35Mb (3,500 SNPs) was divided into 250kb sections, and within each section haplotypes were created based on 24 evenly spaced SNPs. Statistical significance for each region was determined by likelihood ratio test. Haplotype analysis identified two regions showing strong evidence of association (p<10^{-7}) with CAC. The region 28.2-28.25Mb is located completely within the gene LINGO2, which has been associated with BMI and cholesterol. The region 27.5-27.75Mb contains MOBKL2B, IFNK and C9orf72. Additional work will be needed to validate haplotypes used in the model and identify the particular haplotype influencing the trait.

Disclosures: J.E. Hicks: None. M.A. Province: None.
Funding: No

Funding Component:
P110

Gene-Gene Interaction: SERPINE1 Interacts with ANRIL in Association with Coronary Artery Disease and Coronary Artery Calcium in a Non-Hispanic Population

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Introduction: Long non-coding RNAs (lncRNA) are important regulators of gene expression. ANRIL (CDKN2B-AS1) is an anti-sense lncRNA coded for at the Chr9p21 locus. GWAS have reported SNPs in the Chr9p21 to be associated with clinical coronary artery disease (CAD) and coronary artery calcium (CAC). A knockdown study of two isoforms of ANRIL reported the potential of ANRIL’s regulation of SERPINE1 expression. SERPINE1 encodes plasminogen activator inhibitor-1 (PAI-1) and has been reported to be associated with CAD and CAC. The 3’UTR of SERPINE1 has been reported to bind miRNA and lncRNA suggesting ANRIL may modify SERPINE1’s association with CAD and CAC.

Hypothesis: We hypothesized that rs7242 or rs1050955, covering the LD of the 3’ UTR of SERPINE1, will interact with SNPs within ANRIL to affect their association with self-reported CAD and CAC in non-Hispanic Whites (NHW, n=6103) and African Americans (AA, n=2549) in the COPDGene Study.

Methods: Interaction of SNPs from Illumina HumanOmniExpress Beadchip for ANRIL, and rs7242 and rs1050955 were evaluated in an additive genetic model with a cross-product interaction term. Logistic regression was used to evaluate the association of CAD (Yes/No) and CAC (Yes/No) with the SNP-SNP interactions, while controlling for genetic ancestry, ascertainment, age, sex, BMI, diabetes, hypertension, high cholesterol and pack-years of smoking. Analyses were stratified by race.

Results: A significant interaction between rs7242 (SERPINE1) and rs7049105 (ANRIL) and CAD (p=0.0004) and CAC (p=0.0023) were found in NHW (Figure 1). The risk estimates for the rs7242 G allele in SERPINE1 were higher in those with the rs7049105 AA genotype in ANRIL.
but were lower in those with the rs7049105 GG genotype in ANRIL. We did not find any significant interactions in AA.

**Conclusion**: In this study, the previously identified GWAS signal for CAD and CAC in Chr9p21 (ANRIL) interacts with a SNP in SERPINE1. This may be due to ANRIL IncRNA influences on gene expression of SERPINE1 and increases the risk of both CAC and CAD.


**Funding**: No

**Funding Component:**

**P111**

**A Genome-Wide Gene Expression Study of Blood Pressure in Twins**

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**Background**: Recently, a genome wide gene expression study identified 34 genes that were differentially expressed in relation to blood pressure (BP). However, to what extent these BP related gene expression signatures are driven by genetic factors or environmental factors have not been investigated. **Methods**: In this study of 383 twins (84 DZ pairs, 105 MZ pairs and 5 singletons; age 32-69; 40% male) recruited from the Finland Twin Cohort Study, genome-wide gene expression data in peripheral leukocytes were obtained using illumine HT12 V4 array. Systolic and diastolic BP related gene expression changes were identified using linear mixed model. Structural equation modeling was used to estimate the genetic and environmental sources of variance of BP related gene expression signatures. **Results**: Our genome wide gene expression analysis identified 1 gene (ECT2, FDR=0.019) with its expression level associated with SBP and 1 gene (LMNA, FDR=0.004) with its expression level associated with DBP at the cutoff of FDR<0.05. Out of the previously identified SBP (N=21) and DBP related genes (N=20), 5 genes (CD97, TAGLN2, MYADM, SL31A2 and TIPARP) for SBP and 5 genes (CD97, S100A10, MYADM, TIPARP and SLC31A) for DBP can be replicated in the twin cohort with same directions and p<0.05. Four genes showed association with both SBP and DBP. Structural equation modeling was conducted on the expression levels of the newly identified BP related genes as well as the ones that were previously identified but can been replicated in this study. Out of the 8 genes, genetic factors contributed significantly to the expression of 2 genes (LMNA and S100A10) and shared environmental factors contributed significantly to the expression of 1 gene (MYADM), while for 5 genes, both genetic and shared environmental factors have significant contributions to their gene expression levels. **Conclusion**: In this study of twins, we identified novel genes with its expression level associated with BP and replicated several previously identified signals. Our study further provides new insights into the genetic and environmental sources of BP related gene expression signatures.

Disclosures: **Y. Huang**: None. **M. Ollikainen**: None. **J. Kaprio**: None. **G. Hao**: None. **S. Su**: None. **X. Wang**: None.

**Funding**: No

**Funding Component:**
Genes in Genome-wide Association Study-identified Loci and Risk of Atherosclerosis in Adolescents and Young Adults

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Background: Genome-wide association studies (GWASs) have identified multiple genomic loci associated with atherosclerotic diseases. However, specific genes underlying the observed associations are largely unknown.

Objectives: We aimed to examine the associations between genes that harbor variants in high LD with index variants in GWAS-identified loci and pathologically determined atherosclerosis in major arteries from the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) study.

Methods and Results: Data for 1,938 single nucleotide polymorphisms (SNPs) from 28 genes were retrieved from whole exome sequence data. Atherosclerosis was confirmed by postmortem examination of major arteries from 1,005 young persons (aged 15-34 years) who died from non-cardiovascular causes. Logistic regression was used to evaluate associations between common SNPs and atherosclerosis controlling for age and sex. Gene-based analysis was conducted using Sequence Kernel Association Test (SKAT) method to test the combined effect of rare and common variants on atherosclerosis controlling for age and gender. All analyses were performed separately in blacks and whites. Statistical significance was determined by false positive discovery rate (FDR) method. In gene-based analyses, BUD13 ($P=1.11\times10^{-2}$) and COL4A1 ($P=3.58\times10^{-3}$) were associated with atherosclerosis among young blacks; none of the 28 genes was associated with atherosclerosis in whites. In single marker analysis of common SNPs, LRP1 missense variant rs7397167 ($P=8.50\times10^{-3}$), COL4A1 variant rs16975492 ($P=4.60\times10^{-3}$), STK32B variant rs168985 ($P=4.00\times10^{-3}$), and SMARCA4 variant rs8104480 ($P=1.20\times10^{-3}$) were associated with atherosclerosis in blacks; MIA3 variant rs17465637 ($P=8.00\times10^{-3}$), DUS4L missense variant rs6957510 ($P=6.4\times10^{-3}$), BOLL variant rs771018 ($P=6.2\times10^{-3}$), BUD3 missense variant rs11820589 ($P=2.1\times10^{-3}$), and COL4A1 variant rs1133219 ($P=1.8\times10^{-3}$) were associated with atherosclerosis in whites.

Conclusion: Genes in GWAS-identified loci may play a role in the development of atherosclerosis at a young age.

Disclosures: C. Li: None. S. Li: None. J.E. Hixon: None.

Funding: No

Funding Component:

Lipid-related Genetic Variants and Lipid Outcomes in a Cohort of Chilean Children

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Dyslipidemia is an important risk factor for chronic cardiometabolic diseases. Lipid traits are highly heritable and there are currently >185 established loci influencing lipid levels in adults. Recent studies have confirmed that variants associated with lipids influence lipid levels across the lifecourse, and in ancestrally diverse populations. Given that Hispanic/Latinos (HL) shoulder much of the cardiometabolic burden in the United States, it is important to identify genetic variants that contribute the greatest risk for elevated lipid levels across life stages. Thus, our primary aim is to examine the association of known lipid
variants with lipid traits identified in large study of adult participants from a Chilean infancy cohort of primarily European-descent. The sample assessed from 2008 to 2013 (n=546) had genotyping and well-measured lipid phenotypes (median age: 16.8 years, interquartile range: 16.6, 16.9). We assessed single variant associations using linear regression for high density lipoprotein cholesterol (HDL-C), low density lipoprotein cholesterol (LDL-C) and triglycerides (TG), assuming an additive genetic model, adjusted for sex. Additionally, we regressed phenotypes onto weighted trait-specific polygenic risk scores (PRS). Only six variants from the Chilean sample met the a priori threshold of power > 0.8. We found statistically significant effect sizes (mmol/l (se)) for four of the six variants: rs3764261 (0.16 (0.04)) and rs1532085 (0.05 (0.04)) for HDL and rs1260326 (0.34 (0.15)) and rs964184 (0.33 (0.15)) for TG. For each significant variant, direction of effect matched the multiethnic adult GWAS from which SNPs were selected. We compared our findings to a previous study in Finnish children at age 18 years (n=1,216) and found an opposite direction of effect for our significant HDL variants. Likewise, when comparing coefficients for the PRS between the Chilean and Finnish youth sample we found the association to be stronger in the Chilean sample for every trait and gender group with the exception of LDL for males. The lipid loci explained the least amount of total variance for LDL (males=4% and females=5%) and the most amount of variance for HDL (males=20% and females=14%). In conclusion, there is evidence that lipid loci from a HL sample of adolescents contain similar associations as those from European children and adults. Despite the small sample size and possibility for bias with different ancestral groups we found meaningful and statistically significant associations relating lipid loci in a HL cohort of Chilean adolescents with those found in European ancestral groups. These associations emphasize the importance of adolescence as a time for disease prevention given studies demonstrating both the persistence of associations between PRS and lipids over the life course and the increasing role PRS plays in predicting disease.


Funding: Yes

Funding Component: Mid-Atlantic Affiliate (Maryland, North Carolina, South Carolina, Virginia & Washington, DC)

P114

Association Between Socioeconomic Position and Cardiovascular Disease Risk Factors: The Solan Surveillance Study

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Introduction: Data are limited evaluating the association of socioeconomic position and cardiovascular disease risk factors in rural India, an area facing rapid economic changes.

Hypothesis: We hypothesized that socioeconomic position is associated with the prevalence of abnormal cardiovascular disease risk factors in rural India.

Methods: From 2013-2014, we performed multi-stage, representative, community-based sampling of the rural Solan district of Himachal Pradesh in India as part of a prospective, longitudinal cohort study enrolling 40,017 participants. We collected data on demographics, medical history, anthropometry, blood pressure, and laboratory studies. Using
factor analysis for mixed data, we constructed a socioeconomic position index incorporating education, occupation, income, and household assets for each individual. We used multivariable logistic regression models adjusted for age and sex to evaluate the association between quintiles of the socioeconomic position index and cardiovascular disease risk factors.

Results: Participants’ mean (SD) age was 42.7 (15.9) years, and 57% were women. Fifteen percent of participants were illiterate (n = 6081) and 24% were employed (n = 9502). The mean (SD) BMI was 22.3 (4.1) kg/m^2. The mean (SD) systolic and diastolic blood pressures were 139.6 (21.8) mmHg and 84.3 (11.4) mmHg, respectively. After adjustment, individuals in the highest quintile of socioeconomic position index had 2.19 (95% CI 2.01, 2.38) higher odds of being overweight, 3.43 (95% CI 2.91, 4.04) higher odds of being obese, 2.45 (95% CI 2.16, 2.78) higher odds of having hypertension, and 1.62 (95% CI 1.44, 1.82) higher odds of having diabetes mellitus (Figure).

Conclusion: We observed a direct, stepwise association between socioeconomic position and prevalence of abnormal cardiovascular risk factors in rural India. Primordial prevention strategies are needed for rural Indians, including those who experience increases in socioeconomic position, to improve cardiovascular health.


Funding: No
detect points in time when significant changes in the trends occurred.

**Results:** In 2012, age-standardised mortality rates per 100,000 were 65.3 in Argentina, 132.4 in Colombia and 130.3 in Mexico. Compared to 1985, by 2012 mortality fell by 17.5% in Colombia and 52.5% in Argentina. The largest annual decreases in mortality rates were observed in Argentina from 1988-1994 (APC=-5.7 p-value<0.01). The declines in Colombia were constant and smaller for the full period (APC=-0.4 p-value<0.01). CHD mortality rose by 48.9% in Mexico, particularly after 2000. Mortality rates increased in both men and women, particularly in younger men (<39 years) and older women (>60 years). Application of the garbage code corrections produced dramatic increases in mortality rates, more in women than men, and particularly in Argentina: approximately 80 additional deaths per 100,000 (compared with just 14 additional deaths per 10⁵ in Colombia and 13 per 10⁵ in Mexico).

**Conclusions**

Different Latin American countries demonstrate dramatically different CHD epidemiology. Mortality rates increased after correcting for garbage code misclassification. Although CHD mortality is falling in Argentina, the modest falls in Colombia and substantial rises in Mexico highlight the region’s urgent need for effective, population-wide prevention policies.

Disclosures: **M.C. Arroyo Quiroz**: None. **M. O’Flaherty**: None. **H. Lamadrid-Figueroa**: None. **M.L. Guzman-Castillo**: None. **S. Capewell**: None. **T. Barrientos-Gutierrez**: None.

Funding: No

Funding Component:

**P116**

**The Impact of Diet Low in Fruits and Vegetables on Cardiovascular Disease Burden Across 195 Countries in 2015**


**Introduction** While cardio-protective effects of fruits and vegetables are well-established, the impact of their suboptimal intake on the CVD burden across nations and levels of development has not been evaluated.

**Objective** To systematically quantify the burden of CVD attributable to low intake of fruits and low intake of vegetables in 195 countries by age, sex, country, and development status in 2015.

**Methods** We obtained data on consumption of fruits and vegetables from nationally or subnationally representative nutrition surveys and data on their national availability from the UN FAO. Etiologic effect sizes of fruits and vegetables on CVD endpoints were obtained from meta-analyses of prospective cohort studies. The optimal level of intakes for each was determined based on the levels associated with lowest risk of mortality in prospective observational studies. A comparative risk assessment analysis was conducted to quantify the proportion of disability-adjusted life years (DALYs) attributable to low intake of each. The variation of this burden was further evaluated across different levels of our newly developed socio-demographic index (SDI).

**Results** In 2015, low intake of fruits accounted for 57.3 (95% UI: 37.1-78.4) million DALYs due to CVD globally (41.5% from IHD and 58.5% from stroke). Low intake of vegetable caused 44.6 (23.6-68.8) million CVD DALYs (67.3% IHD and 32.7% stroke). The highest burden of CVD attributable to low intake of fruits and vegetables was seen in the middle and low-middle SDI quintiles (17.2 and 14.3% of total DALYs), while the lowest burden for each was seen in high and high-middle SDI quintiles (12.7 and 11.2%). At the country level, the attributable CVD burden ranged from 5.1% of total DALYs (Rwanda) to 23.2% (Bangladesh) for low intake of fruit and from 5.9% (North Korea) to 19.4% (Mongolia) for low intake of vegetable.

**Conclusion** Our findings suggest that population...
Inventions to increase consumption of fruits and vegetables at population level could save millions of life years globally. **Figure.** Age-standardized proportion of disability-adjusted life years attributable to low intake of fruits (A) and vegetables (B) from cardiovascular disease among adults (> 25y) in 2015.

Disclosures: **P.J. Sur:** None. **A. Afshin:** None.

Funding: No

Funding Component:

**P116**

**The Impact of Diet Low in Fruits and Vegetables on Cardiovascular Disease Burden Across 195 Countries in 2015**

**Patrick J Sur,** Ashkan Afshin, Inst for Health Metrics and Evaluation, Univ of Washington, Seattle, WA

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**Conclusion** Our findings suggest that population inventions to increase consumption of fruits and vegetables at population level could save millions of life years globally. **Figure.** Age-standardized proportion of disability-adjusted life years attributable to low intake of fruits (A) and vegetables (B) from cardiovascular disease among adults (> 25y) in 2015.

A) B)
The Impact of Diet Low in Fruits and Vegetables on Cardiovascular Disease Burden Across 195 Countries in 2015


Introduction While cardio-protective effects of fruits and vegetables are well-established, the impact of their suboptimal intake on the CVD burden across nations and levels of development has not been evaluated.

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Conclusion Our findings suggest that population inventions to increase consumption of fruits and vegetables at population level could save millions of life years globally. Figure. Age-standardized proportion of disability-adjusted life years attributable to low intake of fruits (A) and vegetables (B) from cardiovascular disease among adults (>25y) in 2015.

Disclosures: P.J. Sur: None. A. Afshin: None.
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**Background:** The RIESGO (RISK) study was established to investigate associations between lifestyle, risk factors and cerebrovascular diseases in 300 attendees to the annual meeting of the Mexican Academy of Neurology. In these analyses we describe traditional and several new risk factors for Cerebrovascular Disease on the RIESGO participants as well as a novel way to create a cohort.

**Methods:** The RIESGO study employed a sample of the Mexican Congress of neurology attendees and intends to follow them prospectively. All attendees were invited to participate (n=1300). A survey on lifestyle questions, and clinical evaluations were conducted at the congress site, non-parametric descriptive statistics were used.

**Results:** 300 attendees (68.8% physicians) participated in RIESGO, 18-83 years old mean 47.1(DE=13.9) and 59% were men. In the RIESGO study, self-reported Diabetes (DM) was 6.8% compared to 20.1% using Glycated Hemoglobin (HbA1c) for diagnosis (>6.5%) and 40% of those with self-reported DM had elevated HbA1c. Also remarkable is the 20.3% major and minor electrocardiographic abnormalities. Systolic and diastolic hypertension was observed in 14.1% and 4.1% respectively, vs 18.4% for self-reported hypertension. Obesity and overweight was observed 66.2% based on BMI > 25kg/m2. Active and former smoking rates were 14.3% and 24.4% respectively, active exercise (>150min/week) was reported in 48.5% and high alcohol consumption (>25 12Oz Beer or equivalent/30days) was 19.9%.

The subclinical outcomes were: intima-media thickness (≥0.8mm) found in 2.3%, carotid plaque in 6% and ventricular hypertrophy (Sokolow) in 1.8%.

We also explored other new risk factors associated with stroke, and found a high heart rate at rest (>70 beats per minute) in 35%, ventricular premature beats 1.1%, prolonged QTc 0.6% and 0% in men and women respectively, finally on the perceived stress scale 97% “never” or “almost never” felt stressed and only 2.3% felt “fairly often stressed”. We will also discuss the association of traditional vs newer risk factors with subclinical outcomes.

**Conclusions:** These findings indicate a high prevalence and poor awareness and control of major cardiovascular disease risk factors and subclinical outcomes, despite the fact that RIESGO participants have a substantially higher education level and health information than the general Mexican population. These findings reflect the alarming public health problems that diabetes and cardiovascular diseases represent in the Mexican population, even among the most educated individuals. Recurrent attendance at the annual meeting is a novel and convenient way to establish a low cost follow-up study.


**Funding:** No

**Funding Component:**

**P118**

Cardioprotective Association Between High Density Lipoprotein Cholesterol and Endothelial Function Attenuated at Lower Levels of Estradiol in Women at Midlife. The SWAN Heart Study
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Objective: Growing evidence suggests that the cardioprotective effects of high density lipoproteins (HDL) may be diminished over the menopause transition. Estradiol (E2), the leading ovarian estrogen that declines substantially during the menopause transition, is considered a potent antioxidant with potential impact on lipid peroxidation and formation of reactive oxygen species that could affect HDL cardioprotective capacities. Whether the cardioprotective effects of HDL on atherosclerotic subclinical measures are apparent only in the presence of high levels of E2 in women at midlife is not clear. We hypothesized that the expected positive association between levels of high density lipoprotein cholesterol (HDL-C) and endothelial function as indexed by flow-mediated dilation (FMD) is weaker at lower levels of E2.

Methods: Participants were from the baseline visit of the Study of Women’s Health Across the Nation (SWAN) Heart study. Women with hysterectomy and/or bilateral oophorectomy and those on hormone therapy were excluded. B-mode ultrasound images of the right brachial artery before and after deflation were obtained to estimate % change in FMD. Linear regression analyses were utilized to model the difference between log-baseline arterial diameter and log-post-deflation arterial diameter as a function of the interaction between log-E2 and HDL-C levels. To illustrate, the interaction between E2 tertiles and HDL-C was presented as well. The final model adjusted for log-baseline arterial diameter, race, study site, cycle day of blood draw, menopause status, body mass index, and diastolic blood pressure. Results were presented as % change in FMD (95% CI).

Results: The study included 322 women (60% White and 40% Black) aged 50.7±2.8 years who were either in pre-/early perimenopause (63%) or late peri-/postmenopause (37%). In the final model, a significant interaction between HDL-C and log-E2 levels on %FMD was found, P value for interaction=0.01; such that a positive association between HDL-C and %FMD was only evident among women in the high E2 tertile (E2 ≥51.1 pg/ml) [%FMD (95%CI) per 1 SD increase in HDL-C: 0.93% (0.21%, 1.64%)] and that %FMD per 1 SD increase in HDL-C was significantly lower in women in the low E2 tertile (E2 <21.5 pg/ml) compared to women in the high E2 tertile [%FMD difference (95%CI): low E2 tertile vs. high E2 tertile: -0.98 (-1.88, -0.07), P-value=0.03].

Conclusions: The cardioprotective association of HDL-C on endothelial function depends on levels of E2 in women at midlife, such that HDL-C may not be protective to the vascular endothelium in the setting of low endogenous E2. Our analyses should be replicated in longitudinal settings. Future studies should investigate potential mechanistic pathways by which dynamic changes in E2 levels may impact HDL composition and functionality over the menopausal transition.


Funding: No

Funding Component: P119

Changes in Cholesterol Efflux Capacity are Associated With Greater Progression of Aortic Calcification in Women at Midlife. Effects of Estradiol, Metabolic and Inflammatory Status

Samar R. El Khoudary, Univ of Pittsburgh, Pittsburgh, PA; Jay Heinecke, Univ of Washington, Seattle, WA; Maria Brooks, Trevor Orchard, Univ of Pittsburgh, Pittsburgh, PA; Patrick Hutchins, Univ of Washington, Seattle, WA; Karen Matthews, Univ of Pittsburgh, Pittsburgh, PA
Objective: High-density lipoprotein cholesterol efflux capacity (HDL-CEC) is associated inversely with CVD events. Recently, unexpected increases in HDL-CEC have been reported early after menopause. However, associations between HDL-CEC early changes and atherosclerotic progression in midlife women are not clear. We aimed to 1) test whether HDL-CEC changes from before to after menopause are associated with coronary (CAC) and aortic calcification (AC) progression anchored to the final menstrual period (FMP) date and 2) assess whether these associations could be explained by: time-varying estradiol, insulin resistance index (HOMA-IR), or C-reactive protein (CRP).

Methods: Participants were from the Pittsburgh site of the Study of Women’s Health Across the Nation (SWAN). HDL-CEC and calibrated ion mobility HDL particles (HDL-Ps) were measured at two time points: one before and one after menopause (median time difference=6 Yr) and change in each metric was calculated as the difference between the two assessments. CAC and AC Agatston scores were available at the 2nd time point (after menopause) and 2.08 Yr (median time difference) before that. Participants were not on lipid lowering medications or hormone therapy. Linear mixed effect models of repeated measures of log (AC+1) or log (CAC+1) as a function of within-woman change in HDL-CEC, race, time-varying BMI, time since 1st calcification assessment and time before/after FMP were used. Progression of calcification per 1 year increase before/after FMP for every 1 unit increase in log HDL-CEC change were estimated by adding interaction between log HDL-CEC change and time before/after FMP to the above specified model. Estradiol, HOMA-IR, or CRP was added one at a time to the final models. Results: We studied 33 women (66 observations) (67% White and 33% Black) aged 52±2.3 Yr who were either peri-(64%) or postmenopause (36%) at calcification 1st measure. At calcification 2nd measure, all women were postmenopausal with a median time difference before/after FMP = 2.81 (Q1:1.84, Q3:4.30) Yr. Higher HDL-CEC change was associated with greater AC progression per 1 year increase before/after FMP (β(SE): 2.23(0.90) for every 1 log unit higher in HDL-CEC change, P =0.02). This association remained significant after adjusting for premenopausal HDL-CEC level, or changes in HDL-C or HDL-Ps. However, adjusting for estradiol, HOMA-IR, or CRP, the positive association between HDL-CEC and AC progression was largely attenuated and no longer significant. HDL-CEC changes were not associated with CAC progression.

Conclusions: In this pilot study, increases in HDL-CEC early after menopause were associated with greater AC progression that was largely explained by midlife hormonal, metabolic or inflammation status. The midlife is a critical period that could impact HDL function and thus its cardio-protective effects. Our results should be retested in a larger setting.

Disclosures: S.R. El Khoudary: None. J. Heinecke: G. Consultant/Advisory Board; Modest; consultant for Merck, Amgen, and Pacific Biomarkers.. H. Other; Modest; named as a co-inventor on patents from the US Patent Office on the use of HDL markers to predict the risk of cardiovascular disease. M. Brooks: None. T. Orchard: None. P. Hutchins: None. K. Matthews: None.

Funding: Yes

Funding Component: National Center

P120

Relationship of Lipoproteins With Cardiovascular Disease in Persons With Chronic Kidney Disease

Introduction: Chronic kidney disease (CKD) is associated with dyslipidemia (particularly elevated triglycerides [TG] and reduced HDL-cholesterol [HDL-C]) and increased risk of atherosclerotic cardiovascular disease (CVD). However, the association between lipoprotein measures and CVD events in CKD is not well defined.

Hypothesis: We hypothesize that high TG and low HDL-C are associated with increased risk for CVD (myocardial infarction [MI] and ischemic stroke) in CKD.

Methods: The Chronic Renal Insufficiency Cohort (CRIC) is a prospective study of adults with CKD. We compared tertiles of TG, total cholesterol (TC), VLDL-cholesterol (VLDL-C), LDL-cholesterol (LDL-C), HDL-C, apolipoprotein B (apoB), and apolipoprotein A-I (apoA-I) with risk for MI and ischemic stroke using Fine and Gray methods with death as a competing risk. The lowest tertile was used as the reference category except for HDL-C and apoA-I, in which the highest tertile was used. In secondary analyses, we excluded participants with previous MI or stroke.

Results: Among 3811 participants (55% men, 42% Caucasian) with mean age 57.7±11.0 years, 351 had an MI, 132 had an ischemic stroke, and 963 died over a median follow-up of 7.9 years. After adjusting for potential confounders, the hazard ratio (HR, 95% CI) for CVD was 1.04 (0.80-1.34) for high LDL-C, 1.31 (1.01-1.69) for high TG, 1.33 (1.04-1.70) for high VLDL-C, 1.30 (1.01-1.68) for high apoB, 1.65 (1.25-2.17) for low HDL-C, and 1.31 (1.01-1.70) for low apoA-I. In secondary analyses of 2751 participants with no CVD history, high TG (HR 1.46, 1.02-2.10), high VLDL-C (HR 1.56, 1.08-2.25), low HDL-C (HR 2.11, 1.40-3.16) and low apoA-I (HR 2.28, 1.54-3.37) were significantly associated with incident CVD.

Conclusions: While high LDL-C is associated with increased CVD risk in the general population, we found no such association in CKD. Instead, high TG, high VLDL-C, low HDL-C and low apoA-I levels show strong associations with increased CVD risk and incident CVD events in CKD.


Funding: No

Funding Component:

P121

Lifestyle Factors Related to the Difference in Serum Lipids Between Japanese-Ameri cans in Hawaii and Japanese in Japan: the INTERLIPID Study

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Background
Immigration studies reported that dyslipidemia is more prevalent in people living in a western lifestyle. However, it is not clear what kind of lifestyle and dietary factors contribute to this difference.

Aim
To investigate whether lifestyle including dietary factors could explain the difference in serum lipids between Japanese in Japan and Japanese-Americans in Hawaii living a western lifestyle.

Methods
Analyses were conducted in the INTERLIPID study, where four standardized in-depth 24-h dietary recalls were performed. Non-fasting blood was drawn from the participants who included 1,087 Japanese and 176 Japanese-American. Participants’ characteristics were described as means and SD, t test was used for the comparison of means between Hawaii and Japan. Multiple linear regression models were used to examine relationships between dietary and lifestyle factors and the difference in serum lipids levels (low-density lipoprotein cholesterol [LDL-C] and log transformed triglycerides [log-TG]) between Hawaii and Japan, adjusting for age, sex and site as the basic model. Other confounders were then added separately to the basic model. Percentage reduction of regression coefficient for the difference between Hawaii and Japan was calculated.

Results
In men, LDL-C levels were significantly higher in Japanese-Americans (138.3 mg/dl) compared to Japanese in Japan (120.3 mg/dl, P<0.0001). Similarly, in women LDL-C levels were higher in Japanese-Americans (135.5 mg/dl) than in Japanese in Japan (123.7 mg/dl, P<0.001). Median levels of TG were also higher in Japanese-Americans compared to Japanese in Japan (men: 171.0 mg/dl and 132.0 mg/dl, P<0.001 and women: 132.0 mg/dl and 94.5 mg/dl, P<0.0001). Mean intakes of most nutrients were significantly different between Japan and Hawaii for both men and women. In multiple linear regression models, for LDL-C, BMI reduced the regression coefficient of site difference by 44.6% in the basic model that included age, sex and site. Added to the basic model separately, alcohol, dietary cholesterol and saturated fatty acid reduced LDL-C site difference by 11%, 15.6% and 13.4%, respectively. For log-TG, BMI reduced the regression coefficient of site difference by 55.8% and other variables tested reduced the site difference by less than 5%. With step by step addition of other variables (BMI, alcohol, dietary cholesterol, fiber and total fat) into the multiple linear regression model, the site LDL-C and log-TG coefficient further reduced from 14.4 to 3.4 (-76.6%) and 0.31 to 0.10 (-68.2%), respectively.

Conclusion
BMI explained about half of the higher LDL-C and TG levels in Japanese-Americans in Hawaii compared to Japanese in Japan. BMI together with other macro-nutrients contributed to about 70% of the difference. Further investigation is required to explore the remaining difference.


Funding: No
Funding Component: P122
The Clinical Impact of TC/HDL-C Discordance With LDL-C and Non-HDL-C: 20 Year Follow-up of the Atherosclerosis Risk in Communities (ARIC) Study

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Introduction: The Total to High-Density Lipoprotein cholesterol (TC/HDL-C) ratio may carry unique prognostic information for atherosclerotic cardiovascular diseases (ASCVD) risk beyond the more commonly used measures of low-density lipoprotein (LDL-C) and non-high-density lipoprotein cholesterol (non-HDL-C). Information regarding patient-level discordance between these lipid parameters may be clinically relevant in refining risk stratification.

Methods: We studied 14,393 ARIC participants free of ASCVD at baseline who were mean age 54 years, 56% women, and 25% black. Lipids were measured at baseline (1987-1989) and at four additional visits. TC/HDL-C discordance with non-HDL-C and LDL-C (defined by categories above/below the median) was updated at each visit. Participants were followed for ASCVD events through end of 2013, with mean follow-up of 20 years. Multivariable-adjusted Cox hazard models were used to estimate for ASCVD risk for each category.

Results: Among participants with low LDL-C <median, a discordantly high TC/HDL-C ≥median was associated with a greater ASCVD risk compared to those concordantly low for both TC/HDL-C and LDL-C. Those with low non-HDL but a discordantly high TC/HDL-C also had greater ASCVD risk than those concordantly low for both measures (Table). Conclusions: In a primary prevention population, the TC/HDL-C ratio provides additional prognostic information to non-HDL-C and LDL-C. Individuals who reach low levels of LDL-C or non-HDL-C may still be at high risk of ASCVD if TC/HDL-C is discordantly high.


Funding: No

Funding Component:

P122

The Clinical Impact of TC/HDL-C Discordance With LDL-C and Non-HDL-C: 20 Year Follow-up of the Atherosclerosis Risk in Communities (ARIC) Study

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Conclusions: In a primary prevention population, the TC/HDL-C ratio provides additional prognostic information to non-HDL-C and LDL-C. Individuals who reach low levels of LDL-C or non-HDL-C may still be at high risk of ASCVD if TC/HDL-C is discordantly high.


Funding: No

Funding Component:

P123

Lipid-lowering Therapy Prescription Patterns and Predictors of High Intensity Statin Prescriptions in Patients With Diabetes or Atherosclerotic Cardiovascular Disease

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Background: Many patients with atherosclerotic cardiovascular disease (ASCVD) or diabetes mellitus (DM) do not receive guideline-recommended lipid lowering therapy (LLT). We characterized LLT treatment patterns and identified predictors of high intensity statin prescriptions (Rx) in patients with ASCVD and DM. Methods: Olmsted County, MN residents with DM or ASCVD (MI, unstable angina, revascularization, ischemic stroke/TIA) from 2005-2012 were followed for 2 years capturing all LDL-C and LLT Rx. Cox regression examined
predictors of high intensity statin Rx, modeling LDL-C as a time-dependent variable. **Results:** 8408 patients with DM (n=4881) or ASCVD (n=3527) were identified (mean age 63.1, 55.1% male). Over 2 years, mean (SD) number of LDL-C measurements was 2.7 (1.9); 12.1% had none. Among those with ≥1 LDL-C, the first was ≥100 mg/dL in 46.2%. LLT Rx increased within 30 days after the first LDL-C. (Table). However, among those with LDL-C ≥100, 40.1% were not prescribed LLT; these patients were younger (mean age 56.9 vs 60.8), more likely female (52.7% vs 45.6%) and more likely to have DM vs ASCVD (84.5% vs 54.6%) than those prescribed LLT. High intensity statin Rx increased more for those with LDL-C ≥100 than those with LDL-C <100. Men [HR 1.29 (CI 1.13-1.48)] and patients with ASCVD vs DM [6.12 (5.25-7.12)] were more likely to be prescribed high intensity statins. Higher LDL-C was associated with greater high intensity statin Rx, although associations differed between ASCVD and DM (p-interaction=0.004). Compared to DM, ASCVD patients were more likely prescribed high intensity statins at every level of LDL-C [2.73 (1.70-4.37), 6.47 (4.94-8.47), 5.68 (4.45-7.25), and 7.88 (5.89-10.53) for LDL-C <70, 70-99, 100-130, and ≥130]. **Conclusions:** Although high intensity statin Rx increased in response to increasing LDL-C, a large proportion of patients do not receive guideline-concordant care. Efforts should be made to encourage more aggressive treatment of elevated LDL-C and to understand why treatment is neglected or delayed.

Disclosures: **A.M. Chamberlain:** B. Research Grant; Significant; Research Grant sponsored by Amgen, Inc. **S.S. Cohen:** B. Research Grant; Significant; Research Grant sponsored by Amgen, Inc. **J.M. Killian:** None. **K.L. Monda:** A. Employment; Significant; Employed by Amgen, Inc. **E.O. Hedgeman:** B. Research Grant; Modest; Research grant from Amgen, Inc. **S.A. Weston:** None. **T. Okerson:** A. Employment; Significant; Employed by Amgen, Inc.

Funding: No

Funding Component:

**P124**

**Network Meta-analysis of the Effects of Breast Cancer Hormone Therapy on Changes in Lipid Profiles**

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**Introduction:** Adjuvant hormone therapy prolongs survival of patients with early-stage hormone receptor-positive breast cancer (BC). For postmenopausal patients, aromatase inhibitors (AIs) have been shown to improve disease free survival compared to tamoxifen, but the impact on overall survival has been inconsistent. A meta-analysis showed higher risk of cardiovascular diseases (CVDs) for patients taking AIs. Deteriorating lipids induced by AIs may contribute to this result. This analysis aims to compare the effects of hormone therapeutic options on changes in lipids from published randomized clinical trials (RCTs).

**Methods:**

RCTs evaluating effects of adjuvant hormone therapy on lipids (total cholesterol, high-density lipoprotein cholesterol (HDLc), low density lipoprotein cholesterol (LDLc), and/or triglycerides) in postmenopausal early-stage BC patients published in PubMed and Embase, prior to Jan. 31, 2016 were reviewed. Bayesian network meta-analysis was used to compare effects of placebo, selective estrogen receptor modulators (SERMs- tamoxifen and toremifene) and AIs (letrozole, anastrozole, and exemestane) on lipids across longitudinal time points.
Heterogeneity was examined by meta-regressions adjusting for mean age, baseline lipid value, and prior tamoxifen use. An arm-based random effect model tested the consistency of the direct and indirect evidence of the drug effects.

**Results:**
We identified 17 articles from 13 RCTs for a total of 1,913 subjects. The Table summarizes the results, with statistically significant results bolded. Toremifene significantly improved all lipids and was the best choice regardless of covariate adjustment, while tamoxifen had weaker but significant LDLc lowering but opposite HDLc/triglyceride effects to toremifene. AIs generally had little effect on lipids.

**Conclusions:**
In general, AIs tend to have worse effects on lipids than SERMs, while only toremifene had beneficial effects on all lipid values. Patients on AIs with high risk of CVD should monitor their lipids.

**Disclosures:**

**Funding:**
No

**Funding Component:**
P125

**Reverse Causality of the Relationship Between Dietary Cholesterol and Serum Low Density Lipoprotein Cholesterol Associated With Education and Employment: the INTERLIPID Study**

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Introduction The upper limit of recommended dietary cholesterol has been abolished recently from guidelines in Japan and US even though high intake is known to increase serum cholesterol levels. Reverse causality has been involved, reflecting availability of widespread information with consequent lifestyle modifications among knowledgeable people. People with higher serum cholesterol are more likely to modify diet than those with lower serum cholesterol, especially among more educated; if enough people do this, dietary cholesterol will not relate to serum cholesterol or will relate inversely.

Hypothesis We assessed the hypothesis that lifestyle modifications separately by those with high education level and employment status reverse the positive relationship between dietary cholesterol and serum low density lipoprotein cholesterol (LDL-C); therefore, the positive relationship between dietary cholesterol and LDL-C would prevail after adjustment for education level and employment status.

Methods A population-based, random sample, cross-sectional study (INTERLIPID) which was an ancillary study of the International Study of Macronutrients and Blood Pressure (INTERMAP), conducted a survey between 1996 and 1999. Among 1,145 Japanese individuals...
ages 40-59 years, 106 were excluded because of special diets, use of lipid lowering drugs, hormone replacement, and missing data, leaving 1,039 individuals (533 men and 506 women). Dietary cholesterol was assessed from four 24-h dietary recalls and LDL-C was measured by enzymatic methods on an autoanalyzer. A standard questionnaire inquired about years of education and employment status.

Results Linear regression analysis revealed an inverse association between dietary cholesterol and LDL-C in men (coefficient, -0.04 [95%CI, -0.08 to -0.01]), no significant association when adjusted for education and its interaction term with dietary cholesterol in men (coefficient, 0.05 [95%CI, -0.03 to 0.14]), and a significant positive relation when adjusted for employment and its interaction term in men (coefficient, 0.13 [95%CI, 0.01 to 0.26]). With adjustment for education and employment and their interactions, a significant positive relation was recorded again in men (coefficient, 0.16 [95%CI, 0.03 to 0.29]). These relationships were not observed in women.

Conclusions In Japanese men, education, employment, and their interaction terms with dietary cholesterol reversed an observed inverse relationship between dietary cholesterol and LDL-C. A positive relation prevailed between dietary cholesterol and LDL-C after adjustment for education level and employment status.


Funding: No

Funding Component:

P126

Unanticipated Lipid Profiles in Victims of Sudden Unexpected Death: Low Low-density Lipoprotein Cholesterol and an Elevated Triglyceride to High-density Lipoprotein Cholesterol Ratio

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Background: Though low-density lipoprotein cholesterol (LDL) is a proven cardiovascular risk factor, substantive data on LDL levels in victims of sudden cardiac or sudden unexpected death is lacking. Additionally, post-mortem studies have shown higher concentrations of remnant-like lipoprotein particles (RLP) in sudden cardiac death victims. Triglyceride to high-density lipoprotein cholesterol ratio (TG/HDL) is associated with RLP concentration, but has not been reported for victims prior to sudden death.

Hypothesis: We assessed the hypothesis that out-of-hospital sudden unexpected death (OHSUD) victims would have similar or higher calculated LDL levels and higher TG/HDL ratios when compared with National Health and Nutrition Examination Survey (NHANES) participants.

Methods: From 2013-15, all free living adults aged 18-64 who died out-of-hospital as reported by emergency medical services in Wake County, North Carolina (population 974,289) were adjudicated to identify OHSUD victims (n=408). Medical records were requested from area healthcare providers; 138 victims had a lipid panel available at an average of 1.2 years prior to death. To emulate a similar follow-up period, 18-64 year old NHANES (2009-2010) participants with a lipid panel who were alive at the end of 2011 served as a comparison group (n=1316). Covariates were abstracted from medical records for OHSUD victims and self-reported in NHANES participants. Subjects with triglycerides>400 mg/dL were excluded for analysis pertaining to LDL. We used multiple linear regression to assess the difference in lipid
measures between OHSUD victims and NHANES participants, adjusting for demographics, prevalent dyslipidemia, diabetes, hypertension, body mass index, and coronary artery disease, use of lipid-lowering medication and clinic visits per year.

Results: OHSUD victims had a lower mean LDL than NHANES participants (91.6 mg/dL; 95% CI 84.7, 98.5 vs. 115.8 mg/dL; 95%CI 113.8, 117.7 respectively). After multivariate adjustment, mean LDL of victims was still 22.3 mg/dL lower than NHANES participants (p<0.001). OHSUD victims had a higher unadjusted mean TG/HDL ratio than NHANES participants (4.2; 95% CI 3.2, 5.2 vs. 2.9; 95% CI 2.7, 3.2 respectively); this difference was mildly attenuated on adjustment for age, gender and race and insignificant upon additional adjustment for dyslipidemia and diabetes status.

Conclusion: Contrary to expectations, out-of-hospital sudden unexpected death victims had a more favorable LDL cholesterol profile unexplained by differences in demographics, comorbid conditions or use of lipid lowering medication. The elevated TG/HDL ratio in victims, though explained by a higher prevalence of comorbidities, corroborates an evolving hypothesis on the contributory nature of vasoactive, prothrombotic remnant-like lipoprotein particles to sudden unexpected death.


Funding: No

Funding Component:

P127

Dose-dependent Effects of Comprehensive Lifestyle Changes on Blood Lipid Levels: Results From the PREMIER Trial

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INTRODUCTION
Low-density lipoprotein (LDLc) is a major risk factor for cardiovascular (CV) disease. While comprehensive lifestyle change (CLC) lowers LDLc, little is known about how CLC adherence affects LDLc levels.

HYPOTHESIS
The PREMIER trial demonstrated CLC reduced LDLc levels. We hypothesized those undergoing CLC will exhibit dose dependent reductions in LDLc proportional to the number of intervention sessions attended.

METHODS
PREMIER was a multicenter randomized trial in adults with pre-hypertension or stage 1 hypertension. The current analyses were limited to participants randomized to CLC interventions, excluding those who were assigned to control, those on lipid-lowering medication, or those missing follow-up lipid data. One intervention, “Established” (Est.), was a CLC that emphasized increased physical activity, weight reduction, reduced sodium intake, and a reduced fat/calorie diet. A second CLC intervention, “Established+DASH” (Est.+DASH), also included counseling on the DASH diet. Behavioral counseling was delivered via 18 sessions in the first 6 months and 15 sessions in the following 12 months (total 33 sessions).

RESULTS
Among the 450 participants, mean age was 50.4, 63% were women, and 31% were black. Baseline LDLc was 134 mg/dL in Est. and 134.8 mg/dL in Est.+DASH. Mean attendance in the first 6 months was 14.2 sessions in Est. and 14.6 in Est.+DASH, and in the last 12 months was 9.6 sessions in Est. and 10.1 sessions in Est.+DASH. There was no difference in attendance by intervention. After adjustment for factors associated with LDLc, every 10 CLC sessions were associated with a 6 mg/dL (P=0.003) lower LDLc (Table). This association was attenuated when adjusted for weight change. Similar patterns were noted for triglycerides and total...
cholesterol.

CONCLUSIONS

Better attendance at CLC sessions was associated with larger reductions in LDLc over an 18 month period with evidence that weight loss mediated this relationship.


Funding: No

Funding Component:

P128

Serum Lipid Levels at Adolescence can Predict Adult Dyslipidemia in South Korea - The Kangwha Study


Introduction: Several studies have examined tracking pattern of lipid profile level during long follow-up periods in Western countries. However, there have been few such studies in East Asia.

Hypothesis: We assessed the hypothesis that there exists tracking pattern of lipid profile level from adolescence to adulthood, and lipid measurements in adolescence can predict adult dyslipidemia in South Korea.

Methods: The Kangwha Study was a community-based prospective cohort study that started in 1986 in Kangwha County, South Korea. A total of 400 participants (54% women) whose serum total cholesterol, triglyceride, and high density lipoprotein (HDL) cholesterol level were measured at least once during adolescence (1992-1996), and repeatedly measured at least once during adulthood (2005-2015) were enrolled in our study. Body mass index, waist circumstance, and blood pressure were measured at all measurements. Family history of cardiovascular disease, smoking history, and presence of adult dyslipidemia were checked at adulthood. The tracking pattern of lipid profile level was determined by tracking coefficients (low: <0.30; moderate: 0.30-0.59; moderately high: 0.60-0.89; high: ≥0.90). The tracking coefficients were calculated by Generalized Estimating Equation. The predictability of adult dyslipidemia was assessed by multiple logistic regression and area under curve (AUC) value. Additional analyses were performed to find out whether repeated lipid measurements during adolescence can enhance the predictability of adult dyslipidemia or not.

Results: The presence of adult dyslipidemia was 26.3% (105 of 400). Mean age of study participants at enrollment is 13.8 years (SD, 1.6 years), and that at adulthood is 30.1 years (SD, 3.7 years). When adjusted for age, body mass index, waist circumstance, and blood pressure, the tracking coefficient of total cholesterol was 0.59 (95% confidence interval (CI), 0.54-0.63), that of triglyceride was 0.39 (95% CI, 0.28-0.49), and that of HDL cholesterol was 0.51 (95% CI, 0.46-0.55). The AUC value of our multiple logistic regression model on adult dyslipidemia without lipid profile levels at adolescence was 0.77 (95% CI, 0.72-0.83), and that with lipid profile levels at adolescence was 0.80 (95% CI, 0.75-0.85). P value for AUC comparison was significant (p=0.02). In additional analyses, using the average lipid profile levels in multiple lipid
measurements at adolescence did not significantly improve the AUC value (p>0.09).

Conclusion: In conclusion, moderate tracking patterns of serum lipid profile level were shown in this study. Serum lipid profile measurements at adolescence could help the prediction of adult dyslipidemia. The results of this study supported the need of lipid profile screening at adolescence.


Funding: No

Funding Component:
P129


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Plasma concentrations of low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C), and triglycerides (TG) are important risk factors for metabolic and cardiovascular diseases and are widely-used as targets for therapeutic intervention. Consideration of the multivariate distribution of these lipid traits could be informative for studies involving pleiotropic genetic variants, variants associated with more than one lipid outcome, but featuring only univariate lipid outcome models. Confirmatory factor analysis (CFA) is one way to characterize the multivariate distribution of biologically plausible, related indicators such as lipids with a continuous latent factor. Although CFA has been used to characterize metabolic syndrome, a cardiovascular disease (CVD) risk factor involving many correlated indicators, dyslipidemia is a CVD risk factor that remains relatively unexplored in this literature. Thus, the primary aim of this study is to conduct CFA with LDL-C, HDL-C and TG as indicators representing a single continuous latent lipid factor and assess its suitability as an outcome measure in a United States representative sample by racial/ethnic groups stratified by age and gender over five 2-year time periods (2003-2004, 2005-2006, 2007-2008, 2009-2010, 2011-2012) from NHANES. First, we used principal component analyses (PCA) to visually examine clustering by race and gender in biplots. Second, we tested for scale differences in the lipid factor across a) calendar time and b) racial/ethnic groups (Mexican-American, non-Hispanic White, non-Hispanic Black, Other Hispanic and Other race/ethnicity). All analyses were stratified by medication use, gender and three age groups: 12-19 years, 20 to 49 years and 50-80 years, and adjusted for age and body mass index (BMI). We found significant scale differences across racial/ethnic groups. In particular, the center of the distribution differed across racial/ethnic groups for ages 12-19 years (p<0.0001), 20-49 years (p<0.0001) and 50-80 years (p<0.0001), suggesting joint distributions of TG, HDL-C, and LDL-C vary across racial/ethnic groups. In summary, one continuous latent factor representing all three lipids and their concomitant associations provides a means to characterize lipid values simultaneously and can serve as an outcome when studying exposures influencing multiple lipid values, pleiotropic genetic variants being just one example of many. Differences in the lipid latent factor across racial/ethnic groups emphasizes distinct multivariate distributions necessitating stratification. Limited analyses exist using this CFA framework for lipids, and future efforts considering the joint distribution of lipids may improve our understanding of the genetic architecture of dyslipidemia.

Disclosures: A. Von Holle: None. K. North: None.

Funding: Yes

Funding Component: Mid-Atlantic Affiliate (Maryland, North Carolina, South Carolina, Virginia & Washington, DC)
Ideal Cardiovascular Health and Incident Cardiovascular Disease: Heterogeneity Across Event Phenotype and Contribution of Multiple Biomarkers. The Prime Study

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Background: To which extent the association between ideal cardiovascular health (CVH) and incident vascular events differ by main coronary heart disease (CHD) and main stroke phenotype is currently unknown. Furthermore, data on potential mediating factors underlying the association of ideal CVH with outcomes are lacking.

Aims: We aimed to 1) quantify the association between ideal CVH and incident CHD and stroke, 2) to assess for potential heterogeneity across main CHD and main stroke phenotypes and between CHD and stroke; and 3) to assess the mediating effect of a selected panel of key circulatory biomarkers from different relevant disease pathways.

Methods and Results: A total of 9312 men middle-aged men (50-59 years) free of CHD and stroke were recruited in the framework of WHO MONICA centres in Lille, Strasbourg, Toulouse (France) and Belfast (Northern Ireland) between 1991 and 1993 and enrolled in the PRIME study. According to the American Heart Association, men with 0-2, 3-4 and 5-7 metrics at the ideal level were categorized as having poor, intermediate and ideal CVH respectively. Hazards ratios (HRs) were estimated using Cox proportional hazards regression and were adjusted for age, centre, education, living alone, marital status, family history of CHD and blood fibrinogen. The contribution of baseline circulating, endothelial inflammatory and haemostatic biomarkers was explored in a case control study nested within the PRIME cohort and settled after 10 years of follow-up. An ideal CVH was observed in 7% of the participants. After a median follow-up of 10 years, 614 first CHD events (myocardial infarction, angina, coronary death) and 117 first stroke events (ischaemic and non ischaemic) were adjudicated. Compared to those with poor CVH, those with an ideal CVH at baseline had a 72% lower risk of CHD (HR=0.28; 95% CI: 0.17; 0.46) and a 76% lower risk of stroke (HR=0.24; 95% CI: 0.06; 0.98) in multivariate analysis. No heterogeneity was detected across main CHD and main stroke phenotypes. While significantly lower mean concentrations of hs-CRP, IL-6, ICAM-1, fibrinogen and von Willbrandt factor were noted in subjects with ideal or intermediate as compared to poor CVH status in the controls, none of these biomarkers contribute to the association of CVH with future CHD.

Conclusion: In this study ideal CVH was associated with a substantially lower risk of CHD and stroke, without any difference across phenotypes. Neither inflammatory, endothelial nor haemostatic biomarkers explained the lower risk of CHD in men with ideal CVH.

Effect of a Social Incentive-based Gamification Intervention Using Wearable Devices and Smartphones on Physical Activity: The BE FIT Randomized Clinical Trial

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Background: Social networks can influence individual health behaviors, but interventions that leverage social incentives within these networks to change health behaviors have not been well examined. The objective of this study was to test the effectiveness of a social incentive-based gamification intervention to increase physical activity in the community.

Methods: The Behavioral Economics Framingham Incentive Trial (BE FIT) was a randomized clinical trial that recruited 206 adults comprising 97 groups of two or three family members in the Framingham Heart Study and occurred between December 2015 and August 2016. Participants used a wearable device or smartphone application to establish a baseline step count and selected a step goal increase for a 12-week primary intervention period and a 12-week follow-up period. Participants in both the control and intervention arms received daily feedback on their performance for 24 weeks. During the first 12 weeks, participants in the intervention arm played a game (including points, levels, and lifelines) with their family members that was designed using insights from behavioral economics to enhance social incentives such as peer support, accountability, and collaboration. The primary outcome was the mean proportion of participant-days the step goal was achieved during the primary intervention period. Secondary outcomes included the mean proportion of participant-days the step goal was achieved during the follow-up period and mean daily steps during the intervention and follow-up periods.

Results: Participants in the intervention arm achieved step goals on a greater proportion of participant-days and had greater mean daily steps than the control arm during the intervention and follow-up periods (TABLE).

Conclusions: Among groups of family members in a community, a social incentive-based gamification intervention was effective at increasing physical activity during the 12-week intervention period and effects were sustained during the 12-week follow-up period.

Disclosures: M.S. Patel: F. Ownership Interest; Significant; Catalyst Health LLC. G. Consultant/Advisory Board; Significant; Healthmin Services Inc.. E.J. Benjamin: None. K.G. Volpp: None. C.S. Fox: None. D.S. Small: None. J.M. Massaro: None. J.J. Lee: None. V. Hilbert: None. M. Valentino: None. D.H. Taylor: None. E.S. Manders:
Background: Ecological momentary assessment (EMA) assesses individuals’ current experiences, location and social context in which behaviors occur. During a 12-mo behavioral weight loss intervention and using an EMA app, we asked participants to report any instances of temptations or a lapse from their weight management diet. Objective: Estimate the rate of temptations per unit time and the probability that a lapse will follow based on the location (restaurant, home, work) and the social context (with others who are eating, completely alone). Methods: Using a smartphone, participants initiated a report when they experienced a temptation and reported if this led to a lapse. Their location and the social context were recorded during the 5,211 self-reported temptations as well as during 106,960 random assessments over 12 mos. Analyses: A frailty model was used to estimate the rate at which temptations occurred per unit of time and a logistic regression model was used to estimate the probability that a temptation led to a lapse both as a function of location and social context. Results: The sample (N = 150) was predominantly female (90.7%) and White (80.7%), 56.4% were married with 16.4 (2.8) years of education and a mean BMI of 34.0 kg/m^2 (4.6). Temptations occurred most often in a restaurant and the person was with others who were eating or in sight of others who were eating (Fig 1). While temptations occurred infrequently in another person’s home, there was nearly a 65% probability that a lapse would occur there. When with others who are eating, the temptation rate and probability of a lapse were high. Conclusions: Temptations to eat in a manner that is inconsistent with a weight loss plan occur more frequently in certain locations, e.g., restaurants; however, the probability a temptation leads to a lapse is high in a variety of locations and social contexts, e.g., with others who are eating. Interventions need to focus on empowering individuals trying to manage their weight to resist temptations in these at risk locations and social contexts.
Jonathan A Drezner, Univ of Washington, Seattle, WA

Background & Aim: The accuracy of each cardiac screening tool for young athletes needs further investigation. The aim of this study is to evaluate the Preparticipation Physical Evaluation Monograph 4th Edition (PPE-4), which is the current recommendation for cardiovascular screening in young athletes, and the 12-lead electrocardiogram (ECG).

Methods: During October 2010 to June 2013 student athletes from high schools around the greater Seattle area received a one-time cardiac screen including history and physical examination as recommended in the PPE-4, and a resting 12-lead ECG. Those with abnormal findings received a focused echocardiogram. Student athletes were defined as participating in at least one high school level sport or higher per year. A true positive was defined as the identification of a cardiac disorder associated with sudden cardiac death. Sensitivity (Sn), specificity (Sp), false positive rate (FP), and positive and negative likelihood ratios (+LR, -LR), were calculated for each screening tool.

Results: Screening events were held at 23 high schools; 4,743 student athletes ranged in age from 13-19 (mean 15.8), 54% male, 65% Caucasian, 13% mixed race, 10% Asian/Pacific Islander, 6% African-American. A total of 1065 (23%) students had at least one positive history response after physician review, 408 (9%) had an abnormal finding on physical exam, and 185 (4%) had an abnormal ECG. Echocardiography was performed on 1417 students who presented a positive finding on history, physical, or ECG or were a male basketball player. There were 21 cardiac disorders identified that could potentially lead to SCD (0.4%). Wolff-Parkinson-White (9) was most common, followed by 4 cases of coronary artery abnormalities, 3 cases of Long QT Syndrome, 3 dilated aortic roots or aneurysm, and 1 case each of hypertrophic cardiomyopathy and Short QT Syndrome. ECG identified 14 cases of those 21. Physical Exam had a Sn 19%, Sp 91%, +LR 2.2, and FP 9%. ECG had a Sn 67%, Sp 96%, +LR 18.4, and FP 4%.

Conclusion: ECG had the highest Sn, Sp, and +LR of the screening tools evaluated. History and physical exam had lower Sn and +LRs and higher false positive rates. A limitation to this study is that there is no gold standard for this screening protocol. ECG may miss structural abnormalities and Echo may miss conduction disorders. A combination of the two tests was considered the gold standard, meaning sensitivity of all tests may be overestimated. More research is needed to improve the performance of cardiovascular screening methods especially through the history questionnaire and physical exam. Out of the three tools evaluated the best tool to detect underlying cardiovascular conditions associated with SCD is ECG.


Funding: No

Funding Component:

P135

Abdominal Obesity is Associated With DNA Methylation in Cardiovascular Health Related Genes Among Adolescents


Background: Obesity, especially abdominal obesity, is a risk factor for coronary artery disease (CAD) in various populations. Little is known regarding the role of epigenetics in the
association between abdominal obesity and cardiovascular health in adolescents.

Hypothesis: Abdominal and especially visceral obesity is associated with DNA methylation in genes related to cardiovascular health among adolescents.

Methods: We used data from a sample of 263 adolescents participating in the population-based Penn State Child Cohort follow-up exam (N=421). Dual-energy X-ray absorptiometry was used to measure visceral and subcutaneous fat areas (VAT; SAT, in cm²) in each participant. We extracted DNA from peripheral leukocytes and subjected it to enhanced, reduced representation bisulfite sequencing. A high-throughput assay provided single nucleotide resolution of DNA methylation in cytosine-phosphate-guanine (CpG) sites and surrounding regions. We excluded bases with < 10x coverage or available from < 20 individuals. We analyzed a total of 1,609,424 methylation sites. We used linear regression models to assess the association between site-specific methylation level (expressed as %) and VAT and SAT. We adjusted all models for age, race, sex, and body mass index (BMI) percentile. We used Bonferroni-adjusted statistical tests to identify sites significantly related to VAT and separately, SAT. We mapped the VAT- and SAT-associated sites to the hg19 assembly and subjected them to Ingenuity Pathway Analysis (IPA) wherein mapped gene sets were examined for enrichment of downstream function and diseases.

Results: On average, the sample was 55% male, 79% white and aged 16.7 (standard deviation = 2.2) years. VAT and SAT were significantly associated with methylation at 296 sites within 193 genes and 101 sites within 87 genes, respectively. Among them, seven genes related to VAT and five related to SAT were associated with CAD. IPA revealed that CAD-related genes were significantly enriched in both gene sets (for VAT: p=1.97x10⁻²; SAT: p=9.67x10⁻³). Genes related to VAT also were significantly enriched in endothelial activation (p=8.16x10⁻³), fibrogenesis (p=5.01x10⁻⁵), and dyslipidemia (p=7.99x10⁻³). Indeed, higher VAT was associated with hypomethylation of CD14 and hypermethylation of GNMT, while higher SAT was associated with hypermethylation of ADRB1 and hypomethylation of TUBB4A.

Conclusion: If externally validated, our data would suggest that (1) abdominal obesity in adolescence is associated with DNA methylation of genes related to cardiovascular health, independent of BMI; and (2) visceral adiposity has a more prominent association with cardiovascular health through DNA methylation of genes with roles in atherogenesis.


Funding: No

Funding Component:

P136

Cardiometabolic Burden in Adolescents is Associated with DNA Methylation in Genes Related to Cardiovascular Disease Risk


Background: Metabolic syndrome is related to increased cardiovascular disease (CVD) risk. Although continuous metabolic syndrome score (cMets) is a marker of cardiometabolic burden in adolescence, the relationship between cardiometabolic burden and DNA methylation has been rarely assessed at this stage of the life course.

Hypothesis: Cardiometabolic burden is related to methylation levels in genes related to CVD risk in adolescents.

Methods: A sample of 263 independent adolescents from the population-based Penn
State Child Cohort follow-up exam (N=421) was used in this analysis. cMets was calculated as the sum of standardized residuals of five established cardiometabolic risk factors, namely waist circumference, mean arterial pressure, homeostatic model assessment of insulin resistance, triglycerides, and high density lipoprotein cholesterol (HDL) concentration. cMets was log-transformed to improve the distribution. Peripheral leukocyte DNA was extracted and subjected to enhanced, reduced representation bisulfite sequencing. The assay provided single nucleotide resolution of DNA methylation in cytosine-phosphate-guanine (CpG) sites and surrounding regions. Bases with < 10x coverage were excluded, resulting a total of 1,609,424 methylation sites. Linear regression was used to model the association between site-specific methylation level and cMets. All models were adjusted for age, race, and sex. A p < 10^{-8} was used to determine statistical significance. The significant sites were mapped to the hg19 assembly and subjected to Ingenuity Pathway Analysis (IPA) wherein mapped gene sets were examined for enrichment of downstream function and diseases. Permutations were further performed to confirm the robustness of our findings.

**Results:** On average, the sample was 55% male, 79% white, and aged 16.7 (standard deviation = 2.2) years. cMetS was significantly associated with 52 sites within 43 genes. Among the genes, three were related to glucose tolerance, two to endothelial function, and two more to oxidative stress. IPA indicated that genes associated with these functions were significantly enriched for glucose tolerance (p=0.029), endothelial function (p=0.009), and oxidative stress (p=0.028). Indeed, high cMetS was associated with hypermethylation of PRKCD, which is related to diabetes risk, and PRDX5, which encodes anti-oxidant peroxiredoxin-5. Higher cMetS also was associated with hypomethylation of ID3.

**Conclusion:** Despite validation is pending, these preliminary findings suggest that cardiometabolic burden in adolescents is related to DNA methylation in genes related to CVD risk factors in adulthood, including glucose tolerance, endothelial function, and oxidative stress.


**Funding:** No

**Funding Component:**

**P137**

**Effect of Obesity & T2DM on Cardiac Strain in Youth**

Jessica E Haley, Zhiqian Gao, Philip Khoury, Stephanie N Stewart, Nicolas L Madsen, Thomas R Kimball, Lawrence M Dolan, Elaine M Urbina, Cincinnati Children's Hosp, Cincinnati, OH

**Introduction:** Heart failure is a complication of long standing T2DM. Advanced echo measures can identify early sub-clinical systolic dysfunction in adults with T2DM. We hypothesized that subtle systolic dysfunction was present in young diabetics. **Methods:** Longitudinal strain was measured in 151 subjects with T2DM matched by age, race and sex to a lean (L=146), and non-diabetic (proven by OGTT) obese (O=162) control (23.0 ± 4.0 years, 35% male, 63% African American). Anthropometrics, BP, HR, fasting lipids, glucose and CRP and echocardiograms for LVM, shortening fraction (SF), global longitudinal 4-chamber strain (GLS) and strain rate in systole (GLSR) were obtained. ANOVA was performed to compare differences among groups for CV risk factors and strain measures and ANCOVA to determine if presence of T2DM remained an independent predictor of strain after correction for risk factors (full model=age, sex, race, presence of T2DM, BMI, SBP, DBP, HR and lab values). ANOVA was performed to compare differences among groups for CV risk factors and strain measures and ANCOVA to determine if presence of T2DM remained an independent predictor of strain after correction for risk factors (full model=age, sex, race, presence of T2DM, BMI, SBP, DBP, HR and lab values). **Results:** CV risk factors worsened and there was a graded decline in GLS from L to O to T2DM subjects. GLSR was less negative and LVM/ht^{2.7} was higher in O & T as compared to L
(all \( p \leq 0.05 \)). There was no difference in SF among groups. Presence of T2DM was an independent determinant of GLS and GLSR adjusted for most CV risk factors but lost significance when BMI was added to the model. GLS = -21.6 -age*0.088 - male*1.8 + 0.12*BMI + 0.045*DBP + 0.058*HR - 0.023*HDL \( (R^2 = 0.38, p \leq 0.0001) \); GLSR = -1.20 -male*0.093 + WHR*0.48 + DBP*0.0029 \( (R^2 = 0.23, p \leq 0.0001) \).

**Conclusion:** Early in the course of T2D in youth, obesity has a greater deleterious effect on systolic function than T2DM. Treatment of obesity in youth is necessary for prevention of future heart failure.

**Disclosures:** J.E. Haley: None. Z. Gao: None. P. Khoury: None. S.N. Stewart: None. N.L. Madsen: None. T.R. Kimball: B. Research Grant; Modest; NIH. L.M. Dolan: B. Research Grant; Modest; NIH. E.M. Urbina: B. Research Grant; Modest; AtCor Medical (travel grant). B. Research Grant; Significant; NIH.

**Funding:** No

**Funding Component:**

**P138**

**Asthma and Left Ventricular Mass in Young Adults: the Bogalusa Heart Study**

Dianjiangy Sun, Tulane Univ, New Orleans, LA; Tiange Wang, Shanghai Inst of Endocrine and Metabolic Diseases, Rui Jin Hosp, Shanghai Jiao Tong Univ Sch of Med, Shanghai, China; Yoriko Heianza, Tulane Univ, New Orleans, LA; Jun Lv, Sch of Public Health, Peking Univ Health Science Ctr, Beijing, China; Felicia Rabito, Tanika Kelly, Shengxu Li, Jiang He, Lydia Bazzano, Wei Chen, Lu Qi, Tulane Univ, New Orleans, LA

**Background:** A history of asthma from childhood has been related to various risk factors affecting left ventricular (LV) remodeling; however, no prospective study has analyzed the impact of asthma on markers of LV remodeling. **Methods:** Prospective analyses were performed among 1177 Bogalusa Heart Study participants (average age at follow-up: 36.3±8.3), with a baseline history of self-reported asthma collected since childhood (mean first diagnosed age: 25.2±10.3). LV mass was assessed using 2-dimensional guided M-mode echocardiography, and indexed for body height \((m^{2.7})\) as LV mass index \((LVMI, g/m^{2.7})\). A multivariate linear mixed model was fitted for the repeated measures. **Results:** After an average of 9.1 years follow-up, participants with a history of asthma showed significantly greater LV mass (166.9 vs. 156.3, \( p=0.007 \)) and LVMI (40.1 vs. 37.1, \( p=0.002 \)) than those without asthma, with adjustment for age, gender, race, smoking status, antihypertensive medicine, heart rate and systolic blood pressure (SBP) at follow-up. Also, we found significant interactions between SBP and asthma on LV mass and LVMI \(( p \text{ for interaction} = 0.008 \) and 0.006\). The associations between asthma and LV measures appeared to be stronger among prehypertensive participants \((SBP \geq 130 \text{ mm/Hg})\) compared with those with normal SBP \(< 130 \text{ mm/Hg})\) \([\text{regression coefficient: 26.12 vs. -0.79}\] for LV mass; and 6.75 vs. 0.29 for LVMI). **Conclusions:** Our findings indicate that a history of asthma is associated with higher LV mass, and such association is stronger among individuals with prehypertension.
Asthma and Left Ventricular Mass in Young Adults: the Bogalusa Heart Study

Dianjianyi Sun, Tulane Univ, New Orleans, LA; Tiange Wang, Shanghai Inst of Endocrine and Metabolic Diseases, Rui Jin Hosp, Shanghai Jiao Tong Univ Sch of Med, Shanghai, China; Yoriko Heianza, Tulane Univ, New Orleans, LA; Jun Lv, Sch of Public Health, Peking Univ Health Science Ctr, Beijing, China; Felicia Rabito, Tanika Kelly, Shengxu Li, Jiang He, Lydia Bazzano, Wei Chen, Lu Qi, Tulane Univ, New Orleans, LA

Background: A history of asthma from childhood has been related to various risk factors affecting left ventricular (LV) remodeling; however, no prospective study has analyzed the impact of asthma on markers of LV remodeling. Methods: Prospective analyses were performed among 1177 Bogalusa Heart Study participants (average age at follow-up: 36.3±8.3), with a baseline history of self-reported asthma collected since childhood (mean first diagnosed age: 25.2±10.3). LV mass was assessed using 2-dimensional guided M-mode echocardiography, and indexed for body height (m².7) as LV mass index (LVMI, g/m².7). A multivariate linear mixed model was fitted for the repeated measures. Results: After an average of 9.1 years follow-up, participants with a history of asthma showed significantly greater LV mass (166.9 vs. 156.3, p=0.007) and LVMI (40.1 vs. 37.1, p=0.002) than those without asthma, with adjustment for age, gender, race, smoking status, antihypertensive medicine, heart rate and systolic blood pressure (SBP) at follow-up. Also, we found significant interactions between SBP and asthma on LV mass and LVMI (p for interaction= 0.008 and 0.006). The associations between asthma and LV measures appeared to be stronger among prehypertensive participants (SBP≥130 mm/Hg) compared with those with normal SBP (<130 mm/Hg) [regression coefficient: 26.12 vs. -0.79 for LV mass; and 6.75 vs. 0.29 for LVMI].

Conclusions: Our findings indicate that a history of asthma is associated with higher LV mass, and such association is stronger among individuals with prehypertension.

Diego State Univ, San Diego, CA; Mercedes R Carnethon, Northwestern Univ, Chicago, IL

**Background:** Adult cardiorespiratory fitness (CRF) is associated with lower risk of cardiovascular disease and mortality. However, there is scarce information in youth about the role of CRF in subclinical measures of CVD, such as endothelial function. In this study we tested associations of cardiometabolic factors (CMF) and biomarkers of endothelial function (e-selectin; PAI-1).

**Methods:** We included 1,380 participants (699 girls and 681 boys) aged 8-16 years from SOL Youth. CRF was assessed by a step test and VO2 max was estimated. CMF included fasting glucose, lipids, blood pressure. Inflammatory markers included hs-CRP and adiponectin. Associations of CRF with e-selectin and PAI-1 were assessed with multiple linear regression models, adjusting for potential confounders: actigraphy derived physical activity (PA) and sedentary time (SED), adiposity, and socio-demographic factors. Odds ratios were derived for the association of CRF and having ≥3 CVD risk factors (RF)(defined by elevated age/sex appropriate BP, lipids, glucose, and obesity), adjusted for confounders. Analyses accounted for complex survey design.

**Results:** Boys and US-born youth were more likely to have higher CRF. CRF was positively correlated with PA (r=.23, p<.0001) but inversely correlated with SED (r=-.10, p=.001), BMiz-score (r=-.37, p<.0001), waist circumference (WC)(r=-.38, p<.0001), and %body fat (r=-.43, p<.0001). In multivariate models adjusting for socio-demographic factors, PA and SED (model 1), CRF was strongly and inversely associated with markers of endothelial function, inflammation, and CMF, which were attenuated when adjusting for WC (model 2)(Table 1). The odds of having ≥3 CVD RF was significantly lower at highest quartiles of fitness (ORs Q2=0.47, Q3=0.68, Q4=.35, p-trend=.001) after adjusting for confounders and WC.

**Conclusions:** Among Latino youth, CRF appears to be a strong protective factor for endothelial dysfunction and CMF. Strategies to improve CRF may be a useful approach for improving cardiovascular health in youth.


Funding: No

Funding Component:

P140

**The Association of Common Genetic Loci with Childhood Obesity in 1,612 Hispanic/Latino Children and Adolescents From Across the United States and Mexico**

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Childhood obesity is a global health concern due to its potential to increase cardiometabolic risk across the life course. In the United States (US) the burden of childhood obesity is highest among Hispanic/Latinos, in particular children or adolescents of Mexican descent. Although the genetic epidemiology of childhood obesity has been studied previously, the potential for novel childhood obesity loci in Hispanic/Latinos and the generalizability of previously reported loci to Hispanic/Latino children and adolescents are still unknown. Thus we aimed to conduct a genome-wide association study of childhood obesity in 1,612 Hispanic/Latino children and adolescents (2-18 years) collected as part of one Mexican (n=794 Mexico City Study) and two US (n=362 Children’s Hospital of Philadelphia; n=456 Viva La Familia Study) studies, and to generalize 11 previously reported childhood obesity loci from European descent samples to our Hispanic/Latino samples. Obesity cases and controls were defined by BMI-for-age percentiles based on the Centers for Disease Control and Prevention smoothed and sex-specific growth curves from 2000, wherein cases had percentiles ≥95th and controls had percentiles ≤85th. Each study performed a genome-wide logistic regression analysis of single nucleotide polymorphism (SNPs) after adjusting for sex, population stratification and relatedness, as applicable. We combined study results for SNPs >10 minor allele counts and imputation quality ≥0.5 using fixed-effect inverse-variance weighted meta-analysis. A priori, we estimated that in our sample (N_effective=1,498) we would have >80% power to detect common SNPs (>15% minor allele frequency) across the genome (p<5x10^{-8}) that increase the odds of childhood obesity of 55% per risk allele. Generalizability at 11 known childhood obesity loci was defined as p<0.05 and directional consistency with the previously reported obesity-increasing allele. We found 5 suggestive childhood obesity loci (p<4x10^{-6}), including a SNP that associated with an increased odds of childhood obesity of 54% per risk allele (73% frequent) at ARHGAP21, which is expressed in an enhancer region in brain, muscle and adipose tissues and has been previously implicated with trunk fat mass in Viva la Familia at another SNP (r^2<0.08). Of the 11 known childhood obesity loci, 9 were directionally consistent (binomial p=0.03). SEC16B and TMEM18 generalized to Hispanic/Latinos (ps0.01), corresponding to a 27% and 40% increased odds of obesity per risk allele (22-88% frequency). These preliminary results suggest the presence of novel loci for childhood obesity and the generalizability of genetic loci discovered in samples of European descent to Hispanic/Latinos, albeit with stronger effect sizes. Future work will attempt to identify additional Hispanic/Latino obesity cases and controls to replicate the suggestive associations.


Funding: No

Funding Component:

P141

Biological and Socioeconomic Determinants of Dysglycaemia in Canadian Youth

Allison Feely, Univ of Manitoba, Winnipeg, MB, Canada; Celia Rodd, Children's Hosp Res Inst of Manitoba, Winnipeg, MB, Canada; Allison Dart, Univ of Manitoba, Winnipeg, MB, Canada; Atul Sharma, George and Fay Yee Ctr for Healthcare
Innovation, Winnipeg, MB, Canada; Jonathan McGavock, Children’s Hosp Res Inst of Manitoba, Winnipeg, MB, Canada

**Background:** Population-based rates of prediabetes or dysglycaemia (i.e. elevated A1C) among low-risk youth are not well described. Moreover, the biological and socioeconomic determinants of an elevated A1C in youth remain poorly understood.

**Methods:** Youth aged 6-19 years who participated in the first (2007-2009) or second (2009-2011) cycles of the Canadian Health Measures Survey (CHMS) were included in our analyses. The primary outcome, dysglycaemia was defined using A1C guidelines established by the American Diabetes Association (ADA: 5.7%-6.4%) and Canadian Diabetes Association (CDA: 6.0%-6.4%). Various biological and socioeconomic determinants were compared between healthy and dysglycaemic youth using two sample t-tests and \( \chi^2 \) tests (Table 1). Multivariable logistic regression was used to calculate adjusted odds ratios for dysglycaemia. Age stratified regression was performed to adjust for physical activity. All analyses were unweighted.

**Results:** Of the 3449 youth studied, 785 (22.8%) and 179 (5.2%) displayed dysglycaemia according to ADA and CDA definitions, respectively. Youth with dysglycaemia (ADA definition) were more likely to be male (55.4 v 50.6%, \( p=0.02 \)), non-white (24.8 v 14.6%, \( p<0.001 \)) and obese (16.2 v 10.8%, \( p<0.001 \)). Dysglycaemia in youth was more common in those living in households with middle income adequacy (32.6 v 26.8%, \( p=0.006 \)) and lower levels of parental education (high school or less, 15 vs 11.4%, \( p=0.007 \)). Similar associations were found using CDA definition. In the adjusted logistic regression model (age \( \geq 12y \)), significant predictors were age, race, income adequacy, geographic region, obesity (OR=1.60, 95% CI: 1.08-2.35) and physical activity (monthly frequency of activity longer than 15 minutes, OR=0.97, 95% CI: 0.95-0.99).

**Conclusion:** Nearly 1 of every 5 youth in Canada are at risk for type 2 diabetes, based on early elevated A1C. Elevated A1C in youth is associated with social determinants of health and some lifestyle factors and both should be addressed in prevention efforts.

**Disclosures:** A. Feely: None. C. Rodd: None. A. Dart: None. A. Sharma: None. J. McGavock: E. Honoraria; Modest; Medtronic.

**Funding:** No

**Funding Component:**

**P142**

**Social Jetlag is Associated With Adiposity in 8-10 Year Old New Zealand Children**

Lee Stoner, Univ of North Carolina, Chapel Hill, NC

**Background:** Childhood obesity has been associated with poor sleep behaviour, including sleep duration, sleep disorders and social jetlag. Social jetlag is the discrepancy between an individual’s circadian clock and social rhythms, and is measured as the difference in hours between the midpoint of sleep at work/school and free days. While social jetlag has been associated with being overweight adults, no known studies have examined whether obesity is associated with social jetlag in children. We hypothesized that poor sleep behavior, including sleep duration, sleep disorders and social jetlag, would be associated with body

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**Table 1: Sample characteristics of healthy and dysglycaemic youth based on ADA definition**

<table>
<thead>
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<th>Characteristic</th>
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**Notes:**

1. \( \chi^2 \) test for continuous variable, \( \chi^2(2) \) for categorical variables.
composition in 8-10 year old New Zealand children. **Methods:** This cross-sectional study recruited 341 children (50% F) aged 8-10 years from three representative sample sites across New Zealand. Four dependent variables were calculated: body fat (%), fat mass index (FMI, kg/m$^2$), waist to hip ratio (WHR), and body mass index (BMI, kg/m$^2$). The three independent variables were: average sleep duration, social jetlag, and sleep disorders. Sleep duration was recorded using a parent-reported, single item habitual school/weekday sleep survey. Social jetlag was calculated as the absolute difference between the midpoints of sleep on weekdays versus weekend days. Sleep disorders were estimated using the Children’s Sleep Habits Questionnaire. **Results:** Following adjustment for confounders, sleep duration was only associated WHR ($\beta = -0.008$, 95%CI: -0.015, 0.000), and sleep disorders was only associated with FMI ($\beta = -0.034$, 95%CI: 0.002, 0.067 kg/m$^2$), while social jetlag was associated with all four body composition variables. A one hour increase in social jetlag was associated with a 2.98% (95%CI: 0.41, 5.55%) increase in body fat, 0.51 kg/m$^2$ (95%CI: 0.11, 0.91 kg/m$^2$) increase in FMI, a 0.90 kg/m$^2$ (95%CI: 0.21, 1.58 kg/m$^2$) increase in BMI, and a 0.13 (95%CI: 0.003, 0.023 increase in WHR. **Conclusions:** In conclusion, Social jetlag may be a particularly important sleep behaviour correlate of adiposity in children. Moreover, social jetlag provides an opportunity for a relatively simple and measurable public health strategy.

Disclosures: **L. Stoner:** None.

Funding: No

Funding Component:

**P144**

**Being Born Small for Gestational Age and Later Cardiac Structure and Function in Adolescence**

**Simon Timpka**, Brigham and Women's Hosp and Harvard Medical Sch, Boston, MA; Alun D Hughes, Nishi Chaturvedi, Inst of Cardiovascular Science, Univ Coll London, London, United Kingdom; Paul W Franks, Lund Univ, Lund, Sweden; Debbie A. Lawlor, Abigail Fraser, Sch of Social and Community Med, Univ of Bristol, Bristol, United Kingdom

**Background:** Evidence suggests that impaired fetal growth is associated with increased risks of ischemic heart disease, atrial fibrillation, and stroke. Less is known about the potential association between low birth weight (small for gestational age; SGA) and cardiac structure and function later in life. **Methods:** 1,592 participants (54% females) from a UK birth cohort were examined with echocardiography at mean age 17.7 years (SD 0.3). Using regression models we investigated the association between being born SGA and adolescent cardiac structure and function; left ventricular mass indexed to height$^{2.7}$ (LVMI), relative wall thickness (RWT), left atrial size indexed to height$^{2.7}$, ejection fraction, s’, and E/e’. Birth weight Z-score (by gestational week and sex) was defined according to an external reference based on UK data from the same time period as the births of the participants. SGA was defined as Z-score ≤5th percentile. Birth weight was also analyzed using linear splines with predefined knots at the 5th, 50th and 95th percentile to allow for potential non-linearity in associations. Main models were adjusted for age, sex and several maternal factors: height, pre-pregnancy BMI, gestational diabetes, gestational week at birth, hypertensive disorders of pregnancy, smoking, and education. **Results:** Adolescents born SGA had smaller LVMI (-2.12 g/m$^{2.7}$; 95% Confidence Interval (CI) -3.69 to -0.55). SGA was also associated with greater mean ejection fraction (2.24, 95% CI 0.62 to 3.87) compared to non-SGA adolescents. In the linear spline analyses, we observed a positive increase in LVMI per one unit increase in birth weight Z-score among those born SGA (3.56 g/m$^{2.7}$, 95% CI 0.95 to 6.17) and a negative change of slope in the next interval (birth weight between 5th and 50th percentile, p=0.02). There was no support for
any associations between SGA, including the spline analyses, and the other outcomes (RWT, left atrial size indexed to height\textsuperscript{2,7}, s’, and E/e’). The association between SGA and left ventricular mass was evident also without indexing for body size, and when indexing by body surface area or (height in m)\textsuperscript{1.6}.

**Conclusion:** Being born SGA appears to be associated with certain aspects of cardiac structure and function in adolescence, which later in life predict the development of clinical heart disease. Smaller left ventricular mass in adolescence might predispose those born SGA to be more susceptible to adverse cardiac remodeling later in life.

Disclosures: **S. Timpka:** None. **A.D. Hughes:** None. **N. Chaturvedi:** None. **P.W. Franks:** None. **D.A. Lawlor:** None. **A. Fraser:** None.

Funding: No

Funding Component: 

**P145**

**Association Between Birth Weight and Childhood and Maternal Cardiovascular Disease Risk Factors in Full Term Birth Infants**

**Amna Umer,** Candice Hamilton, Cris Britton, Lesley Cottrell, Peter Giacobbi Jr, George Kelley, Kim Innes, Collin John, William Neal, Christa Lilly, West Virginia Univ, Morgantown, WV

**Introduction:** Reported associations between birth weight (BTW) and childhood cardiovascular disease (CVD) risk factors have been inconsistent. The relationship between infants’ BTW and later maternal CVD is also a more recent and active area of research. We aimed to examine the association between BTW and subsequent childhood and maternal CVD risk factors 11 years post-partum.

**Methods:** The study used longitudinally linked data from three cross-sectional datasets in West Virginia (N=19,583). The outcome variables included blood pressure for children and lipid levels for both mothers and children.

The exposure was BTW of the infants born full-term. The role of the child’s current body mass index (BMI) was assessed as a potential mediator.

**Results:** Unadjusted analyses showed a positive association between BTW and the child’s systolic blood pressure (SBP), diastolic blood pressure (DBP), high-density lipoprotein cholesterol (HDL), and a negative association with triglycerides (TGs). When adjusted for the child’s BMI, the association became non-significant for SBP and DBP but remained significant for HDL [β= 0.14 mg/dL (95% CI: 0.11, 0.18) per1000g increase in BTW] and TGs [β= -0.007 mg/dL (-0.008, -0.005) per 1000g increase in BTW]. Low-density lipoprotein cholesterol (LDL) and non-HDL became significant and negatively associated with BTW in the adjusted analysis [LDL (β = -0.1 mg/dL (-0.19, -0.16) per 1000 g increase in BTW; non-HDL (b = -0.18 mg/dL (-0.28, -0.09) per 1000 g increase in BTW). There was a positive association between infant’s birth weight and maternal total cholesterol (TC) levels, which became non-significant in the adjusted analysis [β = 0.4 (95% CI: 0.01, 0.90) mg/dL per1000g increase in birth weight]. None of the other maternal lipids levels (LDL, HDL, and TG) were significant in the unadjusted or the adjusted analysis.

**Conclusion:** Low BTW was associated with higher LDL, non-HDL, and TGs, and lower HDL levels in fifth grade children independent of the current weight status. As childhood CVD risk factors persist and are often amplified over time, these small effect sizes can have potential unfavorable consequences on lipid levels in later adulthood.

Disclosures: **A. Umer:** None. **C. Hamilton:** None. **C. Britton:** None. **L. Cottrell:** None. **P. Giacobbi:** None. **G. Kelley:** None. **K. Innes:** None. **C. John:** None. **W. Neal:** None. **C. Lilly:** None.

Funding: No

Funding Component:
Parental Influences on Children’s Healthy Behaviors

Kayla Marcotte, Rachel Krallman, MCORRP, Ann Arbor, MI; Jean DuRussel-Weston, Univ of Michigan Health System, Ann Arbor, MI; Eva Kline-Rogers, MCORRP, Ann Arbor, MI; Elizabeth A Jackson, Kim A Eagle, Univ of Michigan Health System, Ann Arbor, MI

Background: The effect of parental health behaviors on children has not been well studied. This study examined how sixth-grade students’ health behaviors were influenced by perceptions of their parents’ health behaviors.

Methods: Sixth grade students from 60 schools in Michigan participating in Project Healthy Schools were eligible for this study. Data on children’s and parents’ dietary, physical activity, and sedentary habits were collected through a validated health behavior questionnaire. Health behaviors analyzed included physical activity, screen time, sugary beverage consumption, fast/fatty food consumption, and fruit/vegetable consumption. Logistic regressions were used to determine the effect of parents’ health behaviors on their children’s health behaviors.

Results: 4065 students completed the health behavior questionnaire. Children were more likely to have healthy physical activity habits if their parents also had healthy physical activity habits. Children were more likely to have healthy screen time habits if their parents had healthy screen time. Children were more likely to have healthy sugary beverage habits if their parents had healthy sugary beverage habits. Children were more likely to have healthy fast/fatty food habits if their parents had healthy fast/fatty food habits. Children were more likely to have healthy fruit/vegetable habits if their parents had healthy fruit/vegetable habits.

Conclusions: Parent behaviors were strong predictors of child behaviors in the same category (e.g. high parental physical activity predicted high child physical activity) for all health behaviors assessed. All behaviors except physical activity were influenced by a multiple parent behaviors, suggesting more complex relationships. Further investigation may provide insight into strategies to improve children’s health behaviors.


Funding: No

Glycemic Control and Weight in a Pediatric Diabetes Clinic Over Time: Gender Differences in Children With Type 1 Diabetes Between the Ages of 9-17 Years

Alexandra Bodan, Univ of Southern California Keck Sch of Med, Los Angeles, CA

Research shows women with type 1 diabetes (T1D) face a disproportionately increased risk for development of cardiovascular disease (CVD) compared to men. We posit, adolescence may be a critical time period for CVD risk development. Our study examined the effects on gender differences in Hemoglobin A1c (HbA1c) and Body Mass Index z-score (BMIz) across puberty in children with T1D in a large pediatric diabetes specialty clinic. A total of 733 T1D children (M=355, F=378) aged 9-17 with a total of 21,534 visits from the Barbara Davis
Center were suitable for this retrospective cohort study. To exam HbA1c and BMIz overtime by gender we used a linear mixed model with SAS version 9.4. HbA1c increased with age in both genders (p<0.0001), but there was a greater increase in girls across adolescence (sex by age interaction, p<0.0007). BMIz increased with age in girls only (sex by age interaction, p<0.0001). Teenagers had worse glycemic control than younger children, and girls had worse glycemic control with greater obesity rates than boys. This gender difference in glycemic control and obesity during puberty may explain the increased CVD risk seen in women with T1D compared to men.

Introduction: Few studies have examined the relationship between perinatal and postnatal birth factors with later childhood obesity. One notable exception found only infant weight-related factors (such as adiposity rebound) related to weight at age 7, but not other potential risk factors (such as breastfeeding, parity, maternal age, etc., Reilly et al 2005) Our goal with the current study was to expand earlier work, utilizing an Appalachian sample, and to develop a risk score based on an expanded set of risk factors.

Methods: The study used longitudinally linked data from three cross-sectional datasets in West Virginia (N=22136). Risk score development followed the tutorial by Sullivan et al (2004). The outcome was defined as childhood obesity at age 10 and calculated as children with 95th percentile BMI for their age and gender. The perinatal predictors included sex, race, health insurance status, family history of cholesterol and cardiovascular disease, smoking during pregnancy, maternal age at birth, breastfeeding intention at birth, and birth weight of the infant. ROC analysis was then performed to establish a cut-off that would maximize the sensitivity and specificity of the perinatal risk factor scores in predicting childhood obesity.

Results: Table 1 shows the significant risk factors and associated points. A score of 17 maximized sensitivity (50%) and specificity (60%) using the combined risk factor system for predicting childhood obesity at age 10. Nearly 43% (N=4054 of 9494) of the children had a high perinatal risk score; of those, 34.24% (N=1388) were obese (compared to 26.53% of those with a low perinatal risk score). The odds of being obese in fifth grade were 1.44 (95%CI: 1.32, 1.58) times among those who had a high perinatal score compared to those who had a low score.

Discussion: The results of the study can help in identifying infants at birth who are at higher risk of developing childhood obesity. Future research should include other predictors to increase sensitivity and specificity of the risk score system.
Associations Between Perinatal Risk Factors and Childhood Cholesterol and Blood Pressure

Christa Lilly, Amna Umer, Candice Hamilton, Cris Britton, Collin John, William Neal, West Virginia Univ, Morgantown, WV

Introduction: There is growing evidence that early-life risk factors may influence the development of cardiovascular disease (CVD) in later life. The goal of this study was to examine the associations between numerous early life exposures and subsequent childhood hypertension and dyslipidemia at 11 years of age to identify the modifiable risk factors.

Methods: The study used longitudinally linked data from three cross-sectional datasets in West Virginia (N= 22,136). The outcome variables included pre-hypertension/hypertension defined as ≥ 90th percentile for SBP (>124mmHg) or DBP (>80mmHg) and dyslipidemia defined as LDL ≥130mg/dl and HDL <40 mg/dl. Logistic regression was used to examine the association between the two outcomes and an extensive list of perinatal predictors, including sex, race, health insurance status, family history of cholesterol and cardiovascular disease, smoking during pregnancy, maternal age at birth, breastfeeding intention at birth, and birth weight of the infant.

Results: The results showed that approximately 21% (4482 of 21817) of the children had hypertension and one fourth had dyslipidemia (24.6%, 4481 of 18184) in fifth grade. Increased odds for childhood hypertension was associated with age of the child in fifth grade, male gender, race (other compared to white), family history of cholesterol, and no maternal intention of exclusively breastfeeding their infant. Increased odds for childhood dyslipidemia was associated with family history of cholesterol, family history of cardiovascular disease, and maternal smoking during pregnancy. Notably, two modifiable perinatal risk factors stood out: mothers who did not intend to exclusively breastfeed had children who had significantly higher odds of having hypertension in fifth grade (OR: 1.2, 95%CI: 1.1, 1.3) compared to mothers who intended to exclusively breastfeed. Additionally, mothers who smoked during pregnancy had children who had significantly higher odds of having dyslipidemia in fifth grade compared to mothers who did not smoke (OR: 1.3, 95%CI: 1.2, 1.4).

Conclusion: Surprisingly few perinatal factors were associated with childhood hypertension and dyslipidemia. The perinatal modifiable factors for hypertension and dyslipidemia included intent to breastfeed and maternal smoking during pregnancy; thus, smoking cessation and exclusive breastfeeding should be encouraged.

Funding Component:

P150

Linkage Program to Identify Siblings from a CARDIAC Risk Factor Registry

Lee A Pyles, Charles J Mullett, Christa Lilly, William A Neal, West Virginia Univ, Morgantown, WV

Introduction: The Coronary Artery Risk Detection in Appalachian Communities (CARDIAC) Project gathers anthropometric, BP and lipid data from fifth graders in West Virginia in the past 18 y. 60,403 children had LDL cholesterol and we found 5259 sets of siblings by direct match on mothers first and last name. The suggestion that more sibships could be identified prompted evaluation of Link Plus software from Centers for Disease Control (CDC) to improve matching. Methods: LinkPlus generates potential matches via a probabilistic algorithm that allows relative weighting of multiple factors such as first and last name. For our purposes the deduplication rather than matching algorithm was run using mother’s first and last name using the NYSIIS (New York State Identification and Intelligence System) phonetic schema to avoid creating multiple many-to-many relationships that were difficult to analyze. Additional variables considered included county, street address, telephone, fathers first and last name, school. Subject last name was used as a blocking variable. Results: 7602 matched siblings were generated by the program that determined a probability score ranging from 61.3 to cut off at 15; few matches were observed below this level. The figure demonstrates exponential decay beginning at a probability score of 26 with 95% accuracy at 25.5. 6827 pairs were included at that level including 6824 matched pairs and only 3 false positive pairs. Partial matches (n = 61) likely are half sibs including exact match of telephone and/or street but only one parent matching. Child surname was not used in the algorithm. Typographical errors were accounted by Link Plus. Lipid correlations were similar to those found with excel but more robust. Conclusion: The Link Plus record matching program from CDC is able to successfully determine sibships with increased sensitivity compared with a direct match from a sorted excel file. The program was able to identify likely sibs and half-sibs plus avoid non-match due to minor typo errors in the analyzed fields.


Funding: No

Funding Component:

P151

Comparison of Standard Definitions and Sagittal Abdominal Diameter as a Measure of Excess Adiposity When Defining Metabolic Syndrome in Adolescents

Symielle A Gaston, Nicolle S Tulve, U.S. EPA, Research Triangle Park, NC; Tekeda F Ferguson, LSU Health Sciences Ctr, New Orleans, LA

Introduction: Metabolic syndrome (MetS) is the cluster of several clinical symptoms that together represent the strongest risk factor for cardiovascular disease. The prevalence of MetS in adolescents is difficult to estimate given that there are several, but no agreed upon definition of MetS for this age group. It is important to estimate MetS and identify at-risk adolescents early in order to provide effective interventions prior to the development of diabetes and coronary heart disease. Objective: Study objectives are to: (1) estimate the prevalence of
MetS in U.S. adolescents using three widely adopted definitions and (2) compare changes in prevalence of MetS when utilizing sagittal abdominal diameter (SAD) as a component of MetS. Methods: Data from U.S. adolescents ages 12–19 years (N=970) in the NHANES (2011–2014) were analyzed. MetS standard definitions developed by Cook et al. (2003), deFerranti et al. (2007), and the International Disease Federation (IDF, 2007) were applied to estimate the sex-stratified, weighted prevalence of MetS and its individual components (i.e., high waist circumference (WC), hypertension, blood lipid abnormalities, and high fasting blood glucose (FBG)). The definitions were modified by substituting SAD for WC, and weighted MetS prevalence was re-estimated. Results: Regardless of gender and definition, abnormal blood lipids and high WC were the most prevalent MetS components. For both sexes, estimated prevalence of components varied greatly by definition (e.g., boys’ prevalence of high fasting blood glucose: IDF–27.2% vs. Cook and deFerranti–both 2.7%). MetS prevalence in boys using standard and SAD-modified definitions were 4.5% and 5.0%; 10.6% and 9.4%; and 4.6% and 3.3% for the Cook, deFerranti, and IDF definitions, respectively. MetS prevalence in girls using standard and SAD-modified definitions were 2.4% and 2.4%; 8.5% and 8.2%; and 4.3% and 2.8% for the Cook, deFerranti, and IDF definitions, respectively. Conclusions: Though the most prevalent MetS components were similar, the estimated prevalence values of individual components varied greatly across MetS definitions. With the risk of false positives, the deFerranti definition of MetS may identify the greatest number of adolescents at potential risk for MetS. Cook and deFerranti definitions may miss the identification of adolescents who could benefit from additional health promotion programs. Compared to WC, use of SAD resulted in similar yet slightly attenuated estimated MetS prevalence.

Disclosures: S.A. Gaston: None. N.S. Tulve: None. T.F. Ferguson: None.

Funding: No

Funding Component:

P152

Cardiometabolic Risk Factors in Adolescent Blood Donors

James Keeton, UT Southwestern Medical Ctr, Dallas, TX; Stephen J Eason, Merlyn Sayers, Carter BloodCare, Bedford, TX; Colby Ayers, Maria Odette Gore, UT Southwestern Medical Ctr, Dallas, TX

Objective

Cardiometabolic risk factors have been extensively studied in adults, but to a lesser extent in adolescents. We assessed potential cardiometabolic risk factors in a large cohort of adolescent blood donors.

Methods

Glycated hemoglobin (HbA1c), blood pressure (BP), and total cholesterol were measured in 10,756 blood donors aged 16-19 years at school blood drives conducted by Carter BloodCare, a large North Texas blood center. Borderline values were defined as HbA1c 5.7–6.4%, BP (systolic/diastolic) 120–139/80–89 mm Hg, and total cholesterol 170–199 mg/dL. Elevated values were defined as HbA1c ≥ 6.5%, BP ≥140/90, and total cholesterol ≥200 mg/dL. Subjects were classified into one of three subcohorts: (A) no borderline or elevated values (“healthy” subcohort); (B) one borderline value; (C) either two borderline values or one elevated value. The subcohorts were further stratified as shown in the Table.

Results

Of the 10,756 blood donors, 35.2% had one borderline cardiometabolic risk factor, and 17.9% had either two borderline or one elevated risk factor. There were more girls than boys in the “healthy” subcohort (p<0.0001). Girls had a higher prevalence of borderline or elevated total cholesterol (p<0.0001), whereas boys had higher prevalence of borderline or elevated BP (p<0.0001). Other differences
between subcohorts are summarized in the Table.

**Conclusion**

More than half of adolescents in this study had at least one cardiometabolic risk factor that was either borderline or elevated. Blood donation programs can serve as highly efficient and cost-effective gateways for cardiometabolic risk screening in adolescents, with potential for the development of targeted interventions aimed at promoting healthy behaviors early in life, specifically among those at increased risk.

**Disclosures:** J. Keeton: None. S.J. Eason: None. M. Sayers: None. C. Ayers: None. M.O. Gore: None.

**Funding:** No

**Funding Component:**

P154

**Short-Term Health Care Expenditures Increase After Workplace Wellness Program**

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**Introduction**

A major goal of workplace wellness programs is to improve employee health and lower health care costs. Research on wellness program effectiveness is often limited by either a lack of a control comparison groups or confounding when the intervention and control groups differ on baseline health. Our study objective was to assess the effect on health expenditures of an employee wellness program (BeFit), already shown to improve diet, physical activity, cholesterol, and BP. We compared participants to a matched non-participant control group.

**Hypothesis**

We hypothesized that health care costs would be lower for participants than for non-participants.

**Methods**

BeFit is a 10 week nutrition/exercise program that includes measurement of cardiovascular risk factors, weekly meetings with a nutritionist and personal trainer, gym membership, and team competition to achieve weight and exercise goals. For this study, participants were matched by age, sex, period of employment, and pre-participation Diagnostic Cost Group (DCG) risk score (a predictor of future health care use based on past-year use), to two non-participant control employees. Health expenditures were gathered from claims data obtained by the employer’s human resource department. Subjects in the analysis had at least 12 months pre- and post-program claims data. Within-subject quarterly health care cost trends were compared after subjects’ BeFit start dates using multivariable generalized least squares regression controlling for age, sex, and baseline health. Control subjects were assigned the start date of the subject to whom they were matched. Expenditures were capped at the 99th percentile ($42,393) so results were not unduly influenced by extreme events unlikely to be affected by a wellness program. We analyzed overall, domain-specific (outpatient, inpatient, pharmaceutical), and diagnosis-specific costs.

**Results**

From 2010-2014, 412 BeFit participants and 824 controls met the inclusion criteria (77% female, 0.352)
mean age 41 [range 23,78], mean baseline DCG risk score of 92.3 [range 3, 2315]). After participation in BeFit, the regression-adjusted health expenditures decreased by $15/quarter among BeFit participants compared to $85/quarter among control subjects (95% CI for difference $27, $113). Trends were significantly more negative in the control group for outpatient, inpatient, and pharmaceutical costs, as well. There were no differences in trends for cardiovascular or diabetes-related costs.

Conclusions
Contrary to our hypothesis, trends in health expenditures decreased more for the matched control group than for participants in the employee wellness program. This result may be due to increased attention to health and higher health care use spurred by participation in the program. Further work is necessary to understand the long-term impact of wellness programs on health and health expenditures.


Funding: No

Funding Component:
P155

Cardiovascular Health at Young and Middle Ages and Medical Care Costs at Old Age

Cuiping Schiman, Lei Liu, Northwestern Univ, Chicago, IL; Tina Shih, Univ of Texas MD Anderson Cancer Ctr, Houston, TX; Lihui Zhao, Northwestern Univ, Chicago, IL; Martha Daviglus, Univ of Illinois Coll of Med, Chicago, IL; Kiang Liu, Northwestern Univ, Chicago, IL; James Fries, Stanford Sch of Med, Stanford, CA; Daniel Garside, Univ of Illinois Coll of Med, Chicago, IL; Thanh Huyen Vu, Jeremiah Stamler, Donald Lloyd-Jones, Norrina B. Allen, Northwestern Univ, Chicago, IL

Introduction: We investigate the association between cardiovascular health at young and middle age and medical care costs and utilization in old age.

Methods: We linked Chicago Heart Association (CHA) study participants’ baseline cardiovascular health (CVH) (18-59 yrs) to their Medicare claims (1991-2010) for all Part A and Part B services, including inpatient and skilled nursing facility, outpatient, home health, durable medical equipment, and hospice care. Baseline CVH is a composite measure of BP, cholesterol, diabetes, BMI, and smoking and is divided into four strata representing increasing burden. Medical care utilization (e.g., admissions and visits) and costs (in 2010 dollars) were calculated from the claims. We analyzed both the overall costs and the composition of costs among various medical care services and by CVD (non-CVD) morbidity and sex. Conditional quantile regressions were used to estimate the association between increased CVH and costs and negative binomial regressions were used for the number of inpatient admissions and outpatient visits, and the length of inpatient or hospice stay.

Results: Among the 22,236 participants (222,816 person-years) 41.7% are female, 5.7% had favorable levels of all factors, 19.6% had 1+ risk factors at elevated levels, 40.9% had 1 high risk factor, and 33.7% had 2+ high risk factors. The median (mean) health care costs over the sample is $12,477 ($189,598) per person year in 2010 dollars, poorer CVH was associated with higher total medical care costs and a greater proportion of spending on home health visits (Figure). A greater CVH burden was associated with greater utilization and length of stay. Individuals with 2+ high risk factors on average have 0.22 more inpatient admissions per year and their inpatient stay is almost 2.91 days longer per year than individuals with favorable CVH.

Conclusion: Unfavorable CVH early in life is associated with higher medical care cost burden in old age. Future interventions to improve CVH may result in reduced healthcare costs and utilization.

Funding: No

Funding Component:

P156

Assessing the Effect of the Heart of New Ulm Project: a Population-Based Program to Reduce Cardiovascular Disease

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Background: Despite a highly recognized priority for public health and healthcare to implement population-level strategies to reduce the burden of cardiovascular disease (CVD), limited evidence exists on the most effective strategies. Data collection and evaluation of large scale, community-based prevention programs can be challenging and costly to achieve. The Heart of New Ulm (HOUNU) Project, begun in 2009, is a population-based initiative with healthcare, community, and workplace interventions addressing multiple levels of the social-ecological model designed to reduce modifiable CVD risk factors in rural New Ulm, MN. The community is served by one health system, enabling the use of electronic health record (EHR) data for surveillance.

Objective: To assess trends for CVD risk factors, events, and healthcare utilization for New Ulm residents compared to a matched control population.

Methods: We matched New Ulm residents (n = 4,077) with controls (n = 4,077) from a regional community served by the same health system using refined covariate balance techniques to match on baseline demographics, CVD risk factors, and health care utilization. Mixed effects longitudinal models with adjustment for age and gender, and an interaction for time by community, were run. Model based estimates were constructed for the entire cohort at each time period.

Results: Over the first 6 years of the HOUNU Project, blood pressure, LDL, total cholesterol, and triglycerides were managed better in New Ulm than the matched comparison community. The proportion of New Ulm residents with controlled blood pressure increased by 6.2 percentage points while the control group increased by 2 points. 10-year ASCVD risk scores showed less decline for New Ulm residents than controls (16 vs. 18.4). The intervention and control groups did not differ with regard to inpatient stays, CVD events, smoking, or glucose.

Conclusions: Compared to a matched control population, we found improved control of CVD risk factors in the New Ulm Population exposed to the HOUNU Project.
Sex Disparities in High Intensity Statin Use Following Myocardial Infarction

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**Background:** High intensity statins have been shown to lower the risk of major cardiovascular events after an index myocardial infarction (MI). Studies have shown that women are less likely than men to receive cardiovascular risk reduction therapies but little is known about sex differences in high intensity statin use following hospital discharge for MI.

**Methods:** We compared high intensity statin use following hospital discharge for MI in 2014 between men and women 19 to 64 years with commercial health insurance in the Marketscan database (n=7,089 men and 2,318 women) and Medicare beneficiaries ≥66 years (n=20,202 men and n=18,937 women). Patients were included if they filled a statin of any intensity within 30 days following hospital discharge. Statin fills were identified through pharmacy claims and high intensity statins included atorvastatin 40 or 80 mg and rosuvastatin 20 or 40 mg.

**Results:** Among patients not taking statins prior to having an MI (n=6,303 in Marketscan and n=17,763 in Medicare), 69.4% of men and 62.4% of women (p-value <0.001) in the Marketscan database and 55.2% of men and 48.1% of women (p-value <0.001) with health insurance through Medicare initiated treatment with a high intensity statin. Among patients taking low or moderate intensity statins prior to having an MI (n=2,234 in Marketscan and n=16,818 in Medicare), 58.0% of men and 49.2% of women (p-value <0.001) in the Marketscan database and 38.2% of men and 31.7% of women (p-value <0.001) in Medicare titrated to a high intensity statin within 30 days of hospital discharge. After multivariable adjustment, women were less likely to initiate treatment with a high intensity statin (relative risk: 0.92; 95% CI 0.88-0.96 in Marketscan and 0.92; 95% CI 0.90-0.95 in Medicare) or titrate from low/moderate to high intensity statin (relative risk: 0.89 95% CI 0.81-0.95 in Marketscan and 0.89; 95% CI 0.86-0.93 in Medicare). Among those taking a high intensity statin prior to their MI (n=870 in Marketscan and n=4,558 in Medicare), 92.0% and 87.4% of men and women, respectively, in Marketscan (adjusted relative risk 0.95; 95% CI 0.90-1.01) and 91.5% and 88.1% of men and women, respectively, in Medicare (adjusted relative risk 0.97; 95% CI 0.95-0.99), remained on a high intensity statin following hospital discharge.

**Conclusions:** Women are less likely than men to receive high intensity statins following hospital discharge for MI.

Support; Modest; None. D. Speakers Bureau; Modest; None. E. Honoraria; Modest; Kowa. F. Ownership Interest; Modest; None. G. Consultant/Advisory Board; Modest; Akcea, Amgen, Astra Zeneca, C5, Eli Lilly, Regenron, Sanofi. H. Other; Significant; Royalties. K. Monda: A. Employment; Significant; Amgen, Inc. M. Safford: B. Research Grant; Significant; Amgen, Inc.. G. Consultant/Advisory Board; Modest; Amgen,Inc. B. Taylor: A. Employment; Significant; Amgen, Inc.. Y. Dai: None. H. Zhao: None. P. Muntner: B. Research Grant; Significant; Amgen. V. Bittner: G. Consultant/Advisory Board; Modest; Eli Lilly, Amgen.

Funding: No

Funding Component:

P159

In-Hospital Lifestyle Interventions to Prevent Secondary Stroke Among At-Risk Patients Varies by Patient Characteristics and Over Time: Analyses From a Large, Multi-Hospital Network

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Introduction/Objective: Recent studies show that targeted interventions on lifestyle factors such as weight management and diet can be successful in reducing ischemic stroke (ISC) and transient ischemic attack (TIA) rates. The objective of this study was to examine which subpopulations of patients at risk for secondary stroke presenting to a hospital with an ISC or TIA were more likely to receive interventions in a multi-hospital health system. Methods: Data from 26 hospitals participating in a multi-state healthcare system stroke registry, from January 2009 to December 2015, were used. Patients admitted with a diagnosis of ISC or TIA discharged to home were included. Patients on comfort care or those not discharged home were excluded. At-risk groups included patients with Body Mass Index (BMI) ≥ 25 and those prescribed medication for hypertension or high cholesterol in-hospital. Risk-related interventions included educational material given to patients during admission. Mixed effects logistic regression models with backward elimination were used to identify significant predictors of receiving the intervention from the following variables: year of discharge, age, insurance (private, Medicare, other/self-pay), BMI grouping, ambulation status, length of stay, stroke severity, and medical histories of family stroke, previous stroke or TIA, atrial fibrillation, coronary artery disease, heart failure, dyslipidemia, hypertension, and drug/alcohol abuse. Results: A total of 19,661 patients met the inclusion criteria. Of the 8,334 patients with a BMI ≥ 25, 57% (n=4,717) received weight management intervention. Of the 9,676 prescribed medication for hypertension, 55% (n=5,348) received information on antihypertensive diet. Of the 10,999 patients prescribed medication to lower cholesterol, 64% (n=7,088) received cholesterol lowering diet information. From 2009 to 2015, interventions increased for patients with a BMI ≥ 25 (40% to 66%), prescribed medication for hypertension (37% to 53%), and prescribed medication to lower cholesterol (39% to 67%). The mixed effects logistic regression models showed that all risk groups were significantly less likely to receive intervention if they had lower BMIs, were unable to ambulate versus able to ambulate alone, and had no family history of stroke. For those on medication for cholesterol, patients with Medicare were significantly less likely to receive the intervention compared to those on private insurance or other payment types (AOR=0.78, p<0.001). Conclusions: This large patient cohort demonstrates there are improvement opportunities for in-hospital secondary stroke prevention efforts. Over time, prevention efforts have increased for at-risk patients, but many are still not receiving it. The disparity in intervention rates suggest that a more targeted
strategy to educate at-risk populations may need to be developed.

Disclosures: E. Baraban: None. L. Lucas: None. K. Spinelli: None.

Funding: No

Funding Component:

P160

Weight Management Program Characteristics: Keeping Patients Engaged Through Group Activities

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Introduction: Weight management programs must be effective at engaging patients in order to be successful. However, few studies have examined program characteristics associated with better patient engagement.

Hypothesis: The objective of this study was to assess patient engagement on a facility-level in the nation’s largest population-based weight management program (MOVE!).

Methods: Facility-level data were collected from the Veterans Health Administration (VHA) Support Services Center. Patient engagement was measured as the average number of MOVE! visits per patient per year (VPY). Bivariate statistics were examined and multivariate-adjusted generalized linear models were used to examine factors associated with VPY.

Results: We identified 140 VHA hospitals enrolled in MOVE! between 2008-2013 representing a nationwide sample of 462,132 patients with over 3 million visits. The 140 hospitals were distributed across the nation and represented a population that was 15% female, 72% white, and 34% rural. In 2008, 96% of MOVE! programs offered group counseling, 53% offered weight loss medications, and 26% offered bariatric surgery. The average facility VPY was 5.3 (SD 2.9) and increased from 4.9 (SD 3.9) in 2008 to 6.3 (SD 2.8) in 2013 (p<.01).

Factors associated with higher facility VPY were more administrative staff support (p<.01), group counseling (5.3 vs. 3.3, p=0.01), and higher proportions of group counseling sessions among all MOVE! visits at a facility (p<.01). In adjusted analyses, facilities offering group counseling reported 1.8 more VPY than facilities without group counseling (p=0.01, Figure). Offering weight loss medications (p=0.76) and bariatric surgery (p=0.57) had no effect on engagement.

Conclusions: Our study demonstrates that weight loss programs offering group counseling may be more effective at engaging patients in the intervention. These findings identify potential areas for improving utilization of weight management programs.

Disclosures: L.A. Graham: None. J. Richman: None. E.B. Levitan: None.

Funding: No

Funding Component:

P161

Variation in Five-Year Weight Loss Patterns Following Bariatric Surgery by Insurance Status

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In the general population, bariatric surgery facilitates sustained weight loss and remission of comorbidities (e.g., CVD). The effectiveness among Medicaid beneficiaries, a population with a disproportionately high burden of obesity, remains unclear. We sought to determine if patterns of weight change...
following bariatric surgery differed in patients with Medicaid compared to commercial insurance.

Data were obtained from the Longitudinal Assessment of Bariatric Surgery, an observational cohort study of adults undergoing bariatric surgery (2006-2009) at one of 6 geographically diverse centers. We used group-based trajectory models (PROC TRAJ, SAS) to identify discrete groups of individuals with similar weight trajectories over 5-years; we considered cubic trajectory models with between 1 and 6 groups. We selected the 6-group model based on Bayesian Information Criteria, visual fit and statistical significance of parameter estimates. We tested demographic predictors against trajectory group membership; Medicaid (n=174) vs. Commercial (n=991) was our primary predictor of interest.

Medicaid participants had higher mean weight at baseline compared to the commercially insured (307.9 vs. 291.2 lbs), but lost a similar amount of weight over time (74.8 vs 85.0 lbs). All groups experienced the most weight loss in year 1 (Figure). Group 6 was the heaviest at baseline and began to regain weight after year 1; groups 1-5 continued to lose weight through year 2. Group’s 1 & 2 weight remained stable over 5 years while groups 3-6 began to slowly regain weight. Medicaid beneficiaries were more likely to be in group 4 (OR 3.2, 95% CI: 1.2, 8.6), group 5 (OR 5.7, 95% CI: 2.0, 16.1) and group 6 (OR 7.9, 95% CI: 2.5, 25.1) compared to group 1.

Medicaid beneficiaries experience substantial long term weight loss. However, they had higher baseline weight and tended to be in groups with less long-term weight loss compared to the commercially insured. Focusing on tailored interventions to specific patient groups could help maintain weight loss.


Funding: No

Funding Component:

P163

Racial, Gender and Regional Variation in Rates of Cardiovascular Hospitalization Among 9 Million US Veterans

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Introduction:
Little is known about population-level trends in rates of cardiovascular hospitalizations among U.S. Veterans. Recent adoption of a centralized Corporate Data Warehouse in the Veterans Health Administration (VHA) provides a new opportunity to evaluate trends in national rates of hospitalization among Veterans. We sought to determine the leading causes of cardiovascular (CV) hospitalization, and to compare national rates of CV hospitalization by age, gender, race, ethnicity, geographical distribution and year, among U.S. Veterans.

Methods:
We evaluated the electronic health records of all Veterans ≥18 years old that accessed VA healthcare services between January 1 2010 and December 31 2014. Among these 9,066,693 patients, we identified the 5 leading causes of CV hospitalization and compared rates of hospitalization by age, gender, race, ethnicity, geographical distribution and year.

Results:
The top 5 causes of CV hospitalization in VA hospitals were: chest pain (3.23 per 1,000 Veterans per year), coronary arteriosclerosis in native artery (2.36), congestive heart failure (1.82), atrial fibrillation (1.34) and acute subendocardial infarction (0.99). Overall, the rate of Veterans hospitalized for one or more of the leading causes of CV hospitalization increased by 3% from 2010 to 2014.
these CV conditions decreased over time, from 9.9 per 1000 Veterans in 2010 to 8.3 per 1000 Veterans in 2014. The odds of hospitalization due to any of the 5 conditions were higher in men vs. women (OR 1.73, p<0.0001), in urban vs. rural areas (OR 1.15, p<0.0001), and in the Southeast vs. Pacific regions (OR 1.08, p<0.0001). As compared with Whites, odds of CV hospitalization were higher in Blacks (OR 1.34, p<0.0001) but lower in Asians (OR 0.50, p<0.0001). Racial, geographic and temporal differences in rates of hospitalization were also observed for each of the individual CV conditions.

Conclusions:
Among U.S. Veterans enrolled in the VA healthcare system, there is substantial variation in rates of CV hospitalization by age, gender, race, geographical distribution and year.

Disclosures: N. Krishnamurthi: None. M.A. Whooley: None.

Funding: No

Funding Component:
P164

The Association Between Resting Heart Rate and Non-cardiovascular Death


Introduction: Higher resting heart rate (RHR) is associated with increased risk of all-cause and cardiovascular mortality, with some reports showing the magnitude of association with all-cause mortality being higher than that with cardiovascular mortality. This suggests that RHR association with mortality may not be limited to cardiovascular death.

Objective: We compared the association between RHR with cardiovascular and non-cardiovascular mortality in the Third National Health and Nutrition Examination Survey (NHANES III).

Methods: This analysis included 6,743 participants aged 18-89 years in sinus rhythm and with complete data. We excluded those on antiarrhythmic drugs or pacemakers. RHR data were obtained from standard 12-lead electrocardiogram recorded on the NHANES participants during a physical examination. National Death Index was used to identify the date and cause of death. Multivariable Cox proportional hazards analysis was used to calculate the hazard ratios (HRs) and 95% confidence intervals (CIs) of a 10 beats/minute increase in RHR, for cardiovascular mortality and non-cardiovascular mortality in separate models.

Results: During a median follow-up of 13.9 years, 906 cardiovascular deaths and 1306 non-cardiovascular deaths occurred. In models adjusted for demographics, cardiovascular risk factors and potential confounders, higher RHR was associated with increased risk of both cardiovascular mortality and non-cardiovascular mortality with a relatively similar magnitude of risk (Table).

Conclusions: Higher RHR is associated with both cardiovascular mortality and non-cardiovascular mortality, suggesting that RHR is primarily a marker of overall well-being, rather than a specific marker of cardiovascular health. This may, in part, be due the bidirectional
relationship between the autonomic nervous system and other body systems.


Funding: No

Funding Component:

P165

Lifestyle Counseling Practices and Referrals for CVD Prevention by Primary Care Providers

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Background: The US Preventive Services Task Force recommends that adults who are overweight or obese and have additional cardiovascular disease (CVD) risk factors be offered or referred to intensive behavioral counseling interventions to promote a healthful diet and physical activity for CVD prevention. However, it is unknown what resources primary care providers (PCPs) refer patients to for this service. This study determined the proportion of PCPs who referred patients to different health sector and community resources to receive intensive behavioral counseling and whether this differed by physical activity counseling frequency.

Methods: DocStyles 2016, a Web-based panel survey of 1256 PCPs (response rate=64.5%), assessed physical activity counseling practices for those patients at risk for CVD (overweight or obese and with hypertension, dyslipidemia, impaired fasting glucose, or metabolic syndrome).

Results: Overall, 78.0% (SE=1.2) of PCPs referred any of their at risk patients to intensive behavioral counseling. The providers and services to which these PCPs referred patients to ranged from 25.4% to a healthcare worker within their practice or group to 41.3% to an organized program in a medical facility (TABLE). PCPs who discussed physical activity with many or most of their at risk patients were more likely to refer to an organized program within the community setting and less likely to refer to a healthcare worker outside their practice or group than their respective counterparts.

Conclusion: Differences in the providers and services PCPs referred to for intensive behavioral counseling were observed by physical activity counseling frequency. Future work could explore the influence that the availability of different resources, especially community programs, has on improving PCPs’ physical activity counseling practices.


Funding: No

Funding Component:

P166

Multimorbidity and Risk of Mortality in China: Results From the Chinese Electronic Health Records Research in Yinzhou (CHERRY) Study

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**Introduction:** The prevalence of multimorbidity is increasing in developed countries, while corresponding research in Chinese population is limited. **Methods:** A population-based cohort in Yinzhou located in an eastern coastal area of China (961,008 adults ≥18 years in 2009; latest mortality follow-up: Nov 2015; 22,637 deaths; 6.53 million person-years at risk) was assembled by linking epidemiological surveys, electronic records for chronic disease management, health administrative and medical records databases. Multimorbidity was defined as the presence of two or more following disorders: hypertension, diabetes, cardiovascular disease or cancer. History of selected diseases was extracted from the electronic records for chronic disease management. Follow-up on fatal events is achieved through records linkage to the regional system of death surveillance. **Results:** Overall age- and sex-standardized prevalence of one, two or ≥3 disorders were 16.16% (16.09% - 16.23%), 4.11% (4.07% - 4.15%) and 0.36% (0.35% - 0.38%) respectively, whereas 41.73%, 14.41% and 1.67% were observed in people aged 60 years and older. The all-cause mortality rate adjusted to the age of 60 was 4.77 per 1000 person-years. Comparing to people without any selected diseases, the age- and sex-adjusted HRs for all-cause mortality were 1.17 (1.14, 1.21) in those with one disorder, 1.78 (1.72, 1.86) in those with two morbidities, and 2.97 (2.76, 3.19) in those with ≥3 morbidities. The HRs in those with multimorbidities were higher in younger people and were heterogeneous among different combinations of multimorbidities. Population-attributable fractions (PAF) for all-cause mortality due to one, two or ≥3 disorders were 2.63%, 3.04% and 0.67% respectively (1.28%, 7.69% and 2.34% in people aged 60 years and older). **Conclusions:** The CHERRY study can serve as a valuable big data resource for scientific research in China. Multimorbidity is becoming a common condition in Chinese population, especially in older population, and is associated with high mortality. A complementary strategy is required for population health interventions. **Disclosures:** H. Lin: None. D. Zhang: None. P. Shen: None. Z. Xu: None. Y. Si: None. X. Tang: None. P. Gao: None.

**Funding:** No

**Funding Component:**

P167

**High vs. Standard Protein Diets in Obese Patients with Heart Failure: Effects on Chronic Disease Risks**

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**Background:** There is controversy over dietary protein’s effect on long-term chronic disease risks in overweight and obese patients with heart failure. The aim of this study was to compare the effects of two calorie-restricted diets differing in protein content on chronic disease risks (e.g., weight, adiposity, glycemic control, lipid profiles, and blood pressure).

**Methods:** A total of 97 overweight and obese (mean body mass index [BMI], 37.0 ± 6.2 kg/m²) patients with heart failure, aged 58.8 ± 9.7 years, 70% males, consumed two diets, each for 12 weeks, in a randomized controlled design. The diets were: (1) a high protein diet (30% protein, 40% carbohydrates, and 30% fat) and (2) a standard protein diet (15% protein, 55% carbohydrates, and 30% fat). Their effects on weight (BMI) visceral fat (i.e. waist circumference), glycemic control (i.e. glycosylated hemoglobin [HgbA1C]), lipid profiles (total cholesterol [TC], low-density lipoprotein [LDL], high-density lipoprotein [HDL], triglycerides [TG]), and blood pressure at the beginning and end of each dietary intervention were analyzed. **Results:** Both diets were equally effective in promoting weight loss.
and visceral fat loss and in improving TC, but the high protein diet decreased to a greater extent HgbA1C levels ($P < 0.001$) when compared with the standard protein diet. The high protein diet improved significantly TG levels ($P < 0.001$) and both systolic and diastolic blood pressures when compared with the standard protein diet ($P < 0.001$ and $P < 0.001$, respectively, see figure). No differences were noted in LDL and HDL levels. **Conclusion:** Energy restricted diets facilitate weight loss and visceral fat loss and lower TC in overweight and obese patients with heart failure. However, the high protein diet promoted better improvements in TG levels, glycemic control, and blood pressure than the standard protein diet, and may be superior in reducing chronic disease risks and potentially slowing the progression of disease in this population.

Disclosures: **L.S. Evangelista:** None. **D. Lombardo:** None. **T. Horwich:** None. **M. Hamilton:** None. **G.C. Fonarow:** None.

**Funding:** No

**Funding Component:**

**P168**

**Animal & Dairy Protein Intakes Associate With Increased Risk of Heart Failure in Men: The Kuopio Ischaemic Heart Disease Risk Factor Study**

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**Introduction:** Different protein sources, such as processed red meat and fish have indicated distinct associations with risk of heart failure. Whether these distinct associations are partly due to the differences in proteins themselves remains unclear. Thus, we examined the associations of proteins from different food sources with risk of heart failure in Finnish male subjects.

**Hypothesis:** We hypothesized that proteins from different dietary sources would have distinct associations with heart failure risk.

**Methods:** The study included 2441 men aged 42-60 y at the baseline examinations in 1984-1989 in the Kuopio Ischaemic Heart Disease Risk Factor Study. Protein intakes at baseline were assessed with 4-d dietary records. Data on incident heart failure cases were obtained from national registers. The multivariable-adjusted risk of heart failure according to protein intake was estimated by Cox proportional hazard ratios. Multivariable analyses included age, examination year, education, income, family history of ischaemic heart disease, smoking, leisure-time physical activity, and intakes of alcohol, energy, fiber, and saturated, monounsaturated, polyunsaturated and trans fatty acids.

**Results:** During the mean follow-up time of 22.2 y, 334 incident cases of heart failure occurred. Total protein (multivariable-adjusted extreme-quartile HR 1.45, 95% CI: 1.04-2.00, P-trend 0.01), animal protein (HR 1.56, 95% CI: 1.12-2.17, P-trend 0.01) and dairy protein (HR 1.53, 95% CI: 1.11-2.11, P-trend 0.01) intakes were associated with increased risk of heart failure. Especially protein from fermented dairy products associated with higher risk (HR 1.48, 95% CI: 1.08-2.02, P-trend 0.002). Adjustment for the potential effect mediators [body mass index and diseases or medications (coronary heart disease, hypertension, type 2 diabetes, lipid-lowering or heart medications) at baseline and during the follow-up] slightly attenuated the associations, but associations of animal, dairy and fermented dairy protein remained statistically significant. Plant protein intake had no association with heart failure risk (HR 1.00,
95% CI: 0.63-1.59, P-trend 0.82).

**Conclusions:** Our data suggest that high intake of protein, especially from animal and dairy sources, may increase the risk of heart failure.

Disclosures: **H.E.K. Virtanen:** B. Research Grant; Modest; the Finnish Cultural Foundation North Savo Regional fund. B. Research Grant; Significant; Päivikki and Sakari Sohlberg Foundation, Juho Vainio Foundation. **S. Voutilainen:** None. **T.T. Koskinen:** B. Research Grant; Modest; Otto A Malm Foundation. B. Research Grant; Significant; Finnish Foundation for Cardiovascular Research. **J. Mursu:** None. **T. Tuomainen:** None. **J.K. Virtanen:** None.

Funding: No

Funding Component:

P169

**Health Literacy and Outcomes in Heart Failure: a Prospective Community Study**

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**Background:** Growing evidence documents the association between low health literacy and poorer health outcomes. However, less is known about the relationship between health literacy and outcomes among patients with heart failure (HF). We examined the association of health literacy with risk of hospitalization and mortality in patients with HF.

**Methods:** Residents in an 11-county region in southeastern Minnesota with incident HF from 1/01/2013 to 3/31/2015 were identified using the International Classification of Diseases, Ninth Revision code 428 (n=3715) and prospectively surveyed to measure health literacy using established screening questions. A total of 1992 patients returned a survey (response rate 54%); 1779 patients with complete clinical data and adequate follow up were retained for analysis. Health literacy, measured as a composite on three 5-point scales, was categorized as adequate (≤ 10) or low (> 10). Cox proportional hazards regression and Andersen-Gill models were used to determine the association of health literacy with mortality and hospitalization.

**Results:** Among 1779 patients (mean age 74, 53% male), 10% had low health literacy. After a mean follow-up of 8±4 months, 72 deaths and 600 hospitalizations occurred. Low health literacy was associated with increased mortality and hospitalizations (Figure). After adjusting for age, sex, comorbidity, education and marital status, the hazard ratio for death and hospitalization in patients with low health literacy was 2.84 (95% CI: 1.63, 4.96) and 1.43 (95% CI: 1.04, 1.96) respectively, compared to patients with adequate health literacy.

**Conclusions:** Low health literacy is associated with increased risk of hospitalization and death among patients with HF. Health literacy is critical to the self-management demands of living with heart failure. Evaluation of health literacy in the clinical setting may guide inventions to target patients with low literacy.

Disclosures: **M. Fabbri:** None. **K. Yost:** None. **L. Finney Rutten:** None. **S. Manemann:** None. **S. Weston:** None. **R. Jiang:** None. **V.L. Roger:** None.

Funding: No

Funding Component:

P170

**High Intake of Dietary Protein is Associated With Increased Risk of Heart Failure With Preserved Ejection Fraction**
Background: Heart Failure with preserved ejection fraction (HFpEF) is growing and common problem in elderly women with high morbidity and mortality. The role of diet in its prevention is under-researched. Objective: To evaluate calibrated and uncalibrated dietary protein, energy adjusted animal and vegetable protein and their association with incident HFpEF. Methods: Study participants in Women’s Health Initiative (n=14,184) with valid FFQ data, free of baseline HF or missing covariates had urinary nitrogen calibrated total protein, energy calibrated using doubly labelled water animal and vegetable protein determined. Cox models adjusted for age, education, race/ethnicity, CHD, diabetes, waist to hip ratio, hypertension, physical activity, systolic blood pressure, anemia, atrial fibrillation evaluated prospective association with HFpEF. HFpEF was defined as ejection fraction >45%. Results: Over 13.2 years of follow-up, there were 513 cases of HF, 268 cases of HFpEF, 162 of HFrEF and 83 of undetermined ejection fraction. Increasing levels of calibrated total protein showed a linear dose response relationship with an increased risk of HFpEF whereas uncalibrated total protein did not. Higher intake of animal protein demonstrated an increased risk, while vegetable protein showed a trend towards an inverse relationship. (see table)

Conclusion: Higher levels of calibrated total protein are associated with increased risk of HFpEF with animal protein appearing to be the most deleterious. Plant based diets with high levels of vegetable protein may be protective. Further studies should evaluate this.


Funding: No

Funding Component:

P171

Potential Mortality Reduction with Optimal Usage of sacubitril/valsartan Therapy for the Treatment of Heart Failure in Canada

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Background: Despite well-recognized standard of care therapies, heart failure (HF) continues to be characterized by high mortality rates. Sacubitril/valsartan, a first-in-class treatment for HF with reduced ejection fraction (HFrEF) provided incremental cardiovascular and overall survival benefit in PARADIGM-HF, the largest clinical trial ever conducted in HF patients. We hypothesized that optimal use of sacubitril/valsartan in the treatment of HFrEF in Canada would be associated with potential benefits in terms of deaths avoided.

Objective: The objective of this analysis was to quantify the number of potential deaths avoided with optimal usage of sacubitril/valsartan in the treatment of HFrEF in Canada.

Methods: Data from Statistics Canada was used to quantify the population above 18 years of age. A literature search was then conducted to determine the prevalence of HF in Canada, the proportion of these with NYHA class II and III,
and finally the proportion of patients with HFrEF. The number needed to treat (NNT) to avoid one death, standardized to 12 months was derived from the PARADIGM-HF trial. The NNT using product limit survival rates and actual follow-up times from the PARADIGM-HF trial was also derived. The potential number of deaths prevented as a result of optimal usage of sacubitril/valsartan as per current approved usage in Canada (HFrEF patients with NYHA class II or III) were estimated along with multiple-way sensitivity analysis using the analysis-of-extremes method. The main outcome and measure was all-cause mortality.

**Results:** A Canadian prevalence of 2.31% was applied to determine the number of HF patients. From those, 64% were classified as NYHA Class II and III of which 56% were considered as rEF. It was estimated that in Canada, approximately 242,200 patients are affected with HFrEF with NYHA class II and III. Based on a NNT of 80, optimal usage of sacubitril/valsartan therapy was estimated to prevent 3,014 deaths per year (range, 1,930 – 4,331 per year). Based on the alternate NNT (71.3) using the product limit survival rates and actual follow-up times from PARADIGM-HF, a total of 3,397 patient deaths could be potentially prevented each year (range, 2,718 – 4,076 per year).

**Conclusion:** Standard of care treatment for HF is well-established and has shown important mortality reduction but there is still a need for additional therapies to further improve survival rates for patients living with HFrEF. The findings from this analysis suggest that a substantial number of deaths in Canada could potentially be avoided by optimal usage of sacubitril/valsartan therapy. This analysis supports the importance of rapidly implementing evidence-based therapy, in this case sacubitril/valsartan, into routine clinical practice to improve clinical outcomes for HFrEF patients in Canada.

Disclosures: **R. McKelvie:** None. **M. White:** None. **M. Vaillancourt:** None. **P. Haddad:** None. **N. Zaour:** None.

**Funding:** No

**Funding Component:**

**P172**

**Exercise Hemodynamics of Heart Failure with Preserved Ejection Fraction: a Meta-Analysis**

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**Background:** Heart failure with preserved ejection fraction (HFpEF) is associated with increased morbidity and mortality, and recalcitrant to available medical therapies. A major challenge in development of effective therapies for HFpEF is the heterogeneity in the underlying pathophysiological mechanisms, with numerous studies demonstrating conflicting findings. We conducted a meta-analysis to characterize the underlying exercise hemodynamic abnormalities that define HFpEF.

**Methods:** 15 studies comparing hemodynamic parameters between HFpEF and normal or hypertensive controls were pooled. Standardized mean differences (SMD) in the exercise reserve (peak exercise - resting) measures of hemodynamic parameters between the HFpEF and control group were pooled using a random-effects model meta-analysis.

**Results:** The meta-analysis included 627 HFpEF patients (age range: 57 - 74 years, 66% women, 80% with hypertension) and 365 normal controls (age range: 47 - 72 years, 58% women, 50% with hypertension). In pooled analysis, HFpEF patients had significantly lower peak oxygen uptake [SMD (95% CI): -1.8 (-1.9 to -1.6)]. HFpEF patients had significantly lower cardiac index (CI) [SMD (95% CI): -2.1 (-2.3 to -1.9)], heart rate (HR) [SMD (95% CI): -1.3 (-1.5 to -1.1)], stroke volume index (SVI) [SMD (95% CI): -0.78 (-0.94
to -0.61]) and arterio-venous oxygen difference (a-VO$_2$) reserve [SMD (95% CI): -0.68 (-0.91 to -0.44)]. HFpEF patients also had significantly greater increase in left ventricular filling (LV) pressure [SMD (95% CI): 2.03 (1.76 to 2.3)] and systemic vascular resistance (SVR) [SMD (95% CI): 1.20(0.94 to 1.45)] despite no change in LV end-diastolic volume reserve between groups.

**Conclusion:**
HFpEF patients have significantly reduced exercise capacity secondary to impaired central (decreased CI, SVI, HR reserve, and increased LV filling pressures without a change in LV diastolic reserve) and peripheral abnormalities (increased SVR and decreased a-VO$_2$Diff).

Disclosures: **B. Park:** None. **R. Khera:** None. **A. Pandey:** None. **M. Haykowsky:** None. **D. Kitzman:** None. **J. Berry:** None.

Funding: No

Funding Component:

P173

**Hyperthyroidism Increases the Risk of Takotsubo Cardiomyopathy Among Hospitalized US Patients**

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**Background:** The association between hyperthyroidism and Takotsubo Cardiomyopathy (TTCM) has only been reported in isolated case reports and a recent single-center study with inconclusive results. It is known that elevated thyroid hormone causes an increased sympathetic modulation of heart rate. It has also been shown that TTCM occurs in the setting of acute stressful illnesses involving excess catecholamine release. What is unclear is whether hyperthyroid states can predispose to TTCM. This is the first nationwide study of this association.

**Methods:** We used ICD-9 CM codes to extract data from the Nationwide Inpatient Sample database from 2007-2011. Patients with TTCM and coexisting hyperthyroidism were compared with TTCM patients without coexisting hyperthyroidism. We excluded persons below the age of 18 as well as patients diagnosed with TTCM who later underwent percutaneous coronary intervention (PCI). Multivariate logistic regression was used to assess the independent effect of coexisting hyperthyroidism on the occurrence of TTCM.

**Results:** A total of 33,639,230 patients were included, where 123,923 patients had hyperthyroidism while 32,400,000 did not have hyperthyroidism. There were 101 (0.08%) TTCM patients with coexisting hyperthyroidism compared to 13,893 (0.04%) without (p<0.0001). In adjusted models, patients with hyperthyroidism had a higher risk of TTCM in the index hospital admission (aOR=1.43, 95% CI=1.18-1.74), independent of potential demographic, comorbid and lifestyle confounders. Hispanics with hyperthyroidism had the highest risk of TTCM (OR=1.41, 95% CI=1.39-1.44).

**Conclusion:** In this large, nationwide study, hyperthyroidism was associated with increased risk of TTCM. This association was strongest among hispanics. Further research is needed to understand the mechanisms behind this association.

Disclosures: **A.M. Akinjero:** None. **O. Adegbala:** None. **T. Akinyemiju:** None.

Funding: No

Funding Component:
Factors Related to Decreased Readmission within 30 Days for Hispanic Heart Failure Patients

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Objective: This study was aimed to relate the obesity paradox to readmission and obesity. The obesity paradox remains controversial in the literature. Obesity has detrimental effects on heart failure, but has been found to be paradoxically associated with improved survival. We hypothesized that readmission in heart failure patients is associated with obesity.

Method: We analyzed 732 patients who were admitted for heart failure exacerbation and enrolled in our heart failure program and excluded those who did not follow-up or patients discharged from the cardiology clinic. Patients who were readmitted within 30 days for heart failure exacerbation were investigated. 688 patients who have been followed since 2013 were included. BMI (body mass index) and WC (waist circumference) were classified according to NCEP-ATP III.

Results: The number of normal weight (BMI <25 kg/m²), overweight (30 kg/m²>BMIG25 kg/m²) and obesity (BMI≥30 kg/m²) were 35.7%, 35.1% and 29.1%, respectively. Central obesity (WC ≥94 cm for men, and ≥80 for women) were 62%. The number of patients in our selected populations of HFrEF, HFP EF and HFP EF(i) were 456(67.9%),136(20.2%) and 68(11.9%) respectively. A higher readmission rate had a significantly associated with non-obese (BMI less than 30 kg/m²) group compared to obese group (BMI more than 30 kg/m²) in HFP EF patients. There was no significant association between central obesity and readmission. In addition, the absence of diabetes mellitus, an ICD (implantable cardioverter defibrillator), no prior cardiac catheterization and age over 65 were associated with a lower readmission rate.

Conclusion: The obesity paradox with BMI applied to our study group. The obese group had a significant association with reduced readmission rate compared to the normal or overweight BMI group in HFP EF. WC was not associated with readmission. Higher BMI may be related to better cardiopulmonary fitness in HFP EF. To apply to clinical practice, a large randomized study should be warranted. Targeted management in different types of heart failure could be associated readmission.


Funding: No

Funding Component:
The number of normal weight (BMI < 25 kg/m²), overweight (30 kg/m² ≤ BMI < 25 kg/m²) and obesity (BMI ≥ 30 kg/m²) were 35.7%, 35.1% and 29.1%, respectively. Central obesity (WC ≥ 94 cm for men, and ≥ 80 for women) were 62%. The number of patients in our selected populations of HFrEF, HFpEF and HFpEF(i) were 456 (67.9%), 136 (20.2%) and 68 (11.9%) respectively. A higher readmission rate had a significantly associated with non-obese (BMI less than 30 kg/m²) group compared to obese group (BMI more than 30 kg/m²) in HFpEF patients. There was no significant association between central obesity and readmission. In addition, the absence of diabetes mellitus, an ICD (implantable cardioverter defibrillator), no prior cardiac catheterization and age over 65 were associated with a lower readmission rate.

**Conclusion:** The obesity paradox with BMI applied to our study group. The obese group had a significant association with reduced readmission rate compared to the normal or overweight BMI group in HFpEF. WC was not associated with readmission. In targeted management in different types of heart failure could be associated readmission.


Funding: No

**Funding Component:**

**P175**

**Can Pediatric Hypertension Criteria be Simplified? A Prediction Analysis of Subclinical Cardiovascular Outcomes From the Bogalusa Heart Study**

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**Background:** Pre-hypertension and hypertension in childhood are defined by sex-, age- and height-specific 90th (or ≥ 120/80 mmHg) and 95th percentiles of blood pressure (BP), respectively, by the 2004 Fourth Report. However, these cut-offs are complex and cumbersome for use. This study assessed the performance of a simplified BP definition to predict adult hypertension and subclinical cardiovascular disease. **Methods:** The longitudinal cohort consisted of 1,225 adults (530 males, aged 26.3–47.7 years) from the Bogalusa Heart Study, with 27.1 years follow-up since childhood. We used 110/70 and 120/80 mmHg for children (age 6–11 years), and 120/80 and 130/85 mmHg for adolescents (age 12–17 years) as the simplified definitions of childhood pre-hypertension and hypertension, respectively, to compare with the complex definitions. Adult carotid intima-media thickness (CIMT), pulse wave velocity (PWV), and left ventricular mass were measured using digital ultrasound instruments. High CIMT was defined as being above the age-, gender- and race-specific 80th percentile, high PWV as being above the age-, gender-, race- and heart rate-specific 80th percentile and left ventricular hypertrophy as > 46.7 g/m² in women and > 49.2 g/m² in men. **Results:** Compared to normal BP, childhood hypertensives diagnosed by the simplified definition (4.1%, 50/1,225) and the complex definition (4.8%, 59/1,225) were both at higher risk of adult hypertension with hazard ratio = 3.1 (95% confidence interval = 1.8–5.3) by the simplified definition and 3.2 (2.0–5.0) by the complex definition, high PWV with 3.5 (1.7–7.1) and 2.2 (1.2–4.1), high CIMT with 3.1 (1.7–5.6) and 2.0 (1.2–3.6), and left ventricular hypertrophy with 3.4 (1.7–6.8) and 3.0 (1.6–5.6). The prediction using the two childhood BP definitions for adult hypertension and subclinical cardiovascular disease was also assessed by reclassification or receiver operating characteristic curve analyses.

**Conclusions:** The simplified childhood BP definition predicts the risk of adult hypertension and subclinical cardiovascular disease equally as the complex definition does.
The simplified pediatric BP cut-offs could be easier to use for screening children at high risk and for targeting early life interventions to reduce the risk of developing cardiovascular disease in later life.

Disclosures: B. Xi: None. T. Zhang: None. S. Li: None. W. Shen: None. E. Harville: None. L. Bazzano: None. J. He: None. W. Chen: None.

Funding: No

Funding Component:

P176

Impact of Serious Adverse Event Risks on the Cost-effectiveness of Intensive Blood Pressure Goals in Patients Aged ≥75 Years

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Background: Compared to the overall Systolic Blood Pressure Intervention Trial (SPRINT) results, patients aged ≥75 years at baseline had a greater reduction in cardiovascular disease (CVD) events and all-cause mortality with an intensive systolic blood pressure (SBP) goal (<120 mmHg) compared to a standard SBP goal (<140 mmHg). Applying an intensive SBP goal in high-risk older patients represents a major shift in clinical practice and may increase concern for medication-related severe adverse events (SAEs). We hypothesized that the benefits of reduced CVD risk would outweigh the increased costs and SAE risk of intensive vs. standard SBP goals in SPRINT-eligible patients aged ≥75 years even when considering variable SAE risks.

Methods: A microsimulation health-state transition model of 10,000 patients was created to estimate the CVD events, SAEs, quality-adjusted life years (QALYs), and direct healthcare costs of intensive vs. standard SBP goals. The model assumed patients were adherent to treatment during the median SPRINT follow-up, but that all patients would become non-adherent over 5 years. While adherent, CVD and SAE risks were derived from published SPRINT effect estimates for the ≥75 subgroup. Due to uncertainty in the SAE risk associated with intensive SBP goals in older adults, the intensive arm SAE risk was varied to determine the point at which treatment costs and harms outweighed CVD benefits at accepted willingness-to-pay thresholds. Healthcare costs and health state utilities were derived from national sources and other published estimates. Results: If SAE risk was equal to the observed rates in SPRINT, mean lifetime costs and QALYs were $268,000 and 7.85 for the intensive arm, and $262,000 and 7.60 for the standard arm. The resulting incremental cost-effectiveness ratio (ICER) was about $26,000 per QALY gained. However, as SAE risk in the intensive arm increased by 1.5, 2, and 2.5 times, the ICER increased to $33,000, $43,000, and $55,000 per QALY gained, respectively. Conclusion: Intensive SBP goals may be a cost-effective way to reduce CVD events and improve survival in patients aged ≥75 years, but safety and cost-effectiveness depend on medication-related SAE risk. However, these results are based on summary data and do not account for clustering of risks at the individual patient level. Thus, more precise prediction of risks and benefits is needed to guide selection of older patients for intensive SBP treatment goals.


Funding: No
Funding Component:

P177

Self-Reported Blood Pressure is Comparable to Measured Blood Pressure in a Study of General Population Participants

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Background: Blood pressure (BP) is an established risk factor for several chronic diseases. Clinical measurement of BP is the preferable method to assess BP, but may not be feasible in large-scale epidemiologic studies. Self-reported BP has been widely collected as an alternative. It has not been well-studied whether self-reported BP is comparable to measured BP, particularly in the general population.

Method: We conducted a cross-sectional analysis in a large, mail-based randomized controlled trial - VITamin D and OmegA-3 Trial (VITAL) - to compare BP levels assessed using different methods. Participants of VITAL were women aged ≥55 years and men aged ≥50 years, free of cardiovascular disease and cancer. Among a total of 21,025 VITAL participants who reported BP in multiple categories on the baseline questionnaire, 1,955 also had seated BP measured at baseline clinic-based or home-based visits, and 269 also completed assessment of 24 hour ambulatory BP (24-hr ABP) monitoring. We included 264 VITAL participants who had all three BP measures in analysis, converted the self-reported BP levels to ordinal variable by using the median of each category, and examined the associations between the different BP measurements with estimation of correlation and linear regression.

Results: The 264 VITAL participants were on average aged 63.8 years, 59% women, 23.5% African-Americans, 54.9% with post-college education, and 6.4% with a history of hypertension. The mean (SD) of self-reported BP, seated BP, and 24-hr ABP were 120.1 (9.1), 120.2 (12.5), and 128.2 (11.3) mmHg for systolic BP (SBP) and 73.0 (6.3), 72.3 (9.8), and 76.9 (7.9) mmHg for diastolic BP (DBP), respectively. Spearman correlation coefficients (Spearman r) between BP measured using three different methods ranged from 0.37 (self-reported vs. seated) to 0.49 (seated vs. 24-hr ambulatory) for SBP and from 0.30 (seated vs. 24-hr ambulatory) to 0.34 (self-reported vs. seated) for DBP (all P<0.0001). The age-adjusted regression coefficients (β coefficients) and 95% confidence intervals (CI) of self-reported BP in relation to measured BP were 0.55 (95% CI: 0.39-0.71) and 0.33 (95% CI: 0.15-0.51) for seated SBP and DBP, and 0.47 (95% CI: 0.33-0.61) and 0.46 (95% CI: 0.32-0.60) for 24-hr ambulatory SBP and DBP, respectively. The β coefficients of seated BP in relation to 24-hr ABP were also statistically significant, of 0.42 (95% CI: 0.33-0.52) and 0.19 (95% CI: 0.10-0.29) for 24-hr ambulatory SBP and DBP, respectively. The β coefficients were generally similar across subgroups of participants by age, gender, and ethnicity, and were consistently stronger among those with higher education.

Conclusion: In this large, mail-based study of older men and women from general US population, self-reported BP correlates reasonably well with measured BP in large-scale epidemiologic studies.

Disclosures: L. Wang: None. J. Forman: B. Research Grant; Significant; NIH grant. D.R. Gold: B. Research Grant; Significant; NIH grant. H. Gibson: None. S. Rautiainen: None. M.C. Jimenez: None. J.E. Buring: B. Research Grant; Significant; NIH grant. J.E. Manson: B. Research Grant; Significant; NIH grant. H.D. Sesso: B. Research Grant; Significant; NIH grant.

Funding: No
Cost-Effectiveness of Intensive versus Standard Blood Pressure Goals by Baseline Systolic Blood Pressure Levels in SPRINT-Eligible US Adults

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Background: In high-risk adults, intensive systolic blood pressure (SBP) goals (<120 mmHg) reduced cardiovascular disease (CVD) events and mortality, when compared to standard SBP goals (<140 mmHg), in the Systolic Blood Pressure Intervention Trial (SPRINT). While average benefit of reduced CVD risk with intensive SBP goals outweighs the average risk of serious adverse events (SAEs) and treatment costs, net intensive SBP goal benefits may vary by baseline SBP. We hypothesized that intensive SBP goals would be cost-effective vs. standard SBP goals when stratified by baseline SBP level in SPRINT-eligible US adults from the payer’s perspective. Methods: Using CVD event, death, and SAE risks, a microsimulation model compared direct healthcare costs and quality-adjusted life-years (QALYs) in the SPRINT intensive and standard SBP goal arms over patients’ remaining lifetimes. Published literature and national estimates were used for model parameters. The model assumed that, after the planned duration of SPRINT, adherence to treatment goals decayed over time. To estimate the effect of baseline SBP on the cost-effectiveness of intensive SBP goals, baseline SBP was stratified into the following groups: 130-139 mmHg, 140-149 mmHg, 150-159 mmHg, 160-169 mmHg, and 170-180 mmHg. Results: With higher baseline SBP, patients in both arms experienced higher rates of CVD events or CVD deaths and accrued higher costs compared with patients starting with lower baseline SBP. However, with higher baseline SBP, there were slightly more incremental QALYs gained with intensive SBP treatment, from 0.29 to 0.31. This led to a modestly better incremental cost-effectiveness ratio (ICER) for intensive vs. standard SBP goals, decreasing from approximately $50,000 to $43,000 per QALY gained as baseline SBP increased. If SPRINT treatment effects and on-trial adherence persisted for the remaining lifetime, the ICER for intensive SBP goals decreased to approximately $25,000-$26,000 per QALY gained across baseline SBP groups. Conclusions: Treatment of all SPRINT-eligible patients led to lifetime cost-effectiveness below accepted willingness-to-pay thresholds and lifetime net benefit and cost-effectiveness varied only modestly by baseline SBP. However, this analysis was based on summary data and did not account for individual patient risks. Multiple predictors, in addition to baseline SBP, may be needed to identify which SPRINT-eligible patients derive maximal benefit from intensive SBP treatment.


Funding: No
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Background Guidelines recommend assessing orthostatic hypotension (OH) 3 minutes after rising from supine to standing positions.

Hypothesis Measurements performed immediately after standing will be as informative as measurements performed closer to 3 minutes after standing with regards to symptoms of dizziness or risk of adverse outcomes.

Methods OH, defined as a drop in blood pressure (systolic ≥20 mm Hg or diastolic ≥10 mm Hg) from the supine to standing position, was measured up to five times at 25 seconds intervals in middle-aged (range 44 to 66 years) ARIC participants (1987-1989). Associations between each measurement and history of dizziness upon standing were examined via logistic regression. We used Cox models to examine the association between each of five measurements with risk of fall, fracture, syncope, and all-cause mortality over a median follow-up of 23 years.

Results In 11,449 participants (mean age 54 years, 54% women, 26% black) 10% reported a history of dizziness upon standing. OH assessed at measurement 1 (performed at a mean of 28 seconds after standing) was associated with risk of fall (P = 0.03), fracture (P = 0.05), syncope (P <0.001), and mortality (P < 0.001) (Table). Furthermore, measurement 1 was the only measurement associated with higher odds of dizziness upon standing (OR: 1.5; P = 0.001). Measurement 2 (performed on average 53 seconds after standing) was associated with all long-term outcomes. Measurements 4 and 5 (mean 100 and 116 seconds after standing) were generally less informative with regards to prospective outcomes than earlier measurements and were not statistically associated with history of dizziness.

Conclusions OH measurements obtained, on average, within the first 30 seconds of standing were predictive of long-term adverse health outcomes and were the most strongly related to symptoms of dizziness compared to later measurements. These findings suggest that BP measurements for determining orthostatic hypotension should be performed immediately after standing.

Table. The Association between Orthostatic Hypotension (OH) and Risk of Dizziness (N=1,138)

<table>
<thead>
<tr>
<th>OH Measure</th>
<th>Mean (SD) Seconds after Standing</th>
<th>Dizziness (N=1,138)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Odds Ratio (95% CI)</td>
</tr>
<tr>
<td>1</td>
<td>28.0 (5.4)</td>
<td>1.49 (1.18, 1.89)</td>
</tr>
<tr>
<td>2</td>
<td>52.6 (7.5)</td>
<td>1.04 (0.83, 1.30)</td>
</tr>
<tr>
<td>3</td>
<td>76.4 (9.1)</td>
<td>1.11 (0.87, 1.42)</td>
</tr>
<tr>
<td>4</td>
<td>100.0 (10.4)</td>
<td>1.11 (0.85, 1.44)</td>
</tr>
<tr>
<td>5</td>
<td>116.0 (4.6)</td>
<td>0.77 (0.49, 1.22)</td>
</tr>
</tbody>
</table>

All models adjusted for age, sex, race-study center, heart rate, leisure index, prior CHD, prior stroke, prior CHF, hypertension, anticholinergic medication use, resting systolic blood pressure, postural change in systolic or diastolic blood pressure at a time point.

Note: The sample size for measurements 1-4 was 11,449. Only measurement 1 was statistically significantly associated with dizziness upon standing.


Funding: No

Funding Component:

P180

Impact of Intensive Systolic Blood Pressure Treatment on Cardiovascular Disease and Mortality in the US Population
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Introduction: Hypertension is the most important risk factor for cardiovascular disease (CVD), the leading cause of morbidity and mortality among US adults. Clinical trials suggest that intensive systolic blood pressure (BP) management significantly reduces risk of CVD and mortality in patients at high risk for CVD. However, the impact of intensive BP lowering in the US population is uncertain.

Hypothesis: More intensive treatment of systolic BP provides great benefits in the reduction of CVD and total deaths in the US population aged ≥40 years.

Methods: We pooled follow-up data in 31,851 individuals from four US cohort studies (ARIC, CHS, Framingham Heart Study, and MESA) to estimate annual incidence rates of major CVD (combined stroke, coronary heart disease, and heart failure) by sex, race (white and non-white), and age groups (40-49, 50-59, 60-69, and ≥70 years). We retrieved mortality data from annual death statistics reported by the CDC. We combined nationally-representative survey data from three NHANES cycles (2009-2010, 2011-2012, 2013-2014) to estimate the proportions of US adults aged ≥40 years in each of 10 systolic BP categories (range <120 to ≥160 mm Hg). A Bayesian network meta-analysis of antihypertensive clinical trials was used to estimate relative risks for CVD and mortality comparing each of the 10 systolic BP categories, after adjusting for baseline risk in included trials. Using these data sources, we calculated the population attributable fractions and number of events (and deaths) that could be reduced by treating systolic BP ≥140 mmHg to more intensive systolic BP targets in the US population.

Results: Treating systolic BP to 120-124 mm Hg showed the largest reduction in number of CVD events and total deaths compared to higher targets (Table).

Conclusions: In conclusion, intensive treatment of systolic BP could prevent a large number of CVD events and total deaths in the US population.

Disclosures: J.D. Bundy: None. C. Li: None. J. He: None.

Funding: No

Funding Component:

P181

Temporal Relationship Between Changes in Body Weight and Insulin Resistance and Its Impact on Blood Pressure in Response to 2-year Weight-loss Diet Interventions: the POUNDS Lost Trial

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Introduction: Changes of body weight and insulin resistance (IR) are closely correlated, and their temporal sequences in affecting blood pressure (BP) remain poorly defined. We examined the temporal sequences of weight
loss and change of IR, and their relations with blood pressure in the Pounds Lost trial, a randomized weight-loss diet intervention study. **Hypothesis:** We hypothesized a one-directional temporal relation between weight loss and change of IR in affecting BP during weight-loss diet interventions.

**Methods:** The present study included overweight/obese adults, who were randomized in a 2×2 factorial design to diets containing 20% or 40% fat and 15% or 25% protein (diets with 65%, 55%, 45% and 35% carbohydrate). Weight, IR, systolic and diastolic BP levels were measured at baseline, 6 and 24 months. After excluding the subjects who took antihypertensive or weight-loss drugs, cross-lagged path and mediation analysis were performed among 540 participants.

**Results:** After adjusting for age, race, sex, and diets groups, the cross-lagged path coefficient from baseline weight to 24-month IR (β₁=0.135, P=0.04) was significantly greater than the path coefficient (β₂=0.022, P>0.05) from baseline IR to 24-month weight (P<0.05 for the difference in βs), indicating that weight-loss preceded change of IR. The mediation effects of 24-month IR on the 24-month systolic BP and diastolic BP were estimated at 17.03% (P=0.004) and 20.94% (P=0.034), respectively.

**Conclusions:** Our data indicate that weight loss precedes change of IR in affecting changes of BP in response to weight loss diet interventions.

**Figure 1.** Covariate-adjusted path coefficients from baseline weight to 24-month IR; β₁ and β₂ are cross-lagged path coefficients; r₁ and r₂ are tracking correlations; The difference between β₁ and β₂ was tested using Fisher Z test; *P<0.01, †P<0.05 for difference between β₁ and β₂.


Funding: No

Funding Component:

P182

**Risk for Hypertension Extends Across Generations in the Community: a Multi-generational Cohort Study**

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**Background** Hypertension is a major risk factor for cardiovascular disease, and parental hypertension is known to predict high blood pressure (BP) in children. However, the extent to which risk for hypertension is conferred across multiple generations, notwithstanding the impact of environmental factors, is unclear. Our objective was therefore to evaluate the degree to which risk for hypertension extends across multiple generations. **Methods** We studied three generations of Framingham Heart Study participants with objectively ascertained, uniform BP measurements performed at serial examinations spanning 5 decades: First Generation cohort (1948-2005), Second Generation cohort (1971-2008), and Third Generation cohort (2002-2005). We examined the simultaneous associations of early-onset hypertension (prior to age 55 years) in parents or grandparents with normotension (BP <120/80; reference), prehypertension (BP 120-139/80-89 mmHg), and hypertension (BP ≥140/90 mmHg, or use of antihypertensive medication) in the Third Generation cohort. We estimated odds ratios (OR) and 95% confidence
Results Our final dataset for analyses included BP measurements collected from 2280 First Generation participants (i.e., grandparents), 3122 Second Generation participants (i.e., parents), and 3608 Third Generation participants (mean age 39 years, 53% women). In Third Generation participants, risk for elevated BP was conferred simultaneously by both parental (OR for prehypertension 1.72 [CI, 1.42-2.08]; OR for hypertension 2.22 [CI, 1.72-2.86]) and grandparental (OR for prehypertension 1.24 [CI, 1.05-1.46]; OR for hypertension 1.38 [CI, 1.11-1.73]) early-onset hypertension. In a secondary analysis with a subset of 3319 Third Generation participants with all covariates available, results were also similar in models additionally adjusting for physical activity and daily dietary intake of sodium. Conclusions A predisposition for developing hypertension is conferred from grandparents to grandchildren, even after adjusting for parental history of hypertension and lifestyle factors. Additional studies are warranted to elucidate how identifying transgenerational risk for early-onset hypertension can improve the care of individuals at risk. Our results also suggest that when assessing an individual's risk for hypertension, more accurate risk stratification could be achieved by considering both parental and grandparental history of hypertension.


Funding: No

Funding Component: P183

Minimal Impact of JAMA 2014 Guidelines on Blood Pressure Control in a Large Health System

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Background: JAMA 2014 blood pressure (BP) guidelines raised BP goals for adults older than 60 years (from <140/90 to <150/90) and adults with chronic kidney disease (CKD) or diabetes (from < 130/80 to <140/90). It is unknown whether there were changes in BP control at the health system level after guideline publication. Methods: Using data from 288,962 adults receiving primary care in the Geisinger Health System, we compared blood pressure control over 1-year time periods before and after the February 2014 publication of the JAMA 2014 BP guidelines (i.e. Aug 2012-July 2013 vs Aug 2014-July 2015). Mixed effects models were used, allowing intercepts to vary by individual, adjusted for age, gender, and race. Results: Mean age was 49.2 ± 18.3 y, 56.7% were female, and 2.5% were black. Prevalence of diagnoses for hypertension, diabetes, and CKD were 40.0%, 15.1%, and 11.4%, respectively. Overall, distributions of systolic BP were similar before and after JAMA 2014 BP guidelines (Figure). BP control <140/90 was also similar between the two periods for adults 18-59 y (90.9% vs. 90.3%; OR 1.01, 95% CI: 0.99-1.02; p=0.3), adults ≥ 60 y (81.8% vs 82.2%; OR 1.01, 95% CI: 1.00-1.03; p=0.05), and adults with diabetes (83.2% vs. 82.7%; OR 1.00, 95% CI: 0.99-1.02; p=0.7) whereas BP control <140/90 improved slightly for adults with CKD (81.7% vs. 82.1%; OR 1.01, 95% CI: 1.00-1.03; p<0.001). BP control <130/80 was marginally worse after JAMA 2014 BP guidelines in patients with diabetes (53.5% vs. 51.8%; OR 0.98, 95% CI: 0.96-0.99; p=0.01). Trends were similar in analyses only including patients with hypertension diagnoses (overall 78.6% vs. 78.2%, OR 1.00, 95% CI: 0.99-1.02; p=0.5), and when using a goal of < 130/80 for patients with CKD (53.3% vs. 53.5%; OR 1.06, 95% CI: 1.04-
1.08; p<0.001). Conclusion: There was little change in blood pressure control in a large integrated health system after publication of the JAMA 2014 BP guidelines. These findings are reassuring given recent findings from the SPRINT trial supporting lower BP goals.


Funding: No

Funding Component:

P184

**Occupation Type, Hypertension Status and Awareness Among Hispanic/Latino Adults: Findings From the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)**

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**Introduction:** Occupation types, e.g. service, have been associated with hypertension (HTN). Data from Hispanics/Latinos are limited, despite high rates of HTN-related morbidity. We examined prevalence of HTN status and awareness by occupation type and association of occupation type with HTN status among Hispanic/Latino adults. **Methods:** Baseline data from HCHS/SOL, a cohort of diverse Hispanics/Latinos ages 18-74 in 2008-11, were used. Participants (N=7,429, mean age 38.9 years) reported current occupation (definition in Table). HTN was defined as elevated blood pressure (≥140/≥90 mm Hg) or self-reported use of antihypertensives; HTN awareness as self-reported physician diagnosed HTN. Survey statistical analyses were weighted and stratified by sex. Effect modification by years in the US, language and social acculturation was tested. **Results:** Non-skilled worker was the most common occupation type (males 30.1%; females 25.3%). Age-adjusted prevalence of HTN was highest in service workers (males 20.7%; females 17.4%); lowest in non-skilled workers (males 15.5 %; females 14.2%). The prevalence of HTN awareness was lowest in non-skilled male workers (48.2%); highest in females in higher status occupations (76.8%). The association of occupation type with HTN status varied by social acculturation (i.e. preferred ethnicity of social relations). In males, service workers with low social acculturation (preferred Hispanic/Latino social relations) had lower odds of HTN compared to those in higher status occupations, while service or skilled workers with high social acculturation had higher odds of HTN. Female non-skilled workers with low social acculturation had higher odds of HTN compared to higher status occupations (Table). **Conclusions:** Among Hispanics/Latinos, prevalence of HTN status and awareness varies by occupation type. Occupation type and social acculturation are jointly associated with HTN status. Strategies for HTN prevention and awareness should take into account occupational differences.
Hypertensive Disorders of Pregnancy in Women With Gestational Diabetes Mellitus on Overweight Status of Their Children

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Background: Hypertensive disorders of pregnancy (HDP) as a group of medical complications in pregnancy are believed to be associated with an increased risk of poor fetal growth, but the influence on offspring’s body composition is not clear. Aims: To evaluate the association between maternal hypertensive disorders of pregnancy and overweight status in the offspring of mothers with gestational diabetes mellitus (GDM). Methods: A cross-sectional study among 1263 GDM mother-child pairs was performed in Tianjin, China. General linear models and logistic regression models were used to assess the associations of maternal hypertension in pregnancy with anthropometry and overweight status in the offspring from birth to 1-5 years old. Results: Offspring of GDM mothers who were diagnosed with hypertensive disorders during pregnancy had higher mean values of Z scores for birth weight for gestational age and birth weight for length, and higher mean values of Z scores for weight for age, weight for length/height, and body mass index for age at 1-5 years old than those of GDM mothers with normal blood pressure during pregnancy. Maternal hypertensive disorders of pregnancy were associated with increased risks of large for gestational age (OR 1.74, 95%CI 1.08-2.79) and macrosomia (OR 2.02, 95%CI 1.23-3.31) at birth and childhood overweight/obesity at 1-5 years old age (OR 1.88, 95%CI 1.16-3.04). Conclusion: For offspring of mothers with GDM, maternal hypertension during pregnancy was a risk factor for macrosomia at birth and childhood overweight and obesity.
cardiovascular disease (CVD) outcomes when present in either younger or older age. However, there are currently scant data to guide clinicians on the possible importance of distinguishing between the significance of hypertension that develops earlier versus later in life. We conducted an investigation in the original Framingham Heart Study cohort to assess the long-term CVD risks associated with developing early- versus late-onset hypertension over the adult life course.

**Methods** Assessment of hypertension onset was based on blood pressure (BP) data collected from serial biannual examinations performed from 1948 through 2005. We defined hypertension as BP ≥140/90 mmHg or use of antihypertensive medication on ≥2 consecutively attended examinations. We studied the relation of age-of-onset of hypertension with cause-specific mortality using a case (CVD deaths) versus control (non-CVD deaths) design. We used logistic regression to calculate case-versus-control odds ratios, adjusted for age at death, sex, smoking status, total cholesterol, and diabetes. **Results** In 3614 decedents (1151 CVD deaths, including 630 coronary deaths), the odds of CVD death increased linearly with decreasing age of hypertension onset (Figure). Compared to non-hypertensives, hypertension onset at age <45 conferred a 2.2-fold odds of CVD death and 2.3-fold odds of coronary death, whereas hypertension onset at age ≥65 conferred a lower-magnitude 1.5-fold odds of CVD death and 1.4-fold odds of coronary death (P≤.002 for differences in odds between hypertension onset at age <45 and ≥65).

**Conclusions** Early- compared to late-onset hypertension was associated with greater odds of CVD and particularly coronary death. These findings suggest it may be important to distinguish between early- and late-onset hypertension as a specific type of BP trait when estimating risk for CVD outcomes in persons with established hypertension.

Disclosures: **T. Niiranen:** None. **E. McCabe:** None. **M. Larson:** None. **N. Lakdawala:** None. **R. Vasan:** None. **S. Cheng:** None.

Funding: No

Funding Component:

**P187**

Socioeconomic Status and Hypertension in Late Life: The Atherosclerosis Risk in Communities (ARIC) Study

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Introduction: Individual and area-level socioeconomic status (SES) are associated with hypertension incidence and blood pressure changes in midlife. However, examination of the relationship between SES and late-life hypertension incidence are limited.

Methods: ARIC Study participants free of hypertension at visit 4 (1996-1998) were followed by annual and semi-annual calls through December 31, 2013 for incidence of hypertension, defined as a self-reported diagnosis or use of antihypertensive medications. Individual and neighborhood SES indicators were assessed at study baseline (using criteria listed in the Table). Among individuals with follow-up and complete data (N=3,374) associations were examined using Cox regression models.

Results: Among men and women with a median baseline blood pressure of 118/68 mg Hg, mean age was 61 years (SD ± 5.5), 45% were female, 12% were Black, and 21.7% had an annual household income of <$25,000 ($36,941 in 2016 dollars). The median neighborhood SES summary z-score was lower among Black (-6.29) compared to White participants (1.69). Over median follow-up of 9.44 years, 1,876 incident hypertension cases were observed. In analyses adjusted for covariates, White participants with high, as compared to low and intermediate measures of SES had lower incidence of hypertension in late life (Table). Results were less consistent among Blacks, possibly due to the smaller sample size and therefore more limited power. After accounting for individual-level SES, there was no association between neighborhood-level SES and incident hypertension.

Conclusion: Both neighborhood and individual SES are related to late life incidence of hypertension, at least among Whites. Understanding the mechanisms, such as the role of access to care, for these associations can guide prevention strategies.


Funding: No

Funding Component:

P188

The Pooled Cohort Equations Over-predict Risk in Women With Hypertensive Disorders of Pregnancy, Even After Refitting the Model

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Introduction: The AHA guidelines for the Prevention of Cardiovascular Disease (CVD) in Women describe hypertensive disorders of pregnancy (HDP) as a failed stress test, which might unmask early CVD. An abundance of prediction models for CVD risk is available for the general population, but their validity in women with HDP is not established.

Hypothesis: The prognostic performance of the Pooled Cohort Equations (PCE) is lower in women with HDP compared to women without HDP and recalibrating and refitting the model will improve the prognostic performance.

Methods: Data were used from 27,339 women out of the MORGEN and PROSPECT cohorts; we excluded those who had never been pregnant. In total, 5,358 answered the question: ‘Did you
suffer from high blood pressure during pregnancy?’ with ‘Yes’; and 15,266 with ‘No’. Outcome definition was equal to that in the original PCE model. MORGEN and PROSPECT were analyzed separately, because of differences in characteristics (e.g. MORGEN is younger and has more current smokers) and observed risks. First, we calculated the 10-year predicted risk and compared this with the observed risk. Subsequently, the model was updated in three steps: by recalibrating the mean linear predictor, by additionally updating the baseline hazard, and by refitting the full model. The performance of all models was quantified by calibration (calibration plot, expected:observed ratio) and discrimination (c-statistic).

**Results:** The Table shows that the original model over-predicts risk in all women, but more in women without HDP. Calibration plots improved most after refitting, which is confirmed by the expected:observed ratio, although the model still over-predicts. Refitting only improved discrimination in women with HDP, but not in women without HDP. **Conclusion:** The PCE over-predicts risk in women with and without HDP, even after refitting the model. Discrimination is overall quite good, except for MORGEN women without HDP. Especially in women with HDP the model discrimination benefits from refitting.


Funding: No

Funding Component:

**P189**

Age-related Differences in Antihypertensive Medication Adherence in Hispanics: A Cross-sectional Community Based Survey in New York City

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**Introduction:** U.S. Hispanics, particularly younger adults in this population, experience a disproportionate burden of uncontrolled hypertension. Little is known about predictors of antihypertensive medication adherence - a major determinant of hypertension control and cardiovascular disease - and differences between age groups in this fast-growing population. **Methods:** The study included 1,043 community dwelling Hispanic hypertensives residing in three Northern Manhattan neighborhoods. Age-stratified analyses assessed the prevalence and predictors of high medication adherence (score 8 on Morisky Medication Adherence Scale, MMAS-8) among younger (<60 years) and older (≥60 years) Hispanic adults. **Results:** Prevalence of high adherence was significantly lower in younger vs. older adults (24.5% [105 of 429] vs. 34.0% [209 of 614], p=0.001). In younger adults, heavy alcohol consumption, a longer duration of hypertension, and recent poor physical health were negatively associated with high adherence, but poor self-rated general health was positively associated with high adherence. In older adults, age, education level, knowledge of hypertension control, private insurance/Medicare vs. Medicaid and poor health-related activity limitations were negatively associated with high adherence. **Conclusion:** Equitable achievement of national hypertension control goals will require particular attention to suboptimal antihypertensive medication adherence found in this study and other samples of U.S. Hispanics, particularly in younger adults. Age differences in predictors of high adherens
highlight the need to tailor efforts to the specific life stage of hypertensive individuals.


Funding: No

Funding Component:

P190

Hypertension, Hypertension Awareness and Depressive Symptom Severity in a Large Hispanic Population

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Introduction: Limited evidence suggests that greater psychological distress among those with elevated blood pressure may be due to awareness or labeling of this condition rather than elevated blood pressure itself. However, studies have not examined this phenomenon among specific race/ethnic groups, among whom chronic disease and disease diagnoses may have varied psychological impact due to group-specific cultural, social, and health-related factors. Hypothesis: Hispanic adults with a lifetime hypertension (HTN) diagnosis will have elevated depression symptom severity compared to those without a diagnosis, regardless of current HTN status. Methods: As part of a large community survey of health and health behaviors, 3,403 Hispanic adults residing in Northern Manhattan were assessed for past month depression symptoms using the Patient Health Questionnaire (range 0-27). Systolic and diastolic blood pressure (SBP, DBP) was calculated as the average of the last two of three sphygmomanometer readings. Using JNC 7 criteria, current HTN was defined as SBP≥140 mmHg or DBP≥90 mmHg. Participants were also asked to report whether they had ever been diagnosed with HTN by a health professional, and were categorized into four groups: (1) no diagnosis, no current HTN, (2) no diagnosis, current HTN, (3) diagnosis, no current HTN, (4) diagnosis, current HTN. Analysis of variance evaluated the overall association between HTN group and mean depression score. Multivariable linear regression further examined differences in mean depression score by HTN group adjusting for age, sex, marital status, education, and insurance status. Results: More than half of participants had no diagnosis and no current HTN (group 1: 56.6% [1,889 of 3,332]), while 27.4% (912 of 3,332) had HTN but no diagnosis (group 2), 5.7% (187 of 3,332) had a diagnosis but no HTN (group 3), and 10.3% (344 of 3,332) had HTN and a diagnosis (group 4). Mean depression score was higher among those with a diagnosis compared to those without (group 1=0.86, group 2=1.48, group 3=0.78, group 4=1.76, p<0.01). In the adjusted regression model, only groups with a diagnosis had significant, albeit modestly, higher mean depression scores compared to group 1, and mean depression score did not differ significantly between these groups (group 2: beta=0.43, p<0.01; group 3: beta=-0.11, p=0.66; group 4: beta=0.72, p<0.01). Sensitivity analyses that varied the definition of HTN and restricted to those with no other chronic disease yielded similar results. Conclusions: This study supports previous work highlighting the psychological impact of HTN diagnosis and extends this evidence to Hispanic adults. Findings from this study may have important implications for clinical practice and strategies to improve mental health among those with chronic illness.

Disclosures: E. Goldmann: None. E.T. Roberts: None. B. Boden-Albala: None.

Funding: No

Funding Component:

P191

Orthostatic Hypotension and Blood Pressure Symptoms in the AASK Cohort Study
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**Background** Orthostatic hypotension (OH) is defined using a consensus-based definition, namely, a drop in systolic blood pressure (SBP) ≥20 mmHg or diastolic BP (DBP) ≥10 mmHg or an increase in heart rate (HR) ≥20 bpm. Whether or not these definitions correspond with patient symptoms is unknown.

**Hypothesis** Traditional metrics for defining OH are arbitrary and warrant revision.

**Methods** SBP, DBP, and HR were assessed after 5 min in the rested, seated position and after 1 min of standing in black participants at each visit of the AASK cohort study (2002-2007; n=677). Postural change was determined by subtracting the seated SBP, DBP, or HR from the standing SBP, DBP, or HR. During each visit, participants were asked whether they experienced 26 distinct BP-related symptoms since last visit (yes or no). Relationships between SBP, DBP, and HR and symptoms were modeled via generalized estimating equations.

**Results** Participants were 40% women; mean age was 60 yrs (SD, 10) and mean number of follow-up visits was 19 (10). Mean (SD) resting SBP, DBP, and HR at baseline were 136 mmHg (22), 81 mmHg (13), and 69 bpm (12). After adjustment for age and sex, dizziness was the only symptom associated with all components of OH: SBP per -10 mmHg (OR 1.13; 95% CI 1.03, 1.23), DBP per -10 mmHg (1.12; 1.00, 1.26), and HR per 10 bpm (1.14; 1.03, 1.26). Light-headedness was associated with SBP (1.12; 1.03, 1.21) and HR (1.14; 1.05, 1.24), but not significantly with DBP (1.11; 0.99, 1.23). When plotted continuously, there was no clear demarcation of risk between symptoms and conventional cut points. Rather, reduction in standing SBP and DBP were each associated with a higher proportion of symptoms at about -5 mm Hg, while increase in standing HR was associated with a higher proportion of symptoms as low as 5 bpm (Figure).

**Conclusions** Dizziness and light-headedness are symptoms most strongly associated with OH. The proportion with symptoms is greater at cut points less extreme than the consensus definition, demonstrating that the consensus definition of OH lacks sensitivity.

Disclosures: S.P. Juraschek: B. Research Grant; Significant; T32 Renal Disease Epidemiology Training Grant. E.R. Miller: None. L.J. Appel: None.

Funding: No

Funding Component:

P192

**Metabolomic Profiles Associated with Total and CVD Mortality in Women**

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**Background**: Using novel metabolomic markers to identify individuals at increased risk for total and cardiovascular mortality may help inform therapeutic or prevention strategies.

**Methods**: A total of 2306 women in the Women’s Health Initiative (WHI) Observational Study (WHI-OS) and Hormone Trials (WHI-HT) had 370 plasma metabolites measured at baseline by liquid chromatography tandem mass spectroscopy. The analysis cohort included 2298 women (943 WHI-OS; 1355 WHI-HT) with complete covariate data. Multivariate cox proportional hazards models were constructed to examine the association of
metabolites with mortality, adjusting for age, body mass index, systolic blood pressure, hypertension treatment, diabetes, smoking, total and HDL cholesterol. The WHI-OS data were used for discovery analyses; metabolites with a multivariate-adjusted false discovery rate (FDR) adjusted p value <0.05 were considered significant. These candidate metabolites were included for backwards selection (p for exclusion > 0.05) to identify independent metabolites for inclusion in a composite score. The score of these significant mutually-adjusted metabolites was created based on the quartile score for each metabolite, with higher values indicating higher likelihood of all cause mortality and was tested in the WHI-HT cohort.

Results: During a median follow-up of 16.7 years, 1,102 women died (417 WHI-OS; 685 WHI-HT), with 601 cardiovascular deaths. At baseline, the median age was 68 years (interquartile range 62-72) and median time to death was 9.9 years. In the WHI-OS discovery cohort, 56 metabolites were significantly associated with multivariate-adjusted total mortality (FDR p< 0.05). When all 56 metabolites were mutually adjusted in the same model and subjected to backwards selection, 15 metabolites remained significantly associated with total mortality after multivariate adjustment and were used to create a composite score. In the separate WHI-HT validation cohort, women in the highest score quartile had a hazards ratio (HR) of 2.36 (95% CI: 1.88-3.21) for death. The mortality score was also associated with CVD death (HR 3.27 [2.54-4.22] highest vs. lowest quartile) for the combined WHI-OS and WHI-HT sample. Six metabolites were significantly associated with mortality in both samples with multivariate mutual adjustment; docosatrienoic acid an omega-3 fatty acid, histamine a pro-inflammatory compound, and the alpha-amino acids histidine and tryptophan were protective while 3-ureidopropionic acid an intermediate in the metabolism of uracil, and 18:1 cholesterol ester were associated with increased risk.

Conclusions: Using a robust discovery and validation design, metabolite profiles were associated with significantly increased total and CVD mortality, even after adjustment for traditional risk factors.


Funding: No

Funding Component:

P193

Metabolomic Profiles Associated With Longevity Women

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Background: Identifying metabolite profiles associated with longevity may identify key pathways of healthy aging. The Framingham Heart Study previously identified 12 metabolites associated with longevity, but no studies have examined women specifically.

Methods: Of 2306 women in the Women’s Health Initiative (WHI) without known cardiovascular disease and with metabolomic profiles at baseline (1993-1998), 1386 were age 63 or older (potentially able to achieve age 85 years in 2015), and were not lost to follow-up before death or age 85. Liquid chromatography mass spectroscopy was used to measure metabolites, which were log-transformed and standardized. The 12 candidate metabolites were considered individually in logistic regression models to predict odds of attaining longevity (age ≥ 85): isocitrate, uridine, lysine, aconitate, histidine, malate, threonine, cotinine,
C22:6 lysophosphatidylcholine (LPC) and C38:6 phosphatidylcholine (PC). Models were initially adjusted for WHI arm and age (model 1), then additionally for baseline BMI, systolic blood pressure, hypertension, diabetes, smoking, total and HDL cholesterol (model 2). An FDR-adjusted p value <0.05 was defined as significant. Significant metabolites were all considered in a backward selection procedure (p for exclusion > 0.05). A composite score of these significant mutually-adjusted metabolites was created based on the quartile score for each metabolite, with higher values indicating higher likelihood of achieving longevity.

Results: The median baseline age was 71 years (range 63-79), and 712 women reached age ≥ 85. Ten of the 12 previously identified metabolites were significantly associated with longevity in this cohort in model 1; 8 remained significant in model 2 (FDR <0.05). When all 10 metabolites were considered together in a model and subjected to backwards selection, 3 remained significantly associated with longevity in model 2 (OR per SD [95% CI]): isocitrate (0.80 [0.70-0.91]) a substrate of the citric acid cycle, uridine (1.18 [1.04-1.34]) one of the five nucleosides making up nucleic acids, and lysine (1.24 [1.09-1.40]) an amino acid used in the biosynthesis of proteins. Women in the highest quartile of the 3 metabolite score had an OR of 2.24 (95% CI: 1.60-3.15) for longevity, compared to those in the lowest quartile of the score, after multivariate adjustment. Results for the score were significant for women both above and below the median age. For women <71 years, the highest score quartile was associated with an OR of 3.57 (2.22-5.76) for longevity, compared to the lowest.

Conclusions: Eight metabolites were found to be significantly associated with attaining longevity among women in the WHI. A score comprised of isocitrate, uridine and lysine was associated with a 2-3-fold higher odds of attaining longevity. Further research to understand the mechanisms between these metabolites and longevity is needed.


Funding: No

Funding Component:

P194

Lipid Metabolic Pathways and Cardiovascular Disease Risk in the Prevención con Dieta Mediterránea (PREDIMED) Trial

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**Background** Metabolomics technologies can efficiently profile a large number of structurally diverse lipids, e.g., glycerophospholipids, sphingolipids, and glycerolipids, that may play differential roles in pathogenesis of cardiovascular disease (CVD). However, existing studies were focused more on discovering individual lipid metabolites for CVD risk prediction than inferring perturbed pathways responsible for the pathological processes.

**Hypothesis** We hypothesized that different lipid metabolic pathways, captured by network analysis, were divergently associated with CVD risk; the associations could be modified by the Mediterranean diet (MedDiet) intervention.

**Methods** We conducted this study in the PREDIMED trial with participants randomized to three intervention diets: MedDiet with extra-virgin olive oil, MedDiet with nuts, or a low-fat control diet. This study comprises a subcohort of 788 participants randomly selected from the PREDIMED cohort and 230 cases. The outcome was a composite endpoint of non-fatal acute myocardial infarction, non-fatal stroke and cardiovascular death. We performed network analysis using Gaussian graphic model among 200 targeted lipid metabolites and subsequent dimensionality reduction using Greedy Modularity Optimization to detect subnetworks. We calculated the subnetwork scores by summing up the products of the topological connectivity weight (representing network structure) and metabolite level and included the scores into Cox proportional hazards model with simultaneous adjustment for other subnetwork scores and covariates. The Benjamini-Hochberg procedure was applied to detect smaller subnetworks of specific interest for further investigation.

**Results** We detected 4 major subnetworks of lipid metabolic pathway. Most lipid metabolites with larger numbers of carbon atom and double bond clustered within a same subnetwork (subnetwork 2), while those with smaller numbers of carbon atom and double bond clustered within other 3 subnetworks (subnetworks 1, 3 and 4). The hazard ratio (HR) of CVD across quartiles of the subnetwork score 2 was 0.56 (95% CI, 0.35, 0.91, P trend =0.008) after multivariable adjustment. The HRs of CVD comparing extreme quartiles of subnetwork scores 3 and 4 were 1.85 (95% CI, 1.15, 2.97, P trend =0.02) and 1.93 (95% CI, 1.19, 3.14, P trend =0.01), respectively. The MedDiet appeared to enhance the inverse association between subnetwork score 2 and CVD (P interaction =0.03). We detected several smaller subnetworks with functional interpretation related to CVD pathogenesis such as the ceramide pathway and the pathway including phospholipids with high unsaturation.

**Conclusions** Based on topological structure of lipid metabolic pathways, we detected biologically meaningful pathways. We found divergent associations between subnetworks and CVD and smaller subnetworks with functional interpretation.


**Funding:** Yes

Funding Component: Founders Affiliate (Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont)

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The Relative Contribution of Systolic Blood Pressure in Cardiovascular Risk Prediction Declines

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Background: The Framingham Risk Score (FRS) is an established tool for the prediction of cardiovascular disease (CVD) risk. The established CVD risk factors age, HDL cholesterol, total cholesterol, systolic blood pressure (SBP), antihypertensive treatment, diabetes mellitus and smoking are used in the calculation of the FRS. The prevalence and distribution of these risk factors in the population have changed within the last decades and especially average levels of SBP have declined. However, the impact of this change on the risk prediction performance of the FRS has not been investigated.

Hypothesis: We assessed the hypothesis that the relative contribution of SBP to CVD risk prediction within the FRS framework has changed from 1985 to 2000.

Methods: We used N = 11 760 participants aged 30 - 65 years from four prospective population-based cohort studies enrolled in Southern Germany in 1985, 1990, 1995, and 2000. CVD risk was calculated by recalibrated equations of the original FRS. Predicted CVD risks using the actual SBP values were compared to predicted CVD risks using optimal (SBP < 120 mmHg) values for each participant. We assessed the relative contribution of SBP with three performance measures: First, the median difference in predicted risks with actual and optimal SBP, second, the relative positive predictive value of the FRS using actual compared to optimal SBP values and third, the population attributable risk fraction of SBP using Levin’s formula.

Results: CVD events occurred in 6.3% of male participants in 1985 and 6.2% in 2000; in women, event rates were 2.4% and 2.3%, respectively. Mean SBP levels decreased from 134 mmHg (Standard Deviation: 17 mmHg) to 132 (SD: 17) mmHg in men and from 127 (SD: 19) mmHg to 121 (SD: 18) mmHg in women. The difference in median predicted risk declined from 1.21 [Interquartile range 0.52, 3.38] in 1985 to 0.93 [0.35, 2.44] in 2000 in men and from 0.26 [-0.05, 1.45] to -0.07 [-0.19, 0.89] in women. The relative positive predictive value dropped from 0.88 to 0.73 in men and from 0.61 to 0.53 in women. The population attributable risk fraction of SBP decreased from 70.2% (95% CI: 42.1, 89.6) to 29.71% (-6.4, 64.7) in men and from 85.7% (62.9, 93.1) to 57.9% (28.0, 82.0) in women. Given the results from 1990 and 1995, the declining trend was nonlinear for all three performance measures.

Conclusion: In conclusion, the relative contribution of blood pressure to cardiovascular risk prediction has decreased within the last decades. This affects the future development of CVD risk prediction methods which will have to consider the changing relative importance of SBP. Furthermore, this might also influence public health policies focusing on the management of SBP and hypertension in order to effectively prevent CVD.


Funding: No

Funding Component:
P196
Cardiovascular Health Across the Lifespan: The Development and Validation of a Synthetic Cardiovascular Cohort

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Introduction: The burden of cardiovascular (CV) risk factors accumulates over the lifespan; however, little information on CV risk across the full lifespan is available. Synthetic cohorts offer the opportunity to understand CV health across the lifespan. In this study we developed and validated a synthetic cohort approach to examine CV risk factors from age 18-90 years of age.

Methods: This study included African American and Caucasian participants from 7 cohorts in the Lifetime Risk Pooling Project. Individuals’ demographics (age, birth year, sex, race, SES), CV risk factors (smoking, total cholesterol, SBP, DBP, glucose, diabetes, lipid-lowering and antihypertensive meds) and outcomes (incident CVD and death) at each exam were included. To generate a complete set of values from age 18 to 90 for each participant, we multiply imputed the participant’s CV risk profile and outcome using the available exam records based on a joint multi-level imputation model. To validate our imputed values, we removed the observed CARDIA data with exam ages 18-30, MESA data with exam ages 50-59 and CHS data with exam ages 80-90. We then imputed the CV risk profile of these deleted values and compared imputed and observed values.

Results: We included 41,387 participants (55% female, 30% African American, mean age 51 at baseline, avg follow-up time 20 yrs). In our validation sample, imputed CV risk factor levels were consistent with observed values at both younger and older ages (table) for BMI, SBP, DBP, glucose and total cholesterol. The prevalence of antihypertensive meds was 14.6% in the observed and 14.9% in the imputed data. Similar findings were shown for the prevalence of diabetes, current smoking, CVD events and death. Imputed prevalence of lipid-lowering meds was lower than observed rates (5% vs 12%).

Conclusions: This synthetic cohort approach provides valid and unbiased estimates of CV risk factors across the lifespan. Future studies using this synthetic cohort can provide novel insights into the origins and accumulation of CVD.


Funding: No

Funding Component: P197

Observational Evidence of Intentionality of Weight Loss on All-cause Mortality and Major Cardiovascular Events. Systematic Review and Meta-analysis

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Background - The obesity paradox has been described in several cohort studies. However, evidence of intentionality of weight loss on all-cause mortality and major cardiovascular events (MACE) in prospective cohorts is not clear. Aim - To summarize and evaluate the observational evidence of the effects of intentionality of weight loss on MACE and all-cause mortality. Methods - Through a systematic review, multiple electronic databases (MEDLINE/PubMed, Web of Science, SciELO and LILACS) were searched and manual search for studies published up to September 2016 was performed. Cohort studies that reported intentionality (intentional and unintentional) weight loss compared to no weight change with risk estimates for MACE and
mortality in primary prevention cohorts were included. A pre-defined protocol in accordance with the standards of quality for reporting meta-analysis of observational studies (MOOSE guidelines) was used. Random effects were used to summarize effects and heterogeneity was analyzed with I². Subgroups were analyzed by age (> 65) and comorbidities reported during follow-up. Results - Our search found 22,008 references and 13 studies met the selection criteria and were involved in the meta-analysis, including 142346 participants (51.3% men, age ranging from 42.2 to 75.3 years). Thirteen studies (25522 participants) reported intentional weight loss and 12 studies (25107 participants) reported non-intentional weight loss. Time of follow-up varied from 2 to 20 years. For intentional weight loss RR (95% CI) were 0.99 (0.92; 1.07) (I² = 58.2%, p=0.003) and 1.03 (0.9; 1.15) (I² = 0.0%, p=0.995) for all-cause and MACE, respectively. Subgroups by age of cohort and comorbidities did not change the estimates materially. For unintentional weight loss, RR (95% CI) were 1.25 (1.17; 1.34) (I² = 70.4%, p=0.000) and 1.09 (0.96; 1.23) (I² = 78.3%, p=0.001) for all-cause mortality and MACE, respectively. Subgroup analysis for participants with comorbidities yielded RR (95% CI) of 1.44 (1.31; 1.56) (I² = 59.1%, p=0.012) and for participants older than 65 years, RR (95% CI) were 1.93 (1.65-2.22) (I² = 0.0%, p=0.808) for all-cause mortality. Conclusion - Available observational evidence shows that unintentional weight loss significantly impacted on all-cause mortality in primary prevention cohorts, specially in aged populations. These findings should be accounted for when discussing the obesity paradox in general population.


Funding: No

Funding Component:
visit for complete data and compare these results to the results from inverse probability weighted analysis. All models are adjusted for sex, age and region. **Results:** The logistic models for dropout and death have low and moderate predictive abilities (c-statistics 0.602 and 0.811, respectively). For incident hypertension, the estimated odds ratio comparing blacks to whites differs little between the complete case (1.87 (1.66, 2.10)) and the weighted (1.83 (1.61, 2.09)) analysis. For left ventricular hypertrophy, the estimated odds ratio comparing blacks to whites changes little from the complete case analysis (1.54 (1.32, 1.79)) to the weighted analysis (1.45 (1.21, 1.74)). **Discussion:** Estimated racial inequalities in the odds of incident hypertension and left ventricular hypertrophy were similar in the complete case and inverse probability weighting analyses, indicating little evidence of selection bias in the estimation of racial inequalities for these outcomes.

Disclosures: **D. Long:** None. **G. Howard:** None. **S. Judd:** None. **J. Manly:** None. **L. McClure:** None. **M. Safford:** None. **M. Glymour:** None. **R. Katz:** None.

Funding: No

Funding Component:

**P199**

**Development of an Algorithm for Identifying Fatal Cardiovascular Disease in Medicare Claims**

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**Introduction:** Administrative claims data including Medicare are often used to study cardiovascular disease (CVD). Approximately one-third of CVD events are fatal, but claims data lack information on cause of death and claims-based analyses only include non-fatal outcomes. **Objective:** To develop claims-based algorithms to discriminate fatal stroke, fatal coronary heart disease (CHD), and fatal CVD (fatal CHD or stroke) from deaths due to other causes. **Methods:** We analyzed data for REasons for Geographic and Racial Differences in Stroke (REGARDS) study participants who died between January, 1, 2003 and December, 31, 2013, and were age ≥65.5 years and had at least 182 consecutive days of fee-for-service Medicare coverage prior to their death. Deaths within 28 days following an expert-adjudicated stroke, CHD, and CVD event in REGARDS were defined as the gold standard. Logistic regression was used to develop algorithms including demographic data, ICD-9-CM diagnosis and procedure codes from Medicare claims for hospitalization and outpatient visits. We chose cut-points of predicted probability to define fatal stroke, CHD and CVD using these algorithms. Cut-points were chosen such that a similar proportion of participants had a fatal stroke, fatal CHD, and fatal CVD through REGARDS adjudication and the algorithms. **Results:** We analyzed data for 2,675 deaths among REGARDS study participants; 142 fatal strokes, 479 fatal CHD events, and 608 fatal CVD events. The algorithms are described in the footnote to the Table. C-statistics for the algorithms were 0.966 (95%CI 0.948, 0.980) for fatal stroke, 0.861 (95%CI 0.843, 0.878) for fatal CHD and 0.883 (95%CI 0.868, 0.898) for fatal CVD. Sensitivity, specificity, and positive and negative predictive values using cut-points of 24%, 30%, and 34% predicted probabilities for fatal stroke, fatal CHD and fatal CVD, respectively, are provided in the Table. **Conclusion:** The algorithms we developed can be used to identify Medicare beneficiaries with fatal CVD events.
Disclosures: F. Xie: None. L. Colantonio: None. J. Curtis: B. Research Grant; Significant; Amgen. G. Consultant/Advisory Board; Modest; Amgen. M. Kilgore: B. Research Grant; Significant; Amgen. G. Consultant/Advisory Board; Modest; Amgen. E. Levitan: B. Research Grant; Significant; Amgen. G. Consultant/Advisory Board; Modest; Amgen, Novartis. K. Monda: A. Employment; Significant; Amgen. M. Safford: B. Research Grant; Significant; Amgen. G. Consultant/Advisory Board; Modest; Amgen. B. Taylor: A. Employment; Significant; Amgen. M. Woodward: G. Consultant/Advisory Board; Modest; Amgen. P. Muntner: B. Research Grant; Significant; Amgen.

Funding: No

Funding Component:

P200

Estimating the Receiver Operating Characteristics (ROC) Curve and its Associated AUC in Matched Case Control Studies

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Background: The matched case-control study design is frequently used in cardiovascular disease research and can result in significant gains in efficiency; however, prediction in this setting is not straightforward. We propose an inverse-probability weighting approach to estimate the predictive ability associated with a set of covariates.

Methods: We consider AUC estimation in 1:m matched case control studies and compare its bias with logistic regression in simulations. Let X denote the vector of exposures, Z the vector of matching factors and Y the binary outcome. We assume the population logistic model: logit [Pr(Y = 1 | X, Z)] = α + βX + γZ. The proposed methods describe (i) estimation of the parameters (α, β, γ); and (ii) estimation of the area under the curve (AUC) associated with (X, Z) using a inverse probability weighting procedure. The performance of the proposed methods was assessed in simulations of 100 datasets, each including 100 matched pairs and data on (Y, X, Z). Each matched dataset was drawn from a simulated larger cohort, in which the prevalence of cases was fixed at 10%. Z was simulated as a standard normal random variable, X as a normal random variable with mean ρZ and variance 1-ρ². β was set to 0.5, γ varied between [0, 0.25, 0.50, 0.75] and [0, 0.35, 0.70], respectively.

Results: Estimation of parameters α, β, γ: β can be estimated from a conditional logistic regression model to the data (Y, X) in the matched study. Based on Qian, J. et al (Biometrics, 2014), we show that (α, γ) can also be estimated from data in a matched case control study by fitting a logistic regression model with Y as outcome, the vector of matching factors Z as predictors, while including an offset equal to f(Z) + βX. Here, f(Z) denotes the factor associated with the sampling of cases and controls into the matched study and can be estimated reliably using data from the parent cohort. Estimation of AUC: Direct estimation of the AUC from matched case control studies can result in severely biased estimates. We propose an inverse probability weighted AUC estimator to recover the relative proportion of cases to controls in the original cohort, within each matching stratum. Simulation results: When the matching variable affects outcome but not
exposure ($\gamma=0.25$, $\rho=0$), the bias in the AUC estimate associated with the proposed methods and logistic regression were 0.00 (95% CI: -0.008, 0.006) and -0.03 (95% CI: -0.04, -0.03), respectively; when the matching variable affected outcome and exposure ($\gamma=0.50$, $\rho=0.35$), the bias associated with the proposed methods and logistic regression were -0.01 (95% CI: -0.02, 0) and -0.18 (95% CI: -0.19, -0.17), respectively.

**Conclusions:** Logistic regression based estimates had significant bias, particularly when matching variables were strongly associated with outcome and with exposure. The proposed method can be used to provide nearly unbiased estimates in a matched case control design.

**Disclosures:**  
R. Balasubramanian: B. Research Grant; Significant; NIH R01 HL122241.  
H. Xu: None.  
B.W. Whitcomb: None.  
S.E. Hankinson: None.  
N. Paynter: None.  
K.M. Rexrode: None.  
J. Qian: None.

**Funding:** No

**Funding Component:**

**P201**

**Use of Medicare Claims Data for the Identification of Myocardial Infarction. The REasons for Geographic And Racial Differences in Stroke (REGARDS) Study**

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**BACKGROUND:** Administrative claims are used to conduct epidemiology research. However, few studies have compared results using administrative claims versus primary data collection. **OBJECTIVE:** To compare myocardial infarction (MI) rates using primary data collection and Medicare claims in the REasons for Geographic and Racial Differences in Stroke (REGARDS) study. **METHODS:** We included 9,951 REGARDS study participants ≥65 years of age with Medicare Part A (inpatient) fee-for-service coverage at baseline in 2003-2007. Participants were asked every 6 months to report heart-related hospitalizations which were subsequently adjudicated to detect definite or probable MIs (MI Definition 1, see **Table** footnotes). Events detected through surveillance in REGARDS were supplemented with adjudicated definite or probable MIs detected through Medicare inpatient claims with a diagnosis code for MI (i.e., ICD-9 code 410.x0 or 410.x1) in any position (Definition 2) and in the primary position (Definition 3). MIs were also defined by a Medicare inpatient claim with a code for MI in any position (Definition 4) and in the primary position (Definition 5), without further adjudication. MIs were ascertained through December 2012. **RESULTS:** REGARDS study procedures detected and adjudicated 669 definite or probable MIs over a mean follow-up of 6.3 years, representing 10.7 MIs per 1,000 person-years (Definition 1, **Table**). Supplementing adjudicated MIs with Medicare inpatient claims resulted in a 12% (any diagnosis position, Definition 2) and 6% (primary diagnosis position, Definition 3) higher rate for MI. Using only Medicare claims without adjudication underestimated the rate for MI by 8% (any diagnosis position, Definition 4) and 32% (primary diagnosis position, Definition 5), compared with REGARDS study procedures. **CONCLUSION:** Supplementing MIs detected through participant self-report with those identified in claims could improve event detection. Using only Medicare claims to identify events may underestimate MI rates.

**Disclosures:**  
L.D. Colantonio: None.  
E.B. Levitan: B. Research Grant; Significant; Amgen.
The purpose of the current study was to evaluate the utility of using machine-learning (ML) algorithm and their ability to integrate data inputs to make predictions of future development of cardiovascular disease (CVD) in a nationwide sample of middle-aged Korean adults. Study population was randomly sampled from the Korea National Health Insurance (NHI) database. We identified 143,453 people (79,584 men and 63,869 women) who were aged 40 years or older, free from CVD or cancer, and completed health screening tests between 2002 and 2003. CVD was defined as composite of cardiovascular death, myocardial infarction, stroke, and coronary artery disease requiring coronary artery intervention or bypass surgery until 2013, and were identified from the NHI claim database. We employed multiple supervised ML algorithms to build a CVD prediction models using clinical and laboratory data during the follow-up period. Prediction performance of the ML algorithm was compared to those of traditional scoring system or logistic prediction models. ML algorithm [area under curve (AUC) 0.895, 95% confidential interval (CI) 0.889-0.902] outperformed a traditional scoring system (AUC 0.721, 95% CI 0.713-0.730), logistic regression model with baseline characteristics (AUC 0.731, 95% CI 0.723-0.739) and logistic model with time-series analysis (AUC 0.804, 95% CI 0.797-0.811) in prediction of future CVD in men. In women, ML algorithm (AUC 0.908, 95% CI 0.901-0.915) also exhibited the most accurate predictive power, compared to the traditional scoring system (AUC 0.749, 95% CI 0.740-0.758), logistic regression model with baseline characteristics (AUC 0.775, 95% CI 0.767-0.784) and logistic model with time-series analysis (AUC 0.842, 95% CI 0.834-0.849). Our findings suggest that ML algorithm with time-series data can improve the performance of CVD risk prediction.
However, many ML techniques do not accommodate censoring. **Methods:** We propose a simple and universal method that allows any ML technique to accommodate right-censored data by averaging predictions over a set of weighted bootstrap samples, where the sampling weights are computed using inverse probability of censoring weighting (IPCW). IPCW is a method that reweights the observed data to represent the underlying population by assigning more weight to observed subjects who were likely to be censored. After resampling from the fully observed data, we fit a model and produce predictions in each iteration. Lastly, we offset computational times by using an ensemble. We consider the problem of predicting 5-year CV risk using EHD from a large health system (N=87,348), where 50% of subjects are censored. We compare our method to other ways of handling censoring. **Results**

Our technique consistently improved calibration by about 70-90% than approaches which ignored censoring (see below). However, there were no differences in discrimination. In conclusion, we show that miscalibration due to censoring can affect real-world treatment decisions, as demonstrated using the 2013 ACC/AHA treatment recommendation for statins. In such a scenario, one does not aim to identify for example top 10% highest risk patients, but rather the actual magnitude of risk for a single patient.

**Funding Component:**

**P204**

**Dyspnea as Predictor of All-cause Mortality: Reduction in Risk Over Time in a Prospective Cohort Study**

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**Background:** It has been suggested that risk in longitudinal studies may drop with time, but clear-cut documentation has been sparse. The purpose of this investigation was to determine risks at several time points in a recently completed/published longitudinal study to further evaluate this hypothesis. **Methods:** A population-based sample of 11,533 Bangladeshi aged 18 to 75 was recruited and followed for 11-12 years and all-cause mortality was evaluated in those with and without baseline dyspnea. Dyspnea, the exposure, was ascertained by trained physicians by questionnaire. Kaplan-Meier survival curves and Cox Proportional Hazard models were used to determine differences between groups at 3, 6, and 11-12 years. **Results:** The Kaplan-Meier curves revealed a clear increase in mortality between dyspnea versus no dyspnea groups at the 3, 6, and 11.2 year time periods. The logrank test was significant with a p value less
than 0.01 for all three time periods. At 3 years (3-yrs) the unadjusted hazard ratio (HR) was 3.43 (95% C.I.; 2.36 - 5.00). The 3-yrs HR adjusted for age, sex, arsenic well water concentration, education, blood pressure, BMI, and smoking was 2.58 (1.77 - 3.76)-for increased mortality in those with dyspnea versus no dyspnea. At 6-yrs, the crude and adj. HRs were 2.98 (2.28 - 3.88) and 2.23 (1.71 - 2.92), respectively. At 11.2 years, the crude and adj. HRs were 2.73 (2.27 - 3.28) and 2.10 (1.74 - 2.52) in those with dyspnea (relative to no dyspnea), respectively. **Conclusions:** Risk appears to drop over time in longitudinal studies of all-cause mortality, consistent with greater loss of those with the exposure relative to the unexposed. This phenomena might be expected. Therefore, longer longitudinal studies may actually underestimate and probably do not overestimate exposure risk.

Disclosures: **G.R. Pesola:** None. **V.M. Chinchilli:** None. **Y. Chen:** None. **M. Argos:** None. **F. Parvez:** None. **A. Ahmed:** None. **T. Islam:** None. **L. Tong:** None. **R. Hasan:** None. **A.I. Neugut:** None. **R.G. Barr:** None. **H. Ahsan:** B. Research Grant; Significant; P42ES010349, RO1CA107431.

Funding: No

Funding Component:

**P205**

**Meat Intake and Risk of Coronary Heart Disease Mortality in Singapore Chinese Adults**

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**Introduction:** Epidemiological studies have reported inconsistent association between meat intake and coronary heart disease (CHD) mortality. We aimed to evaluate this association in a Chinese population with high fish intake and consumption of pork as red meat.

**Hypothesis:** We assessed the hypothesis that intake of red meat, poultry, and fish/shellfish is associated with CHD mortality risk in an Asian population.

**Methods:** The Singapore Chinese Health Study is a population-based cohort that recruited 63,257 Chinese adults aged 45-74 years from 1993 to 1998 in Singapore. A validated 165-item semi-quantitative food-frequency questionnaire was used to assess usual diet at recruitment, and mortality information was identified via registry linkage up to December 31, 2014. Cox proportional hazard models were used to calculate HRs (95% CI) with adjustment for potential confounders in 60,298 eligible participants free of self-reported CHD and stroke at baseline.

**Results:** Median intake of total meat in this population was 95.9 g/d (interquartile range: 66.5-133), averagely comprised of 27.9% red meat, 18.3% poultry, and 53.6% fish/shellfish. During 981,983 person-years of follow-up, we identified 2,610 CHD deaths among 57,078 subjects who were free of cardiovascular disease at baseline. After controlling for socio-demographic, lifestyle and dietary factors including intakes of poultry and fish/shellfish, red meat intake was associated with increased CHD mortality risk (HR comparing highest vs. lowest quartiles 1.17; 95% CI 1.04-1.32; P-trend=0.005), which became insignificant after adjusting for cholesterol intake (1.11; 0.97-1.26; P-trend=0.11). Conversely, an inverse association was observed for poultry intake (0.88; 0.78-0.99; P-trend=0.03) which remained significant when adjusted for dietary cholesterol (0.85; 0.75-0.96; P-trend=0.007). Fish/shellfish intake was marginally associated with decreased risk of CHD mortality after adjusting for cholesterol (0.91; 0.80-1.03; P-trend=0.045). Dietary cholesterol was associated with an increased risk even after adjusting for intake of red meat, poultry, and fish/shellfish (1.22; 1.07-1.39; P-trend=0.002) or dietary saturated fatty acids, monounsaturated fatty acids, n-3, and n-6.
Conclusions: In this large cohort study of Chinese adults, red meat intake was associated with a higher risk of CHD mortality that was partly mediated by its cholesterol content. Conversely, poultry was related to a lower risk of CHD mortality.

Disclosures: M. Talaei Pashiri: None. A. Pan: None. W. Koh: None.

Funding: No

Funding Component:

P206

Coffee Intake Was Not Causally Associated With Type 2 Diabetes Risk in Asians: a Mendelian Randomization Based on the Singapore Chinese Health Study

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Introduction
Despite the largely reported inverse association between coffee intake and type 2 diabetes (T2D) risk by observational studies, the causality of such association is not well established.

Hypothesis
We assessed the hypothesis that the observationally inverse association between coffee intake and T2D risk is causal.

Methods
In a nested case-control study within the Singapore Chinese Health Study cohort, we included 2436 T2D cases and 2436 matched controls. At biospecimen collections (1999-2004), participants were free of diagnosed T2D, cardiovascular disease and cancer. Cases were participants who reported to have physician-diagnosed T2D at follow-up visits during 2006-2010. Controls were randomly selected among those who remained free of T2D and were matched to the index cases by age, sex, dialect group and date of biospecimen collection. We 1) tested the association between coffee intake and T2D risk using conditional logistic regression analysis; 2) tested the association of the nine single-nucleotide polymorphisms (SNPs) with coffee intake or risk of T2D; 3) used the instrumental variable (IV) estimators to quantify the strength of the causal association of coffee intake and risk of T2D. The IV estimator ($\beta_{IV}$) which is identical to that derived by the widely used two-stage least squares method, was calculated through dividing the $\beta$ of the regression coefficients for SNP-T2D by SNP-coffee associations.

Results
Median intake (inter quartile range) for coffee intake was 1.00 (0.36-2.51) cups/day in this population. Coffee intake was observationally associated with lower risk of T2D and OR (95% CI) was 0.93 (0.88-0.98) in multivariate adjusted model. We found three SNPs that were significantly associated with higher coffee intake with $\beta$ coefficients (95% CI) as follows: 0.73 (0.23, 1.24) for rs4410790 ($P=0.004$), 0.72 (0.22, 1.22) for rs6968554 ($P=0.005$), and 1.60 (0.28, 2.91) for rs7800944 ($P=0.017$). Among these three SNPs, two SNPs were marginally associated with higher T2D risk with OR (95% CI) identically 1.08 (0.99, 1.18) for 7:17284577 and 7:17287106, and the other one was insignificantly associated with lower risk (OR 0.94; 95% CI 0.75, 1.18). The estimated $\beta_{IV}$ coefficients (95% CI) was not statistically significant for any of the three SNPs: 0.10 (-0.04, 0.25) for rs4410790 ($P=0.16$), 0.11 (-0.04, 0.25) for rs6968554 ($P=0.15$), and -0.04 (-0.19, 0.11) for rs7800944 ($P=0.60$).

Conclusions
High coffee intake was observationally associated with lower T2D risk, but our finding does not support a causal association.

Disclosures: M. Talaei Pashiri: None. T. Huang: None. W. Koh: None.

Funding: No
Funding Component:

P207

Association Between a 20-year CVD-risk Score Based on Modifiable Lifestyles and Total and Cause Specific Mortality Among US Men and Women

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Background: The previously validated Healthy Heart Score, based on modifiable health behaviors (diet, physical activity, alcohol intake, smoking, and body weight), effectively predicted the 20-year risk of CVD in mid-adulthood. While these lifestyle behaviors are independently associated with many chronic diseases, it remains unknown whether the Healthy Heart Score may extend to an association with overall mortality risk. Thus, we examined the Healthy Heart Score and total and cause-specific mortality in the Nurses’ Health Study (NHS) and Health Professional Follow-up Study (HPFS).

Methods: We conducted a prospective analysis among 58,319 women in the NHS (1984-2010) aged 30-55 y and 30,713 in men in the HPFS (1986-2010) aged 40-75 y free of cancer and CVD at baseline. The Healthy Heart Score was calculated at baseline and included 9 factors that best estimated CVD risk: current smoking, higher BMI, low physical activity, lack of moderate alcohol consumption, low intakes of fruits and vegetables, cereal fiber, and nuts, and high intakes of sugar-sweetened beverages and red and processed meats). Cox proportional hazards models estimated hazard ratios (HR) and 95% confidence intervals (CI) and adjusted for various demographics, medical history, medication use and total energy. Results: During 2,075,504 years of follow-up, there were 19,181 total deaths, including 11,464 in women and 7,717 in men. Compared to participants with the lowest predicted 20-year CVD risk based on the Healthy Heart Score (1st quintile, median CVD risk: 0.01%), participants with the highest predictive CVD risk (5th quintile, median CVD risk: 0.03%) had a pooled HR (95%CI) of 2.26 (1.86, 2.13) for total mortality; 2.89 (95 CI%, 1.93, 4.32) for CVD mortality; and 2.55 (95% CI 2.39, 2.72) for cancer mortality. Participants in the 5th quintile vs. the 1st quintile of the Healthy Heart Score had also a significantly greater risk of death due to CHD (3.40 [2.20, 5.26]), stroke (1.77 [1.00, 3.14]), lung cancer (6.02 [2.83, 12.79]), breast cancer (1.45 [1.13, 1.85]), colon cancer (1.51 (1.17, 1.94)), respiratory disease (3.94 (1.03, 15.14)), and diabetes (3.63 (2.00, 6.59)). Conclusion: The Healthy Heart Score, comprised of 9 self-reported, modifiable lifestyle predictors of CVD, is strongly associated with a greater risk of all-cause and cause-specific mortality. This risk score is a potentially useful tool for risk assessment and counseling of healthy lifestyles to promote longevity


Funding: No

Funding Component:

P208

The Joint Association of Low Vitamin D and Vitamin K Status with Blood Pressure and Hypertension

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Introduction: Low vitamin D and vitamin K status are both associated with cardiovascular risk. New evidence from experimental studies on bone health suggest an interaction between vitamin D and K, however a joint association
with vascular health outcomes is largely unknown. **Hypothesis:** We assessed the hypothesis that the combination of low vitamin D and low vitamin K status is associated with higher systolic and diastolic blood pressure in 402 participants and with incident hypertension in 231 participants free of hypertension at baseline. **Methods:** We used data from a subsample of the Longitudinal Aging Study Amsterdam (LASA), a population-based cohort of Dutch participants 55-65 years. Vitamin D and K status were assessed by measuring 25-hydroxyvitamin D (25(OH)D) and dephosphorylated uncarboxylated matrix gla protein (dp-ucMGP). High dp-ucMGP is indicative of a low vitamin K status. Generalized estimating equation and Cox proportional hazard models were used for the association of vitamin D and vitamin K status with blood pressure and incident hypertension (systolic blood pressure ≥140 or diastolic blood pressure ≥90 mmHg or using anti-hypertensive medication). **Results:** During a median follow-up of 6.4 years, 62% of the participants (n=143) developed hypertension. Vitamin D and vitamin K status were categorized in groups: 25(OH)D <50/≥50 mmol/L and median dp-ucMGP <323/≥323 pmol/L. The combination of low 25(OH)D <50 nmol/L and high dp-ucMGP ≥323 pmol/L was associated with increased systolic 4.8 mmHg (95% CI 0.1-9.5) and diastolic 3.1 mmHg (0.5-5.7) blood pressure compared to 25(OH)D ≥50 nmol/L and dp-ucMGP <323 pmol/L, after adjusting for age and sex, BMI, alcohol consumption, smoking, education, season of blood collection, total cholesterol and estimated glomerular filtration rate. A similar trend was seen for incident hypertension HR:1.62 (0.96-2.73). **Conclusions:** The combination of low vitamin D and K status was associated with increased blood pressure and might play a role in the development of hypertension.


Funding: No

Funding Component:

P209

**Dose-Response Relationship Between Dietary Intake of Alpha-linolenic Acid and Risk of Coronary Heart Disease: A Meta-analysis of Prospective Studies**

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**Introduction:** Previous studies show that alpha-linolenic acid (ALA) is associated with reduced risk of coronary heart disease (CHD). However, it remains unclear whether and how dietary ALA doses are related to CHD. **Hypothesis:** We hypothesized that higher dietary ALA intake is associated with a greater reduction in risk of CHD. **Methods:** We searched PubMed, EMBASE, and Web of Science for prospective studies examining the association between dietary ALA intake and CHD risk. Dietary ALA intake was assigned or measured by self-report. Outcomes were reported as total and fatal CHD and/or myocardial infarction, which were obtained from blinded endpoint assessments or medical records. Two-stage fixed-effects dose-response meta-analyses were conducted to estimate the association between increasing ALA intake (relative to study-specific referents) and CHD. **Results:** Fifteen published articles were...
identified and included in the meta-analysis (13 cohort studies and 2 randomized controlled trials). The pooled analysis was based on 310,768 individuals with 12,049 events with a mean length of follow-up of 9.6 years. The analysis showed a J-shaped curve between ALA intake and relative risk of total CHD (Chi-square=21.08, p<0.001). ALA intake from 0.3-1.4g/day showed reduced risk of total CHD, while intake ≥2.5g/day was associated with increased risk of CHD, compared to people without ALA intake (Figure 1A). Approximately 1g/day of ALA intake was associated with the lowest risk of total CHD. ALA intake was linearly associated with fatal CHD - every 1g/day increase in ALA intake was associated with an 11% decrease in fatal CHD risk (95% CI: -0.16, -0.05) (Figure 1B).

Conclusion: The J-shaped dose-response relationship based on our pooled analysis suggests that 1g/day of dietary ALA may be optimal for total CHD prevention. Though a higher dietary ALA intake was associated with reduced risk of fatal CHD, the excess total CHD risk at higher ALA intakes warrants further investigation, especially through randomized controlled trials.

Sleep Duration and Eating Behavior in Young Adults: Project EAT

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Background: Short sleep duration appears to put adults at risk for excess energy intake and obesity; less is known specifically about how sleep quantity relates to eating patterns.

Objectives: We tested the association between sleep duration and eating among young adults, a group especially vulnerable to suboptimal sleep.

Methods: We used data from Project EAT-III, a cross-sectional study of 1,854 racially/ethnically diverse young adults aged 20-30 from the Minneapolis/St. Paul metropolitan area. The EAT survey assessed: average sleep duration (calculated via weekday and weekend bedtimes and wake times), breakfast skipping, fast food, energy drink, and sport drink consumption. A food frequency questionnaire queried intake of sugar-sweetened, sugar-free, and caffeinated beverages. Linear and logistic regression, adjusted for demographic and behavioral covariates, were used to model the relationship between sleep duration and dietary outcomes. In logistic models, post-estimation commands were used to calculate risk ratios.

Results: In linear models, participants who slept < 7 hours per night (11.5%) consumed significantly more caffeinated beverages relative to those who slept 7-8 hours per night (Table). In logistic models, those who slept 8-9 hours a night (26.6%) and > 9 hours per night (25.8%) reported a lower risk (0.85 (95% CI 0.70-0.99) and 0.80 (95% 0.63-0.98), respectively) of sports drink consumption, compared to those who slept 7-8 hours a night. Intake of sugar sweetened beverages, sugar-free beverages, energy drinks, breakfast, and fast food did not differ significantly by sleep duration.

Conclusions: Sleep duration was related to some eating behaviors associated with energy imbalance, but not all. The impact of sleep
insufficiency during young adulthood, a pivotal period in the life course, may set lifelong trajectories that may increase cardiovascular risk. Sleep may be an important target to include in interventions and policies aimed at cardiometabolic risk management.


Funding: No

Funding Component:

P211

Diet Quality Declines and Differs by Race in Early Childhood

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Introduction: Diet quality is an important determinant of health in children, but little is known about how diet quality progresses during early childhood. We hypothesized that overall diet quality, assessed by the 2010 Healthy Eating Index, would decline during early childhood.

Methods: Three hundred seventy-two (372) healthy 3-year-old children were recruited from the Greater Cincinnati area and assessed every 4 months until age 7 at in-person clinical visits, for a total of 13 visits. Parents completed 3-day diet diaries at each visit which were analyzed for nutrient composition using the Nutrition Data Systems for Research system (NDSR). The 2010 Healthy Eating Index (HEI) total and food-group component scores were calculated and averaged by year of study. Longitudinal mixed modeling was used to evaluate longitudinal trends.

Results: The population was 52% (195/372) male, 78% (290/372) white and 83% (308/372) completed the final visit. HEI total scores at age 3 were poor (mean±SE: 45.2±0.4) and declined significantly between ages 3-7 (p<0.0001). None of the participants had “good” quality diet (HEI>80) at any point in the study. HEI total scores differed by race, with white children having significantly higher scores (p=0.05, Figure). HEI component scores showed a mixed pattern, with some significantly improving (protein, vegetables and fatty acids), some significantly worsening (dairy, refined grains, sodium, whole fruit and total fruit); other component scores did not change. Differences by race also varied, with African-Americans having consistently better scores for vegetables, greens and beans, protein and fatty acids (all p<0.0001), while white children had better scores for dairy, sodium and refined grains (all p<0.0005).

Conclusions: The average HEI scores for young children showed poor baseline diet quality at age 3 that became gradually worse throughout early childhood. The varying patterns in HEI component scores indicate specific areas of focus for early dietary intervention, which may differ by race.

The Association Between Serum Vitamin D and Valvular Calcification in the Multi-Ethnic Study of Atherosclerosis

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Background:
Serum 25-hydroxyvitamin D [25(OH)D] levels have been identified as a possible modifiable risk factor for cardiovascular disease (CVD) but the association may not be linear. Whether 25(OH)D is associated with valvular calcification is unknown. We examined the association of 25(OH)D with Aortic Valve Calcification (AVC) and Mitral Annular Calcification (MAC) in a multi-ethnic cohort. We hypothesized that both deficient and excess 25(OH)D levels are associated with increased calcification (i.e. U-shaped distribution of risk).

Methods:
We studied 5,392 MESA participants who had 25(OH)D levels and a cardiac CT performed at baseline (2000-2002) and a follow-up CT scan at the 2nd or 3rd Exam. AVC and MAC were quantified by the Agatston score. Using relative risk regression, we evaluated the multivariable adjusted risk of prevalent and incident AVC and MAC by 25(OH)D quintiles with median quintile as reference.

Results:
The mean age of participants was 62 ±10 yrs; 53% were women and 26% black. Prevalent AVC and MAC were observed in 12% and 9%, respectively. There was no statistically significant association between 25(OH)D and prevalent AVC or MAC in cross-sectional analyses. Over a mean follow-up of 2.5 yrs, 4.1% developed incident AVC and 4.5% developed incident MAC. After adjusting for demographic variables, the 5th quintile of 25(OH)D was associated with a 33% [RR 0.67 (95% CI 0.45, 0.99)] lower risk of incident MAC compared to the 3rd quintile. However, this association was no longer significant after adjusting for lifestyle and CVD risk factors [TABLE]. There was no association of 25(OH)D with incident AVC [0.89 (0.59, 1.36) for 5th vs. 3rd quintile, Model 1].

Conclusion:
Low 25(OH)D levels were not associated with increased likelihood of prevalent valvular calcification. Higher 25(OH)D were associated with reduced risk of incident MAC independent of demographics, but not with incident AVC. In sum, 25(OH)D may be associated with progression of mitral calcification, but future studies with longer follow-up are needed.

Industry and Non-Profit Partnerships as an Effective Model for Implementation of Community-Based Nutrition Interventions

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Introduction: Consuming fruits, vegetables and whole grains is associated with lower risk of cardiovascular disease. Community-based nutrition programs are an effective approach to changing attitudes and behaviors around food and health in underserved populations. The American Heart Association and Aramark launched Healthy for Life 20 by 20, a five-year initiative to increase fruits, vegetables and whole grains by 20 percent. A major focus of their collaboration was the development and implementation of a 12-week community-delivered nutrition engagement pilot. The purpose of this pilot was to evaluate the effectiveness of this health program in improving healthy food purchasing behaviors, nutrition and lifestyle choices.

Methods: A 12-week pilot intervention was designed and implemented in three cities at five community centers March-June 2016. Weekly sessions were focused on enhancement of healthy cooking and shopping skills, nutrition education, and assessment of personal cardiovascular risk factors. Participating centers had the option to choose from two delivery methods: optimal and flexible. Participant fruit and vegetable intake, whole grain intake, and number of meals prepared at home were assessed before and after completion of the intervention.

Results: Study participants (n=119) were predominately female (79%), Hispanic (60%) and African-American (27%), had high school or lower educational attainment (67%), lower income (39% < $20K, 40% $20K-$39.9K), young and middle ages (45% <34 years old, 27% 35-44), and 52% had > 2 children living in their household. Three-quarters of participants (76%) had no previous experience participating in health and wellness programs. The median consumption of fruits/vegetables among participants increased by 2 servings/day (3.0 to 5.0) and over two-thirds of participants (69%) increased their fruit/vegetable consumption by at least 1/2 a serving. The median consumption of whole grains increased by 1 serving/day (1.0 to 2.0) and half (48%) of participants increased their whole grain consumption by at least 1 serving. Forty-five percent of participants (n=87) increased their percentage of eaten meals prepared at home each week.

Conclusions: The use of industry and non-profit partnerships in a community engagement format can be an effective way to facilitate programs focused on increasing consumer trust for shopping and cooking, to build confidence of new skills, and to empower individuals to improve their health and potentially the health of their family. These results suggest that this community engagement partnership approach can positively transform health in communities and drive the American Heart Association’s goal of improving Americans’ health by 20% by 2020.

Introduction: Resilience is a measure of stress coping ability and has been favourably associated with cardiovascular health. Yet little is known on the likely association between diet and resilience. Hypothesis: We tested the hypothesis that diet quality is associated with resilience. Methods: Cross-sectional analysis on 10,812 subjects (mean age 52.7±10.8, 50.5% men) recruited within the cohort of the Molisani study from 2005 to 2010. Resilience was measured by the 25-item Connor-Davidson Resilience Scale ranging from 0-100 with the higher score reflecting greater resilience. Food intake was recorded by the EPIC food frequency questionnaire and adherence to the Mediterranean diet was appraised by both a Greek and an Italian dietary score. Empirically-derived dietary patterns were obtained by principal components analysis (PCA), while dietary polyphenol and antioxidant intakes and fruit and vegetables variety were assessed by specific holistic scoring. Multivariable linear regression analysis (95%CI) was used to test the association between dietary scores and resilience. Results: As compared to those below the median value of resilience (score=67), more resilient subjects had higher educational status (19.4% vs 13.5% for university or postgraduate education) and were more likely to report favourable health behaviours (leisure-time physical activity and less prevalence of smoking habit). In a multivariable model, greater adherence to Mediterranean-type diets or vegetables-based dietary pattern obtained from PCA, as well as dietary polyphenol or antioxidant intakes and greater variety in fruit and vegetables consumption were all positively associated with resilience (Table). No association with Western-like diets was found. Conclusions: Diet quality, as measured by a number of dietary scores, was positively associated with higher resilience, whereas western-type diets were not. Modulation of stress coping ability may be a factor in considering healthy effect of high quality diet.


Funding: No

Funding Component:

P216

Prevalence of Life's Simple Seven Cardiovascular Health Metrics in the Million Veteran Program

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Background: While previous studies have reported the prevalence of Life's Simple Seven (LSS) in the general population, no data exist in a national sample of US veterans. Objective: To assess the prevalence of ideal LSS in a cross-sectional study of 500,000 US Veterans participating in the Million Veteran Program (MVP) from 2011-2016. Methods: We assigned one of three possible values (0=poor, 1=intermediate, 2=ideal) for each of the seven LSS metrics (adiposity /BMI), smoking status, total cholesterol, blood pressure, plasma
glucose, diet, physical activity) at baseline using self-reported data and electronic health records. A total score of 0 across all seven metrics indicated overall poor cardiovascular health and a score of 14 indicated ideal cardiovascular health. Results: Complete data on all LSS factors were available for 171,146 Veterans (92% men and mean age 65.5yrs ±11.5 SD). Average LSS score was 6.1 ±1.9. Ideal BMI, smoking status, total cholesterol, blood pressure and plasma glucose (fasting and non-fasting) was present in 23.8%, 30%, 22.2%, 22.5% and 42.9%, respectively, in the study population (Fig). Prevalence of ideal diet was 0.4%. Among dietary factors, recommendation for fruits and vegetables (at least 4.5cu ps/day) was the least likely to be achieved. Physical activity at the workplace, home or at leisure was reported among 25.6% of Veterans (21.8% intermediate and 3.8% ideal physical activity). Conclusions: Our data show a low prevalence of ideal LSS among Veterans in the MVP, especially diet (0.4%) and physical activity (3.8%). Compared to NHANES 2005-2006 unadjusted prevalence estimates for AHA 2020 goals, Veterans in MVP have a lower prevalence of all ideal LSS metrics except for diet: BMI (23.8 vs 33%), physical activity (3.8 vs 45%), smoking status (30 vs 73%), total cholesterol (22.2 vs 45%) blood pressure (22.5 vs 42%) and glucose (42.9 vs 58%). These findings underscore the need to improve adherence to modifiable lifestyle factors with subsequent reduction in CVD burden among Veterans.


Funding: No

Funding Component:

P217

Parathyroid Hormone is Not Independently Associated With Cognitive Decline: 20 Year Follow-up From the Atherosclerosis Risk in Communities (ARIC) Study

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Background:
Little is known about the role of parathyroid hormone (PTH) in cognitive decline. Elevated PTH may contribute to cognitive impairment and dementia by mechanisms of endothelial dysfunction, increased vascular stiffness, hypertension, and atherosclerosis, as well as via small vessel cerebral disease. We hypothesized that elevated PTH levels will be independently associated with 20-year cognitive decline in a large population-based cohort study.

Methods:
We studied 12,964 middle-aged white and black ARIC participants without history of prior stroke who had serum PTH levels and cognitive function testing measured in 1990-92 (baseline) and repeat cognitive testing at up to 2 follow-up visits in 1996-98 and 2011-13. The cognitive tests included the Delayed Word Recall, Digit Symbol Substitution, and Word Fluency tests, which were summed as a global z score. Using mixed-effects models, we compared the
relative decline in global cognitive score between each of the top three quartiles of PTH levels to the reference bottom quartile. Time since baseline was modeled by using a linear spline with a knot at 6 years. We adjusted for demographic variables, education, vascular risk factors, and calcium, phosphorous, and vitamin D levels. We imputed missing covariates and follow-up cognitive data using multiple imputation by chained equations (MICE) methods to account for attrition during study follow-up.

**Results:**
The mean (SD) age of our cohort was 57(6) years, 57% were women, and 24% black race. There was no cross-sectional association of elevated PTH with cognitive global Z score at baseline (all p>0.05). Over a median of 20.7 years, participants in each PTH quartile showed decline in cognitive function (Table Part A). However, cognitive decline was not steeper in participants with PTH levels in the higher quartiles than participants with the lowest PTH levels (all p>0.05). [Table Part B].

**Conclusions:**
Our work does not support an independent influence of PTH on cognitive decline in this biracial population-based cohort study.

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**Longitudinal Changes in Berry Intake and the Risk of Cardiovascular Disease in Women**

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**Background:** High intake of polyphenols has been linked to a lower risk of cardiovascular disease (CVD). Berries are high in polyphenols, including anthocyanins, along with other key nutrients. However, few studies have investigated the association between longitudinal changes in berry intake and long-term risk of CVD. The aim of this study was to investigate whether longitudinal changes in berry intake are associated with the risk of major CVD endpoints.

**Methods:** Longitudinal changes in berry intake (sum of blueberries and strawberries) were assessed from two 131-item food-frequency questionnaires (FFQ) completed in 1992-1995 (FFQ1) and 2004 (FFQ2) among 29,598 middle-aged and older women free of CVD from the Women’s Health Study. Women also provided self-reports of a wide range of lifestyle, clinical and dietary factors at both timepoints. For each FFQ, women were categorized into two categories of total berry, blueberry, and strawberry intake: never/rarely and ≥1 time/month. Women were then categorized as having consistent low intake (never/rarely), consistent any intake (≥1 time/month), any increase in intake, and any decrease in intake between FFQ assessments. We used Cox proportional hazards models to calculate age and multivariable-adjusted hazard ratios (HRs) (95% confidence intervals (CI)). We included age, randomization assignments, smoking status, body mass index, physical activity, hormone replacement therapy, family history of myocardial infarction (MI), hypercholesterolemia, hypertension, diabetes, fruit and vegetable intake, saturated fatty acid intake, and omega-3 intake as covariates at the FFQ2 assessment.

**Results:** During a mean follow-up of 9.9 years, we identified 851 cases of incident major CVD
(MI, stroke, and CVD death). The intakes of total berries at FFQ1 were 23% (never/rarely) and 77% (≥1 time/month). Corresponding intakes at FFQ2 were 15% and 85%, respectively. In multivariable-adjusted models, consistently having any berry intake (HR: 1.00 (0.78-1.28)), any increase (HR: 0.89 (0.66-1.19)), or any decrease (HR: 0.84 (0.60-1.18)) in total berry intake over 10 years were not significantly associated with the risk of major CVD compared to women with consistently having no intake. A similar lack of association was observed for changes in strawberry intake. Increasing blueberry intake was associated with a lower risk of major CVD (HR: 0.83 (0.69-0.99)), whereas consistently having any blueberry intake (HR: 1.09 (0.91-1.29)) and any decrease in blueberry intake (HR: 0.97 (0.75-1.27)) were not associated with CVD.

Conclusions: The results from this prospective study of middle-aged and older women initially free of CVD suggest that increasing blueberry intake over time may lower the risk of subsequent CVD.


Funding: No

Funding Component:

P219

Dairy Consumption and Body Mass Index: Mendelian Randomization Analysis of 184,802 Participants and Systematic Review of 37 Randomized Controlled Trials

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Objective Using the Mendelian randomization (MR) approach and meta-analysis of selected randomized controlled trials (RCTs), we aimed to assess whether dairy intake was causally related to BMI. Methods We used a genetic polymorphism in MCM6 (LCT -13910 C/T, rs4988235), located upstream of the lactase gene (LCT), as an instrumental variable (IV) for dairy intake in a MR design. The causal effect of dairy intake on BMI was quantified by IV estimators among 184,802 participants from 25 studies. We further conducted a new meta-analysis of RCTs on the effect of dairy consumption on changes in body composition among 3,007 participants in 37 RCTs. Results Higher dairy intake was associated with higher BMI (multivariable-adjusted β = 0.03 kg/m² per serving/day; 95% CI, 0.00, 0.06; p=0.04), while the LCT -13910 C/T CT+TT genotype was significantly associated with higher dairy intake (β = 0.20 serving/day; 95% CI, 0.14, 0.25; p=3.15×10⁻¹²) and higher BMI (β = 0.12 kg/m²; 95% CI, 0.06, 0.17; p=2.11×10⁻⁵). The IV analysis showed that higher dairy intake was significantly associated with higher BMI (β = 0.60 kg/m² per serving/day; 95% CI, 0.27, 0.92; p=3.0×10⁻⁴). In addition, our systematic review of 37 RCTs indicated that higher dairy intervention significantly increased body weight (0.36 kg, 95% CI: 0.01, 0.70) and marginally increased lean mass (0.14 kg, 95% CI: -0.06, 0.33) in trials without energy restriction.

Conclusions The present study provides evidence to support a causal effect of higher dairy intake in the absence of caloric restriction on increased BMI.


Funding: No
Funding Component:

P220


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Background: Previous studies examined the association between trans-fatty acids (TFAs) and individual components of metabolic syndrome, not simultaneously. In addition, no study has examined if the relationship might become undetectable after significant reduction in TFA intakes. Objective: To examine and compare the association between plasma TFA levels and metabolic syndrome before and after the U.S. Food and Drug Administration enacted food labeling regulations for TFAs in 2006. Methods: We used data on 1442 and 2233 adults aged 20 years or older from NHANES 1999-2000 and 2009-2010, respectively. Multivariable logistic regression analysis was used to assess the association between plasma TFAs concentration and metabolic syndrome and each of its five individual components. Results: The median plasma TFAs level was reduced from 79.8 µmol/L in 1999-2000 to 36.9 µmol/L in 2009-2010. The adjusted prevalence ratios comparing the highest quartile vs. those in the lowest quartiles of plasma TFAs concentration in 1999-2000 were 3.45 (95% confidence interval, 2.42-4.92) for metabolic syndrome, 1.71 (1.37-2.13) for large waistline, 8.45 (6.62-10.77) for high triglycerides level, 1.96 (1.48-2.59) for low HDL cholesterol level, 1.14 (0.85-1.52) for high blood pressure, and 1.49 (1.06-1.85) for high fasting blood sugar, respectively. The corresponding adjusted prevalence ratios in 2009-2010 were 2.92 (2.41-3.54), 1.62 (1.40-1.88), 15.10 (9.39-24.30), 3.09 (2.19-4.37), 1.27 (1.11-1.47), and 1.24 (1.06-1.46), respectively. The observed associations were consistent across age groups, sexes, race-ethnicities, education, dietary intake, physical activity, body mass index, and statin use categories. Conclusions and Relevance: Plasma TFAs concentration was positively associated with risk of metabolic syndrome and its individual components except for blood pressure in 1999-2000. Our findings support initiatives to remove TFAs from industrially-produced foods.

Disclosures: Z. Zhang: None. C. Gillespie: None. Q. Yang: None.

Funding: No

Funding Component:

P221

Relationship of Dietary Carbohydrate and Fiber Intake to Risk of Cardiovascular Disease Mortality in Japanese: NIPPON DATA80

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Aims: The association between carbohydrate intake and cardiovascular disease (CVD) risk has been investigated; however, it remains unclear. Carbohydrate quality is considered to be more important than its amount. Carbohydrate consists of fiber and available carbohydrate which includes starch and sugar. The aim of this study was to examine the relationship of each of carbohydrate, available carbohydrate, starch and fiber intake to the long-term CVD mortality risk in Japanese population. We also examined
the relationship of the ratios of carbohydrate, available carbohydrate or starch-to-fiber to CVD risk.

**Methods:** We prospectively followed 8,925 participants (3,916 men and 5,009 women) aged 30-79 years without CVD who participated in the National Nutrition Survey in 1980 from 300 randomly selected areas in Japan. The participants were followed for 24 years. To identify the cause of death, the National Vital Statistics database of Japan was used. Food intake survey using weighed food records over three days in each household was conducted. The nutrient intake reported for each household was proportionally allocated to each household member according to the mean consumption rate by age and sex in 1995. Ratios of carbohydrate, available carbohydrate or starch intake (g/day) divided by dietary fiber intake (g/day) were also calculated. Cox proportional hazards models were used to estimate multivariable-adjusted hazard ratios (HRs) for CVD mortality by sex-specific quartiles of fiber (g/1000kcal), carbohydrate (%kcal), available carbohydrate (%kcal), starch (%kcal) and their ratios. HRs were adjusted for age, sex, lifestyle factors (smoking status, drinking status, BMI, medication of hypertension, past history of diabetes mellitus), and dietary factors (intakes of sodium, saturated fatty acids and long-chain n-3 polyunsaturated fatty acids). HRs were adjusted for age, sex, lifestyle factors (smoking status, drinking status, BMI, medication of hypertension, past history of diabetes mellitus), and dietary factors (intakes of sodium, saturated fatty acids and long-chain n-3 polyunsaturated fatty acids).

**Results:** During 24-years of follow up, 823 CVD deaths were observed (419 men and 404 women). Adjusted HR for CVD mortality was lower in the highest quartile (Q4) of fiber intake (0.71, 95%CI: 0.57-0.89, P-trend 0.003) compared with the lowest (Q1). However, carbohydrate, available carbohydrate and starch intake were not associated with CVD mortality (Adjusted HR for Q4 compared with Q1: 1.00, 95%CI: 0.76-1.32, P-trend 0.875; 1.07, 0.82-1.40, 0.757; 0.92, 0.71-1.20, 0.619; respectively). The ratios of carbohydrate, available carbohydrate or starch-to-fiber were all positively associated with CVD mortality (Adjusted HR for Q4 compared with Q1: 1.40, 95%CI: 1.13-1.73, P-trend 0.003; 1.33, 1.08-1.64, 0.006; 1.23, 0.99-1.52, 0.032; respectively).

**Conclusions:** Dietary fiber intake was inversely related to long-term CVD mortality risk in Japanese. The ratios of carbohydrate, available carbohydrate or starch-to-fiber were positively associated with long-term CVD mortality risk; they might be useful indexes to predict future CVD risk.


Funding: No

Funding Component: P222

**Moderate Alcohol Consumption is Associated With a Lower Risk of Coronary Artery Disease: The Million Veteran Program**


**Introduction:** Moderate alcohol consumption has been shown to protect against coronary artery disease (CAD) in the general population, but this relationship has not been well studied among U.S. Veterans.

**Methods:** 61,587 Million Veteran Program (MVP) participants completed a baseline and lifestyle survey that included questions about frequency and volume of alcohol consumption. We combined grams of ethanol in wine, beer,
and spirits to create the exposure variable for this analysis. Using the VA electronical health record, incident CAD events included myocardial infarction, angina pectoris, other forms of chronic ischemic heart disease (ICD9 codes 410-414.9) or coronary procedures (ICD9 procedure codes 36.0-36.99). Participants with prevalent CAD (n=27,844) before the baseline survey date or alcohol abuse using ICD9 codes 303.0 and 305.0 (n=16,048) were excluded from the analysis. We used a Cox Proportional Hazard model to estimate hazard ratios (HR) and 95% confidence intervals (CI) for CAD adjusting for age, sex, body mass index, and smoking status.

**Results:** Among 59,288 participants analyzed, the mean age was 65y (SD=11.9), mean BMI was 28.9 kg/m², 90% were men, 33% were never smokers, 86% self-reported as White, 11% Black, and 6% Hispanic. Participants were categorized into 6 alcohol consumption categories: Never, former, and current drinkers of ≤ half drink/d, >half to 1 drink/d, >1 to 2 drinks/d, >2 to 3 drinks/d, >3 to 4 drinks/d, and >4 drinks/d. During a mean follow up of 3.3 years, 3,670 CAD events were documented. Using current drinkers of ≤ half a drink/d as the reference group, we found a 19% lower risk of CAD in drinkers of >1 to 2 drinks/d, a 25% lower risk of CAD with alcohol intake of >3 to 4 drinks/d, and 34% lower risk in the highest alcohol category in a multivariable adjusted model (Table 1). As expected, former drinkers had a slightly higher risk of CAD. We did not have enough data on women to conduct sex-specific analyses.

**Conclusion:** Our data show a lower risk of CAD with moderate alcohol consumption among MVP participants.

Disclosures: **R.J. Song:** None. **X.T. Nguyen:** None. **R.M. Quaden:** None. **Y. Ho:** None. **A.C. Justice:** None. **K. Cho:** None. **C.J. O’Donnell:** None. **J. Concato:** None. **J. Gaziano:** None. **L. Djousse on behalf of the MVP investigators:** None.

Funding: No

Funding Component:

**P223**

**Starch Digestion Related Amylase Genotypes Affect 2-year Adiposity Changes in Response to Weight-loss Diets: The Pounds Lost Trial**

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**Background/Aim:** Salivary amylase, which is encoded by the salivary gene (AMY1), is responsible for digesting starchy foods into sugar, and the AMY1 shows extensive copy number variations which directly affect differences in salivary and serum amylase amount and activity. Recent evidence suggests associations of low serum amylase levels and obesity. We investigated whether the copy number related AMY1 genotypes were associated with 2-year changes of adiposity in response to weight-loss diet intervention.

**Methods:** This study included 692 obese individuals with data on AMY1 variant rs11185098 who were randomly assigned to 1 of 4 diets varying in macronutrient contents. Changes of body weight (BW) and waist circumference (WC) over 2 years during the intervention were evaluated according to the genotype.

**Results:** We found that changes in BW and WC were significantly different according to the AMY1 genotype (Figure). After adjustment for
age, sex, ethnicity, diet groups and value for the respective outcome traits at baseline, carrying the minor A allele (which indicates higher amylase amount and activity-associated allele) of rs11185098 was significantly associated with greater reduction of BW at 6, 12, 18, and 24 months (β (SE), p value; -0.7 (0.35), 0.04; -1.21 (0.46), 0.009; -1.63 (0.52), 0.0017; -1.27 (0.49), 0.0095, respectively). Also, increasing number of allele A was associated with a greater decrease of WC at 6, 12, 18 and 24 months (p <0.05 for all). The genetic effects on these outcomes did not significantly differ across the diet groups.

Conclusions: Our study indicated that the genetic variant responsible for starch metabolism significantly influenced on the response to weight-loss dietary intervention. Obese individuals carrying the AMY1 genotype that associated with higher salivary amylase activity may benefit from greater weight loss and the improvement of central adiposity in response to low-calorie diet interventions.


Funding: No

Funding Component:

P224

Association of Nonalcoholic Fatty Liver Disease With Left Ventricular Geometry and Remodeling: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Background: Nonalcoholic fatty liver disease (NAFLD) is associated with high cardiovascular mortality, including heart failure (HF). Left ventricular hypertrophy (LVH) increases the risk of future HF. The relationship between NAFLD and LV geometry is unknown. In a large prospective population-based sample of black and white adults free from liver or heart disease, we examined the relationship between NAFLD and markers of LV remodeling.

Methods: Participants from the CARDIA study (Y25 exam; age 43-55 years) with concurrent CT quantification of liver fat and tissue Doppler echocardiography were included (n=2,576). Echocardiography was repeated at Y30 follow up (age 47-62 years). LV geometry was classified into normal and abnormal geometry by integrating relative wall thickness and LV mass index. NAFLD was defined as CT liver attenuation ≤ 40 Hounsfield units after excluding other causes of liver fat. Logistic and polytomous regression models were used to test associations.

Results: NAFLD prevalence was 9.6%. NAFLD participants were more likely to be male (57.7% vs. 40.0%), white (57.3% vs. 50.2%), and had higher BMI (36.0 vs. 29.9 kg/m²) than non-NAFLD. At Y30 NAFLD participants had higher LV mass, left atrial diameter, and LV relative wall thickness compared to non-NAFLD (p<0.01). Those with NAFLD had higher prevalence of LVH (31.9% vs. 18.2%), concentric remodeling (15.3% vs. 13.1%), concentric hypertrophy (12.9% vs. 7.9%) and eccentric hypertrophy (18.9% vs. 10.1%, p<0.0001). In multivariable analyses NAFLD was independently associated with prevalent LV remodeling (Table). Associations were attenuated after adjustment for HF risk factors. In contrast, NAFLD was associated with incident LVH independent of HF risk factors. Adjustment for BMI attenuated this
association. There was no interaction by race or sex.

**Conclusion:** NAFLD is associated with subclinical changes in LV geometry and remodeling, a precursor to HF. The role of NAFLD in LV remodeling as a potential therapeutic target warrants further investigation.

Disclosures: **L.B. VanWagner:** B. Research Grant; Modest; Novartis. D. Speakers Bureau; Modest; Valeant (Salix) Pharmaceuticals. G. Consultant/Advisory Board; Modest; American Liver Foundation Medical Advisory Committee. **J.E. Wilcox:** None. **H. Ning:** None. **C.E. Lewis:** None. **S.J. Shah:** None. **J.J. Carr:** None. **M.E. Rinella:** None. **J.A.C. Lima:** None. **D.M. Lloyd-Jones:** None.

**Funding:** No

**Funding Component:**

P225

**Obesity Genetic Risk Alleles Do Not Substantially Contribute to the Association Between Gestational Diabetes Exposure and Childhood Adiposity**

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**BACKGROUND:** Prior work has demonstrated a strong association between gestational diabetes mellitus (GDM) exposure and childhood adiposity. However, it is unknown whether this association is attributable to specific intrauterine effects or merely to genetic transmission of risk alleles associated with obesity or other metabolic traits. We aimed to assess whether obesity and insulin resistance associated genetic risk alleles explain the association between gestational diabetes exposure and childhood adiposity.

**STUDY POPULATION:** Children aged 7 to 12 years enrolled in the Exploring Perinatal Outcomes in Children (EPOCH) Study who have genome-wide common variant genotyping (n=282), 82 of whom were exposed to GDM in utero and 200 of whom were not.

**METHODS:** Genetic risk scores (GRS) for body mass index (BMI) and insulin resistance (IR) were calculated by summing the count of 91 BMI-raising or 10 insulin resistance-raising risk alleles, respectively. Multivariable linear and logistic regression were used where appropriate to estimate associations between offspring GRS and maternal exposures (GDM and pre-pregnancy overweight/obesity [BMI >= 25]), as well as offspring GRS and childhood obesity traits (BMI and childhood waist circumference), adjusting for clinical and demographic covariates. Contribution of offspring GRS to association between maternal GDM or pre-pregnancy overweight/obesity and childhood adiposity was estimated by comparing the regression coefficient for the exposure variable in models with and without GRS.

**RESULTS:** The offspring BMI GRS was weakly associated with GDM (p=0.05), and more strongly associated with maternal pre-pregnancy overweight/obesity (p=0.001). Offspring BMI GRS was also strongly associated with childhood BMI (p=0.006) and waist circumference (p=0.02), whereas the insulin resistance GRS was not associated with GDM, maternal pre-pregnancy overweight/obesity, childhood BMI, or waist circumference. Offspring BMI genetic risk explained only 7.7% (95% CI -3.3, 18.8; p=0.2) and 5.8% (95% CI -3.1, 14.8; p=0.2) of the associations between GDM and childhood BMI and waist circumference, respectively. Similarly, offspring BMI genetic alleles explained only 4.8% (95% CI -5.4, 14.9; p=0.4) and 4.0% (95% CI
-5.4, 13.4; p=0.4) of the associations between maternal pre-pregnancy overweight/obesity and childhood BMI and waist circumference, respectively. CONCLUSIONS: Genetic risk for obesity does not substantially explain the association between GDM exposure and childhood adiposity. The association between GDM and childhood adiposity is likely explained through alternative pathways, either through direct intrauterine effects or through shared postnatal environment.


Funding: No

Funding Component:

P226

Improved Insulin Sensitivity with a Healthy Low Fat or a Healthy Low Carbohydrate Weight Loss Diet: A Twelve Month Randomized Trial

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BACKGROUND: The abilities of healthy low fat (HLF) and healthy low carbohydrate (HLC) weight loss diets to improve insulin sensitivity over the long term are not well understood.

OBJECTIVE: To examine whether HLF and HLC weight loss diets improve insulin sensitivity over 12 months, and to determine if either diet is superior for these improvements.

METHODS: Healthy adults without diabetes, aged 18-50 years, BMI between 28 and 40 kg/m², were randomized to HLF or HLC for 12 months (n = 609). Health educators delivered the interventions in 22 1-hr group classes. Dietary intake was assessed by three 24-hour recalls per time point. Glucose and insulin were measured at times 0, 30, 60, and 120 min during a 75-g oral glucose tolerance test. Indices of hepatic insulin sensitivity (homeostasis model assessment of insulin resistance; HOMA) and whole-body insulin sensitivity (Matsuda index and the plasma concentration ratio of triglyceride to HDL-cholesterol; TG/HDL-C) were measured. Data were collected at baseline and 12 months. Statistical analyses were performed on study completers.

RESULTS: Complete data were available for n = 193 for HLF, and n = 197 for HLC. BMI and all indices of insulin sensitivity were similar between groups at baseline (p > 0.25 for all). Macronutrient distributions at 12 months were 48% vs. 30% carbohydrate, 29% vs. 45% fat, and 21% vs. 23% protein for HLF and HLC, respectively. Changes in BMI (mean ± SEM) were similar between groups (HLF: 33.38 ± 0.28 to 31.48 ± 0.29; HLC: 33.01 ± 0.25 to 30.69 ± 0.28; p = 0.11). Improvements within each group were observed for HOMA (HLF: 3.81 ± 0.17 to 3.16 ± 0.12; HLC: 3.60 ± 0.13 to 3.00 ± 0.12), Matsuda index (HLF: 3.13 ± 0.14 to 3.92 ± 0.18; HLC: 3.10 ± 0.12 to 3.86 ± 0.14), and TG/HDL-C (HLF: 3.16 ± 0.17 to 2.74 ± 0.14; HLC: 2.91 ± 0.15 to 2.09 ± 0.14) (p < 0.001 for all). The improvement in TG/HDL-C was greater for HLC (p = 0.013), while the improvements in HOMA and Matsuda index did not differ significantly between groups (p > 0.75 for both).

CONCLUSIONS: All indices of insulin sensitivity were improved with both diets after 12 months. Neither diet was superior for improving HOMA. The HLC diet was more effective for improving TG/HDL-C, but not the Matsuda index.


Funding: No

Funding Component:

P228

Lower Serum 25-hydroxyvitamin D Concentration is Associated With Greater Risk of Non-alcoholic Fatty Liver Disease Among Caucasians but Not Other Racial-ethnic Groups in the Multi Ethnic Study of Atherosclerosis
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Objective: Non-alcoholic fatty liver disease (NAFLD) is the leading cause of chronic liver disease in developed nations and is independently associated with increased overall morality from all causes as well as from CVD. Growing evidence support that low serum 25-hydroxyvitamin D (25(OH)D) is associated with NAFLD. However, significant racial/ethnic differences exist in serum 25(OH)D and the prevalence of NAFLD: African Americans have lower 25(OH)D than Caucasians, and NAFLD prevalence is higher in Caucasians. We tested whether the association between 25(OH)D and NAFLD vary by race/ethnicity, adjusting for common risk factors for low 25(OH)D and NAFLD. Methods: Participants were from the MESA study, who were free from CVD and liver conditions, were not taking oral corticosteroids, did not report heavy alcohol intake (>7 drinks/week for women and > 14 drinks/week for men), and had serum 25(OH)D and upper abdominal non-contrast CT images available at baseline. 25(OH)D was adjusted for season. NAFLD was defined if liver-to-spleen Hounsfield units ratio was <1. Logistic regression was used for statistical analyses. Final models were adjusted for study site, age, gender, education, income, BMI, triglycerides, high-density lipoproteins, systolic blood pressure, smoking, diabetes, interleukine-6 and C-reactive protein.

Results: The study included 3,484 participants (mean age (SD): 62.7(10.4) Yr; 44% of participants were male; 38.4% Caucasian, 27.8% African American, 23.5% Hispanic, and 10.3% Chinese American). Serum 25(OH)D significantly varied by race/ethnicity; with Caucasian have the highest levels and African American have the lowest levels (mean(SD): 29.5(10.4)ng/ml vs. 19.6(9.1)ng/ml, respectively, p<0.0001). NAFLD was present among 17.5% (n=611) of the participants; with Hispanic showing the highest prevalence rate (26.2%) followed by Chinese American (19.8%), Caucasian (15.8%) and African American (11.7%), P=<0.0001. In unadjusted and final models, the association of 25(OH)D with NAFLD differed significantly by race/ethnicity (P<0.01). Stratification analyses showed significant negative association only in Caucasians; such that lower 25(OH)D was significantly associated with higher risk of NAFLD (adjusted OR (95% CI):1.23(1.03, 1.47) per 1 SD decrease in serum 25(OH)D). For other racial/ethnic groups, BMI, triglycerides, diabetic status and/or smoking, but not serum 25(OH)D, were common independent risk factors for NAFLD. Conclusions: The association of 25(OH)D with NAFLD varies by race/ethnicity. Future studies should assess if targeting vitamin D deficiency in Caucasians may reduce their higher risk of NAFLD above and beyond controlling other modifiable risk factors, whereas, controlling modifiable risk factors, excluding vitamin D, may be more important in reducing NAFLD risk in other racial/ethnic groups.

Disclosures: S.R. El Khoudary: None. S. Samargandy: None. I. Zeb: None. T. Foster: None. I. De Boer: None. D. Li: None. M. Budoff: B. Research Grant; Modest; NIH and General Electric. B. Research Grant; Significant; Yes.

Funding: No

Funding Component:

P229

Prenatal Development and Obesity: Two Distinct Pathways to Diabetes in Adulthood

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**Background:** Adverse prenatal development, often indicated by low birthweight, is associated with elevated risk of cardiometabolic disease, but the mediating role of obesity is not well understood. **Methods:** We used data from the National Longitudinal Study of Adolescent to Adult Health, a nationally representative sample of adolescents followed 14 years over 4 waves into adulthood (1994-95, 1995-96, 2001-02, 2008-09; n=14,180). In gender-stratified path analysis, we examined pathways from birth weight [BW (kg); linear (BW) and quadratic (BW²)], to latent trajectories in body mass index (BMI) from adolescence to adulthood, to prevalent diabetes or prediabetes (DM; HbA1c, diagnosis, medication) in adulthood (Figure), adjusting for sociodemographic characteristics. **Results:** Direct associations between BW and DM (not through BMI) indicated that increasing BW was associated with non-significantly lower likelihood of DM in women [coeff (95% CI): BW: −0.30 (−1.23, 0.63); BW²: 0.01 (−0.14, 0.16)] and unrelated to DM in men. We identified distinct, gender-specific indirect pathways from greater BW to higher BMI and DM. In girls, the association between BW and BMI in adolescence was J-shaped, by which girls born lower and higher BW exhibited elevated BMI in adolescence [coeff (95% CI): BW: −2.10 (−3.96, 0.24); BW²: 0.44 (0.13, 0.75)]; higher BW predicted marginally faster BMI gain from adolescence to adulthood. Higher adolescent BMI and faster BMI gain was associated with diabetes in women [coeff (95% CI): BMI intercept: 0.09 (0.06, 0.12); BMI slope: 0.12 (0.08, 0.17)]. In boys, BW was not associated with BMI at adolescence or BMI gain thereafter; in turn, adolescent BMI was unrelated to diabetes, while faster BMI gain was associated with higher likelihood of adult DM [coeff (95% CI): 0.29 (0.20, 0.37)]. **Conclusions:** Findings suggest that in girls, slowing BMI gain prior to adolescence and from adolescence to adulthood is critical for diabetes prevention, yet may not address distinct pathology stemming from early life.


Funding: No

Funding Component:

P230

**Metabolically Healthy Obesity and QT interval. The Polish Norwegian Study**

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**Introduction:** Obesity has been linked to increased risk of sudden cardiac death and ventricular arrhythmia. Whether the metabolically healthy obese phenotype is a benign condition, is debatable and few studies examined its ventricular repolarization profile. **Purpose:** To examine the association of metabolically healthy/unhealthy obesity phenotypes with prolonged corrected QT (QTc) interval in a large population-based study. **Methods:** Cross-sectional data from an ongoing cohort study in Poland. Data was collected using a standardized protocol. The QT intervals were obtained from digital standard 12-lead resting ECG and were corrected for heart rate by Bazett’s formula. Plasma lipids and glucose were measured in a fasting state. After excluding drugs known to affect the QT interval (antiarrhythmics, digoxin, antipsychotics), the analytic sample size was 11068 participants,
ages 45 to 64 years. Based on the presence of obesity (BMI ≥ 30 kg/ m²) and metabolic syndrome (per the AHA/NHLBI harmonized definition), we defined four phenotypes: metabolically healthy non-obese (MHNO), metabolically unhealthy nonobese (MUNO), metabolically healthy obese (MHO) and metabolically unhealthy obese (MUO). Multivariable linear and logistic regression models were used for analyses. Results: The prevalence of the 4 phenotypes was: MHNO: 51.34%, MUNO: 18.07%, MHO: 10.07%, MUO: 20.52%. The prevalence of an increased QTc interval (greater than >430ms in men/450ms in women) was 14.28%, and the prevalence of a highly prolonged QTc interval (greater than 450ms in men/470ms in women) was 5.2%. The age- and sex-adjusted mean QTc across the 4 phenotypes was: MHNO: 417.05ms (416.39-417.71); MUNO: 418.82 ms (417.71-419.92); MHO: 420.46 ms (418.99-421.93); MUO: 422.45 ms (421.41-423.49). The age- and sex adjusted odds (OR, 95% CI) of an increased QTc interval (greater than 430/450ms in men/women) were increased in MUNO (1.11, 0.96-1.29), MHO (1.44, 1.20-1.72) and MUO (1.47, 1.28-1.69), compared to MHNO phenotype. These estimates were minimally attenuated after additional adjustment for prevalent CVD, LVH on ECG, smoking, alcohol intake, physical activity and education: MUNO (1.10, 0.94-1.28), MHO (1.45, 1.21-1.73) and MUO (1.44, 1.26-1.66). We did not detect effect modification by sex. We obtained similar results in subgroup analyses restricted to those without diabetes and after excluding those with third degree atrioventricular blocks or conduction abnormalities with QRS>120ms. Conclusion: Both metabolically healthy- and non-healthy obese phenotypes had a higher likelihood of an increased/borderline QTc interval compared to the MHNO phenotype. Our study furthered our understanding of ventricular repolarization as reflected in the QTc interval, in the setting of different obesity phenotypes.


Funding: No

Funding Component:

P231

Cumulative Body Mass Index and Incident Prediabetes Over 30 Years of Follow Up: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Introduction: Higher body mass index (BMI) is associated with incident prediabetes, but whether the association is related to higher BMI or duration is unclear.

Methods: We examined cumulative BMI (cBMI) in 4227 black and white men and women, ages 18-30 years at baseline, who were free of prediabetes and diabetes at baseline and did not transition directly from normoglycemia to diabetes. cBMI was a time-varying measure defined as the BMI at a given study visit multiplied by the time until the next available BMI measurement, summed across exams. We examined cumulative BMI (cBMI) defined as fasting glucose of 100-125 mg/dL, 2-hour oral glucose tolerance of 140-199 mg/dL, or HbA1c of 5.7-6.4%. Proportional hazards regression was used to estimate hazard ratios for incident prediabetes across tertiles of cBMI over a maximum of 30 years, without and with adjustment for lifestyle and demographic variables.

Results: Over an average of 20.4 years of follow
up (range 7 to 30 years), there were 2406 incident prediabetes events (56.9% of the sample). Incident events were observed in each cBMI tertile across the full range of follow-up time. In crude models (Table), the hazard ratios for the second and third tertiles of cBMI were statistically significantly and positively associated with incident prediabetes relative to the first tertile. Multivariable adjustment attenuated the associations such that only the third cBMI tertile remained statistically significant, with an 83% higher rate of prediabetes compared to those in the first tertile. These associations did not differ by race, sex or age.

**Conclusions:** Cumulative BMI, a measure capturing both BMI level and duration, was strongly associated with prediabetes only when a relatively high threshold was reached. These results suggest that a high cumulative burden over a wide range of BMI values and persistence from young adulthood is associated with prediabetes by middle age, allowing primary prevention before middle age and progression to frank diabetes.


**Funding:** No

**Funding Component:**

**P232**

**Modifying General and Central Adiposity: Estimated Effect on Population Burden of Coronary Heart Disease. The Atherosclerosis Risk in Communities (ARIC) Study**

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Excess adiposity, which affects 30% of the world’s population, is associated with risk of coronary heart disease (CHD), yet the potential reductions in CHD burden attainable through shifts in the population distributions of adiposity are unclear. Risk of CHD conveyed by excess adiposity is mostly mediated by the associated metabolic dysregulation, with manifestations such as hypertension and diabetes. Considering these metabolic pathways, we estimated the effect of hypothetical population reductions in general adiposity [body mass index (BMI)] or visceral adiposity [indexed by waist circumference (WC)], each consistent with lifestyle modification, on the risk of incident CHD in a US-based biracial population.

The study population included 13,610 ARIC study participants aged 45-64 years, after excluding those with CHD (667) or chronic conditions associated with weight change (969) at baseline. Our hypothetical intervention reduced general adiposity (BMI) or waist circumference (WC) by 5% relative to the temporal trend observed under no intervention; the intervention was applied only among those with BMI > 24 kg/m2 (or WC>88 cm). For example, an individual who increased from a BMI of 25.2 to 27 over the study period under no intervention would increase from 24 to 25.7 following the intervention. Incident CHD was ascertained from 1987 to 2001. CHD risk differences were estimated comparing the intervention to no intervention. Over the follow-up time, 736 (BMI analysis) and 712 (WC analysis) incident CHD events occurred. For the BMI analysis, the median BMI (kg/m2) at the end of follow-up was 28.2 under
no intervention and 25.6 under the hypothetical intervention. The cumulative 12-year incidence of CHD and 95% CI under no intervention was 6.3% (5.9, 6.8%) and the risk difference following the hypothetical BMI change was -0.6% (-1.0, -0.1%). For the WC analysis, the median WC (cm) at the end of follow-up was 100.6 under no intervention and 98.3 under the hypothetical intervention. The cumulative 12-year incidence of CHD and 95% CI was 6.2% (5.8, 6.7%) under no intervention and the risk difference following the hypothetical WC change was -1.0% (-1.4, -0.5%). Hence, 9% and 16% of CHD events occurring in this study population over 12 years could have been prevented by an annual 5% shift in BMI and WC, respectively.

We estimated that meaningful reductions in CHD risk could result from modest reductions in adiposity that are consistent with what might be observed under public health efforts aimed at lifestyle modification. CHD risk reduction was larger under a hypothetical WC reduction compared to a BMI reduction, consistent with metabolic dysregulation associated with visceral adiposity. Public health messages and clinical recommendations that promote modification in WC, perhaps with reference to clothing size, would offer more concrete targets than similar messages for composite measures such as BMI.


Funding: No

Funding Component:

P233

Handgrip Strength Modifies the Association Between Body Mass Index and Blood Pressure in Children and Adolescents of the United States: Experience in NHANES 2011-2014

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Background: Body mass index (BMI), a measure of obesity, is strongly associated with blood pressure (BP) in children and adolescents. Handgrip strength is a measure of muscular strength and body fitness. We hypothesized that handgrip strength modifies the relationship between BMI and BP. Methods: The sample included 3,947 children and adolescents (50.4% boys and 49.6% girls) aged 8-19 years who participated in the National Health and Nutrition Examination Surveys (NHANES) 2011-2014. The sum of the maximum handgrip strength from both hands, standardized to age- and sex-specific z-scores, was used. General linear models were used for data analyses.

Results: As expected, BMI was positively correlated with systolic BP (partial correlation coefficient r=0.17, P<0.0001). After adjustment for age, race, sex, and handgrip strength, each BMI unit increase was associated with 0.47 (0.03, standard error) mm Hg increase in systolic BP (P<0.0001). Further, handgrip strength significantly (P=0.0002) attenuated the association between BMI and systolic BP. In those with handgrip strength below the median, each BMI unit increase was associated with 0.59 (0.04) mm Hg increase in systolic BP; such increase was only 0.38 (0.03) mm Hg in those with handgrip strength above the median, representing a 36% reduction in the effect size of BMI on systolic BP. Conclusion: These results suggest that high fitness, measured by handgrip strength, attenuates the adverse effect of obesity on blood pressure levels in children and adolescents, which indicates that increasing muscular strength and body fitness will have beneficial effects on obesity-associated elevated BP in children and adolescents.
Disclosures: **R. Zhang:** None. **L. Zheng:** None. **W. Chen:** None. **S. Li:** None.

Funding: No

Funding Component:

P234

**The Relationship Between Polyphenols and Body Composition within the Hispanic Community Health Study/Study of Latinos Nutrition and Activity Study**

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Background: Polyphenols have antioxidant properties that may protect against chronic disease. Epidemiological evidence regarding potential impact on body composition and obesity is limited, particularly among Hispanics/Latinos who are disproportionately prone to obesity.

Hypothesis: Polyphenols are associated with lower percent body fat (%BF) and prevalence of obesity, with moderate intra-class correlations between repeated measures.

Methods: Participants were 442 adults from SOLNAS aged 18-74y. Doubly labeled water, a recovery biomarker, estimated Total Energy Expenditure. Polyphenol excretion from 24-hour urine samples was assessed for enterolactone, enterodiol, resveratrol, daidzein, urolithin A, naringenin, hesperetin, and quercetin (nmol/liter). Measures were repeated in a subsample (N=90) to provide a reliability measure. Anthropometric measures were obtained by trained personnel, and %BF was measured by 18O dilution. Diet was assessed using two 24-hour recalls. Linear regression models were used to evaluate the multivariable associations between body composition and polyphenols. Spearman correlations between BMI and %BF with polyphenols and intra-class correlation coefficients (ICCs) between repeated polyphenol measures were computed.

Results: Resveratrol and %BF were weakly correlated (r=-0.11, p=0.02), but 69% of urinary resveratrol levels were below detectable limits. Hesperetin was associated with a 12% lower odds of obesity in models unadjusted for TEE (Table 1), while enterolactone was associated with 16% higher odds in fully-adjusted models. Repeated polyphenol measures were moderately correlated (ICCs:0.11-0.65). Urinary polyphenols and their main food sources were weakly correlated (r=0.10-0.17, p<0.03).

Conclusions: Hesperetin and quercetin were inversely while enterolactone was positively associated with obesity. Findings are indicative of an immigrant group in transition. Repeated measures of urinary polyphenols could help clarify impact on obesity.

Disclosures: **N. Makarem:** None. **Y. Mossavar-Rahmani:** None. **D. Sotres-Alvarez:** None. **S. Hua:** None. **W.W. Wong:** None. **L. Van Horn:** None. **M.L. Davi...in Hawaii Cancer Ctr, Manoa, HI; Jeannette M. Beasley, New York Univ Sch of Med, New York, NY

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Conclusions: Hesperetin and quercetin were inversely while enterolactone was positively associated with obesity. Findings are indicative of an immigrant group in transition. Repeated measures of urinary polyphenols could help clarify impact on obesity.

Disclosures: **N. Makarem:** None. **Y. Mossavar-Rahmani:** None. **D. Sotres-Alvarez:** None. **S. Hua:** None. **W.W. Wong:** None. **L. Van Horn:** None. **M.L. Davi...in Hawaii Cancer Ctr, Manoa, HI; Jeannette M. Beasley, New York Univ Sch of Med, New York, NY
Baseline Demographic Characteristics of the Million Veteran Program: Increasing BMI Seen From 2011-2016 Among US Male Enrollees


Background: More than one-third of US adults are obese and the prevalence has remained stable since 2003. In the largest cohort of 515,912 men and women participating in the Million Veteran Program (MVP), we analyzed trends in baseline weight/obesity across the years of enrollment. Objective: The goal of this study is to examine prevalence and trends in baseline characteristics among US Veterans enrolled in MVP between 2011 and 2016. We highlight the trends in BMI over the enrollment period. Methods: BMI was computed for 479,521 Veterans who enrolled in MVP between 2011 to September 2016. Participants reported weight and height on the baseline survey. Missing survey data was supplemented with patient EMR data taken closest to enrollment date and stratified by year of enrollment. Results: Mean age was 61.2 (SD=13.8), 91.6% (391,124/427,187) were men, 73.8% (353,720/479,520) White, 18.8% (90,020/479,520) Black, and 7.4% (35,593/479,520) Hispanic. Overall, mean BMI was 29.7 [range 11.3 to 78.5]. Prevalence of underweight, normal weight, and overweight was 0.7% (3,164/479,521), 19.4% (93,318/479,521), 38.4% (184,625/479,521), respectively, in this cohort. While the prevalence of obesity increased with consecutive years of enrollment in men and overall, we did not observe such trend for other categories of adiposity (Fig). When stratified by race we did not observe any difference in prevalence of underweight and normal weight among White and Black participants. Prevalence of obesity was higher in Blacks, but the rate of obesity among Whites appears to be growing at a faster rate than in Blacks. Compared to the general VHA (Veterans Health Administration) population, prevalence of obesity and the distributions of race, gender, and ethnicity were similar among participants in MVP. Conclusion: Our data show that the prevalence of overweight/obesity is high among US Veterans. Across consecutive years of enrollment, prevalence of obesity but not overweight appears to increase across each ethnic group.


Funding: No

Funding Component:

P236

Analysison Time Course Changes of Adipocytokine Levels and Abdominal Obesity after Quitting Smoking

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Background: Adipocytokines are produced and secreted by the adipose tissue and are strongly associated with obesity. Among these cytokines, adiponectin prevents arteriosclerosis. In obesity, the serum adiponectin levels decrease whereas leptin levels increase. However, the association between these two adipocytokines and abdominal obesity after smoking cessation is unknown. Purpose: The present study investigated time-dependent changes after smoking cessation of two adipocytokines, adiponectin and leptin, as well as the changes of body mass index and waist circumstance (WC).

Methods: All anti-smoking treatments were conducted according to the Standard Procedures for Anti-Smoking Treatment (originally issued in March 2006 by the Japanese Circulation Society, Japan Lung Cancer Society, and Japanese Cancer Association). The patients were treated with transdermal nicotine patches or the oral administration of varenicline. Among patients who attended our smoking cessation clinic, 56 (37 males and 19 females) successfully quit smoking. We measured their serum leptin and adiponectin levels at baseline, 3 months, and 1 year after beginning smoking cessation. Moreover, the changes in data from before to 3 months and 1 year after smoking cessation were compared by unpaired t-test between patients with a WC increase smaller than the median and those with a WC increase greater than the median.

Results: Body mass index and WC significantly increased from baseline to 3 months to 1 year after beginning smoking cessation. The leptin level significantly increased (5.0 ng/ml → 6.2 ng/ml (p < 0.05) → 7.1 ng/ml (p < 0.001)) in proportion to the weight gain. Adiponectin levels, however, did not change after smoking cessation. Using the median ΔWC (+1.8 %) as the cutoff point, patients were divided into two groups. The percent change in adiponectin level from baseline to 1 year was significantly greater in the ΔWC < median group (+13.4 %) than in the ΔWC ≥ median group (-0.6 %) (p = 0.028).

Conclusion: Despite weight gain and increased abdominal obesity, serum adiponectin levels did not decrease after smoking cessation. Rather, they increased at 1 year after smoking cessation in patients with less abdominal obesity. Thus, the beneficial effect of smoking cessation may outweigh the adverse effect of weight gain after smoking cessation.


Funding: No

Funding Component:

P237

Sex and Body-mass Index Specific Percentiles for Neck and Waist Circumference in the Longitudinal Study of Adult Health: ELSA Brasil

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Background: Waist circumference (WC) and neck circumference (NC) have been linked with higher cardiovascular risk, which cannot be explained only by the association with higher BMI. Therefore, the distributions of predicted neck circumference and waist circumference values according to BMI may be a useful measurement of fat distribution. Aim: To describe percentiles for WC and NC according to BMI and stratified by sex in a large non-clinical based sample of middle-aged Brazilians.

Methods: From the 15105 participants from ELSA-Brasil, 15085 participants with complete data were included in this analysis. Height and weight were measured using a standardized scale, and BMI was calculated by dividing body weight with the squared height in meters (kg/m²). Waist circumference (cm) was measured using standardized procedures and equipment. Neck circumference was measured.
with an inelastic tape (mm) immediately above the cricoid cartilage and perpendicular to the long axis of the neck, with the participant in a sitting position. We determined the estimated distribution function in men and women, with special interest in the 25th, 50th, 75th and 90th percentiles for neck and waist circumferences in ELSA-Brasil baseline fitting spline quantile regression models. Sex-specific nomograms were also built. Analyses were performed using R software and SPSS analytical package. Results: We evaluated 6880 men (52.2 ± 9.3 years old) and 8205 women (52.0 ± 8.9 years old). Among men, mean WC, NC and BMI were 95.3 ± 11.7 cm, 39.5 ± 2.9 cm and 27.0 ± 4.3 kg/m², respectively. Among women mean WC, NC and BMI were 87.8 ± 12.6 cm, 34.0 ± 2.6 cm and 27.0 ± 5.1 kg/m², respectively. Table 1 shows respective 25th, 50th, 75th and 90th percentiles with correspondent 95% prediction interval in cm for NC and WC by BMI and sex. Conclusion: In this study, we describe sex-specific centile values for NC and WC according to BMI. This distribution may be useful in the study of body fat distribution as a marker of cardiovascular risk beyond BMI values.

Disclosures: C.P. Baena: None. B. Moura: None. A. Goulart: None. P. Lotufo: None. I. Santos: None. I. Benseñor: None.

Funding: No

Funding Component:

P238

**Cardiovascular Risk Factors for Intimal and Medial Calcification in a High-risk Population**

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**Introduction:** Arterial calcification is associated with an increased cardiovascular risk. Intimal calcification has long been held responsible for this association, whereas the role of medial calcification was unclear.

**Hypothesis:** We hypothesize that the risk factor profile in patients with high cardiovascular risk differs for those with intimal or medial calcification of the lower extremity arteries.

**Methods:** We conducted a cross-sectional study of 203 patients included in the Second Manifestations of ARterial Disease (SMART) study, comprising of patients with CVD as well as patients at high risk for CVD, who underwent CT (computed tomography) scanning of the lower extremities. Calcification in the femoral and crural arteries was scored as absent, dominant intimal, dominant medial or indistinguishable according to a previously validated algorithm scoring linearity and circularity. We fitted multinomial regression models assessing the associations of cardiovascular risk factors with different patterns of calcification.

**Results:** No calcification was present in 18% for the femoral and 28% for the crural arteries, while prevalence of intimal calcification was 44% and 38%. Medial calcification prevalences were 25% and 20% for the femoral and crural arteries, respectively. We found considerable consistency in the predominant calcification pattern of the crural and femoral arteries (linear weighted Cohen’s kappa [0.41, 95%CI 0.29-0.52]). Patients with dominant medial calcification were older, more often male and more often had diabetes than patients with intimal calcification. Conversely, patients with intimal calcification were more often smokers than patients with medial calcification. In multinomial logistic regression models, age was a significant risk factor for all types of calcification compared with no calcification. Male sex was associated with an increased risk of medial calcification [OR femoral 10.37, 95%CI...
2.14-50.32], but not with intimal or indistinguishable calcification, compared with no calcification. Current smoking was associated with intimal calcification [OR femoral 3.25, 95%CI 0.98;10.83], but not with medial calcification. No significant relationships were found with other cardiovascular risk factors.

Conclusions: Within the same individual, a predominant arterial calcification type (intimal or medial) often exists throughout the lower extremity. These patterns of calcification appear to have different associated risk factor profiles.


Funding: No

Funding Component: P239

Clinical Risk Factors Related to Biological versus Chronological Heart Age: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Introduction
Recent analysis of BRFSS data used the non-laboratory-based Framingham 10-year cardiovascular (CVD) risk calculator to derive biological heart age in older adults. This calculator utilizes cardiovascular disease (CVD) risk factors sex, age, BMI, systolic blood pressure (SBP), diabetes status, smoking status and antihypertensive medication use. We examined which risk factors drove differences between biological and chronological heart age in young adults.

Methods
CARDIA examined 2674 black and white men and women who attended Year 10 (mean age 34) and Year 25 (mean age 49) exams and had complete data for heart age components. Biological heart age was calculated using the non-laboratory-based Framingham 10-year CVD risk calculator. Heart age difference was defined as the difference between biological and chronological heart age, with higher values representing poorer heart age. Heart age difference was categorized into three levels, ≤-5 years, -5 to +5 years, or ≥+5 years. Differences between levels were assessed using linear regression, with heart age difference coded as an indicator variable referenced against a heart age difference of -5 and +5 years.

Results
Race, smoking status, BMI and SBP were statistically significantly different from the reference in those whose heart age differences were lower (≤ -5) and higher (≥ 5) at exam years 10 and 25. Sex differed from the reference only in the lower heart age difference groups at both exams. Diabetes status differed from the reference only in the higher heart age difference groups at both exams.

Conclusions
Most risk factors driving biological heart age, including race, smoking status, diabetes status, antihypertensive medication use, BMI and SBP, drive both favorable and unfavorable heart age differences at years 10 and 25 with the notable exceptions of female sex with favorable and diabetes with unfavorable heart age difference. This suggests that risk factor management at both younger and older ages impacts vascular aging.

Clinical Outcomes in Patients With Takotsubo’s Cardiomyopathy Who Have Undergone Cardiac Catheterization at Presentation vs. Those Who Have Not: A Two Community Based Hospitals Experience

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Background:
Diagnosis of Takotsubo’s Cardiomyopathy (TC) remains a challenge due to similar presentation to acute coronary syndrome. Coronary catheterization (CC) proven clean coronaries is important to diagnose TC. However, it is not uncommon that CC is occasionally delayed due to unstable medical condition and/or high risk for CC. We hypothesized that patients with TC had similar outcomes whether they underwent CC at presentation or were diagnosed using non-invasive imaging techniques.

Methods:
Retrospective chart review of data from Memorial Hospital of Rhode Island and Kent Hospital, two community based hospitals, from June 2008 to March 2016 was done. Thirty nine adult patients > 18 years of age admitted to the intensive care unit or medical floor with chest pain, shortness of breath, elevated troponin, EKG changes, and new non-regional wall motion abnormalities or reduce ejection fraction, with suspected TC were enrolled. Patients were divided into 2 groups based on diagnostic approach of TC: Baseline echo findings suggestive of TC with EF improvement at follow up (non-CC) vs. clean coronaries by CC. Outcomes of the two groups were compared using Chi-square analysis, analysis of variance (ANOVA) and Mann-Whitney Test appropriately.

Results:
Out of 39 patients, 20 underwent CC while 19 did not. Mean age was not different between the 2 groups (69.1±11.8 vs. 62.4±14.0, p= NS) but CC group had more females (95 %, 19 of 20 vs 68.4%, 13 of 19; p=0.031). Most common chief complaint at the time of admission in both groups was shortness of breath (60.0%, 12 of 20 vs 68.4%, 13 of 19; p=0.548). Admission heart rate was significantly higher in non-CC vs. CC patients (102.3± 19.3 vs 85.4±85.4; p=0.007). Third troponin was higher in non-CC group (1.926 ± 2.667 vs 0.775± 1.378, p=0.017). All other admission and in-hospital findings and drug management in both groups were similar. Both CC and non-CC groups had comparable outcomes: intubation (15%, 3 of 20 vs 21.1%, 4 of 19), heart failure (21.2 %, 4 of 20 vs 15.8%, 3 of 19), shock (0 %, 0 of 20 vs 5.3 % 1 of 19 ), stroke (5 %, 1 of 20 vs 0%, 0 of 19), death (5.3 % 1 of 20 vs 5.3% 1 of 19 ), recovery (65%,13 of 20 vs 52.9 % 10 of 19) p=NS for all. ICU admission (42.1%, 8 of 20 vs 52.6%, 10 of 19; p=NS) and length of stay (8.21±7.82 days vs 5.75±5.67 days; p=NS) was not significantly different between the 2 groups. Both groups showed analogous improvement in ejection fraction (21.92 ± 13.96 vs 20.63 ± 13.21; p= 0.835) on a follow up Echo done within 2 weeks to 6 months.

Conclusion:
This study shows no difference in outcomes between TC patients diagnosed with CC or TTE on admission. However, CC should still be done on admission for diagnosis of TC until large non-invasive diagnostic imaging modalities (such as myocardial perfusion echocardiogram) trials show high specificity for diagnosis of TC.


Funding: No
Health Literacy and Patient Activation Are not Predictors of Positive Health Behaviors Among Young Adult Women

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Young adulthood is an important phase during which health behaviors are established. Inadequate health behaviors during this phase may increase susceptibility to future poor health. Health behaviors of young adult women, in particular, will most likely not only affect their health, but that of their families. Research exploring health literacy (enabling informed decision making) and patient activation (confidence to maintain/improve health) as predictors of health behaviors is growing. We examined these variables as predictors of positive health behaviors among a cohort of 22-23 year old females (n=476). Health literacy was assessed using the Newest Vital Sign; scores were categorized as low, marginal, and adequate. The Patient Activation Measure (PAM) was used to assess participant health activation. Scores were categorized as low (<27) or high (>27). Eleven health behavior variables related to nutrition, physical activity, sedentary behavior, sleep, alcohol, and smoking were used to create a health behavior score. These data were collected through health surveys and accelerometry. The health score had a possible range of 0 to 22. We included race/ethnicity, education, body mass index (BMI), and depressive symptoms (CES-D) as potential covariates in multivariable models. About 46% of the cohort was White, 25% Black, and 10% Hispanic; about 77% of middle or low socioeconomic status (SES). About 71% had adequate health literacy (18% marginal, 11% low), while 89% had a high PAM score. Participants who were White (p<0.01), had higher education (p<0.01), reported higher SES (p<0.01), and had a lower CES-D score (p<0.02) had higher health literacy. Participants who had lower CES-D scores (p<0.01) also had higher PAM scores. The mean health behavior score was 12.68 (SD=3.39). Univariate analyses indicated adequate health literacy was associated with individual positive health behaviors: breakfast consumption (p<0.01), low sugar sweetened beverage consumption (p<.01), high physical activity (p<0.01), and no smoking (p<0.04). High PAM score was associated with low sugar sweetened beverage consumption (p<0.04). In univariate linear regression models, higher health literacy was associated with a higher composite health score (p<0.01). PAM score was not associated with health score. Multivariable linear regression models controlling for race/ethnicity, education, BMI, and CES-D score, indicated that neither health literacy nor PAM score were associated with composite health score. Among young adult women, positive health behaviors appear to not be influenced by either their individual health literacy or PAM score. Potential associations may emerge later in adulthood as they become fully independent individuals. Young adults may still be closely tied to their parents; thus parent health literacy and PAM score may predict health behaviors among young adults.


Funding: No

Funding Component:

Periodontal Disease and Incident Venous Thromboembolism: the Atherosclerosis Risk in the Community (ARIC) Study

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Background and Purpose: Previous research has identified an association between periodontal disease (PD) and
atherosclerotic cardiovascular disease, but the relationship between PD and venous thromboembolism (VTE) has not been studied. PD may trigger VTE through activating inflammatory, coagulation, and fibrinolysis processes associated with thrombosis. We hypothesize an independent association between PD and increased risk of VTE.

Methods:
PD was assessed among ARIC participants at visit 4 (1996-1998) using self-reported tooth loss due to gum disease and clinical PD definitions based on ARIC dental exams. PD case definitions from the CDC Periodontal Disease Surveillance workgroup in collaboration with the American Academy of Periodontology (CDC/AAP) and the biofilm-gingival interface (BGI) index were used. The outcome of interest was validated VTE, including all cases of deep vein thrombosis occurring in the leg and pulmonary embolism. Follow-up time was from visit 4 to the first VTE hospitalization, dropping out of the study, death, or else, December 31, 2011. Multivariate-adjusted Cox proportional hazards regression models were used.

Results:
There were a total of 424 VTE events among the 10,651 ARIC participants who provided baseline self-reported PD data and 314 VTE events among the 8,119 participants who were edentulous at visit 4 or who completed the dental exam from which baseline clinical PD data were obtained. Compared to those without periodontal disease, self-reported history of tooth loss due to gum disease was associated with higher VTE risk (HR = 1.42 (1.11, 1.82)), as was being edentulous at exam 4 [1.51 (1.07, 2.14)] using the CDC/AAP PD definition. No other statistically significant associations were observed between clinical levels of PD and VTE risk.

Conclusions:
These results suggest that individuals who are edentulous or have experienced tooth loss due to PD may be at higher VTE risk.


Funding: No

Funding Component:
P243

Retinal Microvascular Findings and Future Risk of Peripheral Artery Disease: the Atherosclerosis Risk in Communities (ARIC) Study

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Introduction
Lower-extremity peripheral artery disease (PAD) is often considered as a subtype of macrovascular disease. For the development of critical limb ischemia (CLI), a severe form of PAD, microvascular disease is indicated to play a crucial role by impairing collateral formation and wound healing. However, the contribution of microvascular disease to the development of PAD has not been systematically evaluated in a
large cohort study.

**Hypothesis**

Microvascular disease, as represented by retinal findings, will be associated with future PAD risk, and its association will be stronger for CLI.

**Methods**

Retinal photographs were taken at the 3rd examination (1993-1995) of the ARIC Study. We investigated 9390 participants free of clinical history of PAD and quantified the associations of each retinal finding with PAD risk using Cox models. PAD was defined as hospitalizations with PAD diagnosis (ICD-9: 440.2x, 440.3, 440.4) or leg revascularization (38.18, 39.25, 39.29, 39.50). Of PAD cases, those with ulcer (707.1), gangrene (785.4) or leg amputation (84.1x) were considered CLI.

**Results**

During a median follow-up of 19 years, 304 participants developed PAD, of which 92 were considered CLI. Retinal hemorrhages, exudates, microaneurysms and any retinopathy demonstrated independent associations with PAD (Table) beyond potential confounders including diabetes, while generalized arteriolar narrowing did not. These significant retinal findings were more strongly associated with CLI than with PAD (HR range 3.1-6.5 vs. 2.2-3.3, with all p-values for difference in HR from seemingly unrelated regression <0.05 except soft exudates). Also, these retinal findings tended to have stronger associations with PAD outcomes among persons with diabetes than those without.

**Conclusions**

Retinal hemorrhages, exudates, microaneurysms and any retinopathy were independently associated with PAD, especially its severe form, CLI. Our results suggest the importance of microvascular wall fragility/permeability in the development of PAD.


Funding: No

Funding Component: P244

**MicroRNAs Implicated in Angiogenesis Are Upregulated in Lower Extremity Peripheral Artery Disease (PAD): the San Diego Population Study (SDPS)**

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**Introduction:** Lower extremity PAD affects approximately 9 million people in the US. However, the genetic factors underlying PAD remain elusive. MicroRNAs are short non-coding RNA segments that regulate gene expression post-transcriptionally. MicroRNAs are hypothesized to be involved in angiogenesis, inflammation, and immune processes central to atherosclerotic process, are modifiable, and thus have potential as therapeutic targets. No previous studies have assessed the role of microRNAs in PAD in a population-based sample. **Methods:** The SDPS is a prospective population-based cohort of non-Hispanic White, African-American, Hispanic
and Asian men and women designed to study PAD and venous disease. A sex- and age-matched nested sample of 24 PAD cases and 24 controls were chosen from 1103 participants who attended the 2007-11 exam. PAD was defined as ankle brachial index (ABI)<0.90, while the ABI range for controls was 1.1-1.3. Thirty-five microRNAs hypothesized to be of importance in development of atherosclerosis were measured in plasma using a high throughput RT qPCR method on the BioMark microfluidic System. MicroRNA expression levels (Cq values) were compared between PAD cases and controls using linear regression and least squares means, with adjustment for age and sex to remove residual confounding.

**Results:** Overall mean±SD age was 79±7, with mean ABI among the PAD cases of 0.60±0.12 and among controls was 1.17±0.06. Six microRNAs, miR-181b, -195, -22, -27b, -424, and -503, were significantly upregulated in PAD cases vs. controls (Figure), all p<0.05. Existing evidence indicates that miR-195, -27b, -424, and -503 are involved in angiogenesis, and miR-503 is upregulated in ischemic leg muscle of patients with diabetes. **Conclusions:** Individuals with PAD have significantly higher expression of miRNAs linked to angiogenesis. Additional research is needed in larger studies to further assess associations with clinical and subclinical PAD, as well as the viability of these miRNAs as therapeutic targets for PAD.


**Funding:** No
estimated the risk of medical-record confirmed idiopathic PE, events which were not associated with surgery, trauma, or cancer. **Results:** We identified 1,112 total incident PE events, including 360 idiopathic PE events, during 28 years of follow-up. In multivariable-adjusted analyses, we found no strong evidence of an association between the amount of alcohol consumed per day and the risk of any PE (quadratic p-trend=0.3) or idiopathic PE (quadratic p-trend=0.4) or between the frequency of alcohol consumption and the risk of any PE (linear p-trend=0.5) or idiopathic PE (linear p-trend=0.8) (Table). **Conclusions:** Among this population of women with relatively low average amounts of alcohol consumption, we found no substantial evidence of an association between the amount or frequency of alcohol consumption and the risk of PE.


Funding: No

Funding Component:

P246

**Long-term Optimal Lifestyle and Clinical Factors and Progression in Arterial Stiffness in the Multiethnic Study of Atherosclerosis**

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**Introduction:** Optimal cardiovascular health (CVH), based on lifestyle and clinical factors, is associated with lower risk of CV events and this may occur partly by preventing progression of arterial stiffness. We assessed the association of optimal lifestyle and clinical factors with changes in arterial stiffness in the Multi-Ethnic Study of Atherosclerosis. **Methods:** Among 2,729 participants (aged 44-84 years, 46.5% male), number of optimal lifestyle factors (BMI <25 kg/m2, never smoker, never drinkers, exercised >500 METs minutes/week) and optimal clinical factors (systolic BP <140 and diastolic BP <90mmHg, fasting glucose <100mg/dL, and total cholesterol <200mg/dL), across 5 visits, were summed to create an overall optimal score for lifestyle and clinical factors. Carotid arterial stiffness was measured using distensibility coefficient (DC) and Young’s elastic modulus (YEM) at baseline and after a mean of 9.5 years (visit 5). In separate multiple linear regression models, percent changes in DC and YEM between visits 1 and 5 were regressed on quartiles of overall optimal score for lifestyle and clinical factors. **Results:** On average, DC decreased by 5.3% and YEM increased by 24.4% over ten years. Mean optimal lifestyle score was 10.2 (range: 0-19) and optimal clinical score was 9.1 (range: 0-15) across 5 visits. There was no difference in arterial stiffness progression between individuals in the upper quartiles of optimal lifestyle score and those in the lowest quartile. A higher score on optimal clinical factors was inversely associated with progression in arterial stiffness. Linear trends in the increase of DC (P-trend=0.001 in all) and decrease of YEM (P-trend<0.002 in all) were observed across the quartiles of optimal clinical score and quartiles of CVH score (i.e. combining lifestyle and clinical factors) (Table 1). **Conclusion:** Optimal CVH was associated with less arterial stiffening, but only the clinical
factors were predicting arterial stiffness and lifestyle factors had no influence on arterial stiffness.


Funding: No

Funding Component:

P247

Dietary Intake and Peripheral Arterial Disease Incidence in Middle Aged Adults: the Atherosclerosis Risk in Communities Study (ARIC)

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Background: Peripheral arterial disease (PAD) is a costly source of morbidity and mortality among older persons in the United States. Dietary intake plays a role in the development of atherosclerotic cardiovascular disease; however, few studies have examined the relation of food intake or diet patterns with PAD.

Objectives: We examined the relationship between habitual dietary intake at midlife and incident PAD over approximately 20 years of follow-up.

Methods: Among 14,082 participants enrolled in the Atherosclerosis Risk in Communities (ARIC) study initially free of PAD, dietary intake was assessed at baseline in 1987-1989 using a Harvard food frequency questionnaire. Food groups were created and principal components analysis was used to develop “healthy” and “Western” dietary patterns; both were categorized into quintiles or quartiles. Incident PAD was defined by an ankle-brachial index (ABI) measure of < 0.90 at either of two subsequent exams (1993-1995, 1996-1998), or a hospital discharge diagnosis of PAD, leg amputation, or leg revascularization procedures through 2012. Cox proportional hazards models adjusted for relevant confounders assessed the relations of each food group or diet pattern with incident PAD.

Results: During a mean follow up of 19.9 years, 1569 participants developed incident PAD. A total of 64.7% of cases had their incident event defined via ICD-9 codes, while 35.3% had incident PAD defined by ABI. In models adjusted for demographics, behaviors, and food groups, the hazard ratios for incident PAD increased across quintiles of meat consumption (Q2 vs. Q1 1.38 [95% CI 1.16, 1.64], Q3 vs. Q1 1.40 [1.18, 1.67], Q4 vs. Q1 1.47 [1.23, 1.77], Q5 vs. Q1 1.66 [1.36, 2.03], p for trend <0.001). Compared to those who drank no alcohol, those who had 1-6 drinks per week had a lower risk of incident PAD (HR=0.78 [95% CI 0.68, 0.89]). For coffee, there was a modest inverse association with incident PAD (Q5 vs. Q1 0.84 [0.75, 1.00], p for trend = 0.014). There was no association between other food groups or patterns and incident PAD.

Conclusions: In this prospective population-based cohort study, greater meat consumption was associated with higher risk of incident PAD, while both moderate alcohol consumption and coffee consumption were associated with lower risk of incident PAD. Whether these associations are causal remains to be seen.


Funding: No

Funding Component:
Glycemic Markers and Risk of Peripheral Artery Disease: The Atherosclerosis Risk in Communities (ARIC) Study

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Introduction: Hemoglobin A1c (HbA1c) is a risk marker for incident peripheral artery disease (PAD). However, its relationship to critical limb ischemia (CLI), the most severe form of PAD, has not been fully characterized. Also, the prognostic value of non-traditional glycemic markers, glycated albumin, fructosamine, and 1,5-anhydroglucitol (1,5-AG) for PAD/CLI risk is unknown.

Hypotheses: These glycemic markers will be particularly strongly associated with incident CLI, and non-traditional markers may provide additional information on PAD risk beyond HbA1c.

Methods: We quantified the associations of four glycemic markers with PAD (hospitalizations with PAD diagnosis [ICD-9: 440.2-440.4] or leg revascularization [eg, 38.18]) in 11,797 ARIC participants free of a history of PAD at baseline (1990-92) using Cox models. Within these PAD cases, CLI was defined with an ICD code of ulcer, gangrene, or leg amputation. All markers were categorized into five groups according to diagnosed diabetes status and percentiles for clinical cut-points of HbA1c as in Table.

Results: Over a median follow-up of 20.7 years, there were 397 cases of PAD (137 were CLI). Compared with the non-diabetic reference group, elevated glycemic marker levels (or reduced levels for 1-5AG) significantly contributed to increased risk of PAD (Table). The glycemic contribution was particularly strong for CLI events, with hazard ratios ranging 14-18 (vs. 6-8 for PAD, p for difference <0.001 in all glycemic markers) in diagnosed diabetes with their elevated levels (reduced for 1-5AG). The associations of non-traditional glycemic markers with PAD/CLI risk were strongly attenuated with further adjustment for HbA1c.

Conclusions: Glycemic markers were significantly associated with PAD, particularly with its severe form, CLI, supporting the importance of glucose metabolism in the progression of PAD. Non-traditional glycemic markers provide similar (but not much additional) predictive value as HbA1c for classifying PAD risk.


Funding: No

Funding Component:

P249

Hemostatic Factors and Long-Term Risk of Peripheral Arterial Disease: The Atherosclerosis Risk in Communities (ARIC) Study

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Background: A few cross-sectional studies have reported associations between hemostatic factors and peripheral arterial disease (PAD), but prospective data are largely lacking.

Hypothesis: Plasma hemostatic factors are associated with incident PAD, independently of traditional atherosclerotic risk factors.

Methods: In 14,071 men and women (age 45-64 years and 25.4% blacks) at visit 1 (1987-1989) of the ARIC Study, we investigated the associations of fibrinogen, Von Willebrand factor (VWF), factor VIII, factor VII, Antithrombin III (ATIII) with incidence of PAD (defined as hospitalizations with PAD diagnosis [ICD-9: 440.2x, 440.3, and 440.4] or leg revascularization [38.18, 39.25, 39.29 and 39.50]). We also explored associations of d-dimer measured at visit 3 (1993-1995) in 11,619 participants.

Results: We identified 540 incident PAD during a median follow-up of 24.4 years. Fibrinogen, VWF, factor VIII, and d-dimer demonstrated positive dose-response relationships to incident PAD, independent of other risk factors (Table). In comparison with respective referent categories, significantly higher PAD risk was observed in the top two quintiles of fibrinogen, VWF, and d-dimer and the highest quintile of factor VIII. When fibrinogen, VWF, and factor VIII were modeled simultaneously (d-dimer was measured at a different visit), only fibrinogen and VWF remained significantly associated with PAD.

Conclusion: Hemostatic factors, particularly fibrinogen and VWF (as well as d-dimer), were independently associated with future risk of PAD. Our findings suggest the pathophysiological involvement of hemostasis in the development of PAD and potential usefulness of those factors for classifying long-term risk of PAD.


Funding: No

Funding Component:

P250

Emergency Room Consultations and Hospitalizations Following Generic Clopidogrel Commercialization in Quebec, Canada

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Background: Clopidogrel is widely used to prevent atherothrombotic events. Federal standards regulate bioequivalence of generic and brand-name drugs through comparative bioavailability studies but does not regulate clinical equivalence nor tolerability in “real-life” settings. We evaluated the impact of the generic clopidogrel commercialization on some adverse events: emergency room consultations (ER) or hospitalizations.

Methods: This is an interrupted time series analysis using the Quebec Integrated Chronic Disease Surveillance System. Rates of adverse events for clopidogrel users (n=75,130) aged ≥ 66 years were calculated monthly, 12 months before and 12 months after generics commercialization. Periods before and after generics
commercialization were compared by negative binomial segmented regression models for all users with a specific variable for generic and brand-name users after generics commercialization. **Results:** Generic clopidogrel analogs (n=6) were commercialized in 2012. There was an approximated monthly mean rate of 157 adverse events per 1000 brand-name and generic users-month. After generics commercialization, there was an immediate increase in rates of adverse events for generic vs. brand-name users (22 vs. 2%, \( p < 0.0001 \), Figure 1). This was explained by increased rates of ER (+22%) and hospitalizations (+20%) the month of generic clopidogrel commercialization. Hospitalization trend up to 1 year after generics commercialization was stable for generic users but reduced for brand-name users (-0.9 vs. -2.9%, \( p = 0.01 \)), while ER trends were comparable (-1.1 vs. -1.8%, \( p = 0.2443 \)). **Conclusion:** Among generic clopidogrel users, increased rates of ER and hospitalizations were observed soon after generics commercialization. The trend of hospitalizations was also affected following generic clopidogrel commercialization. Risk and survival analysis studies controlling for potential confounding are required to better characterize generic substitution.

**Disclosures:** **J. Leclerc:** A. Employment; Modest; Ex-employee Novartis Pharma (until June 2015). H. Other; Modest; Réseau québécois de recherche sur les médicaments and AbbVie PhD studentship (2015-2016). **C. Blais:** None. **L. Rochette:** None. **D. Hamel:** None. **L. Guénette:** None. **P. Poirier:** G. Consultant/Advisory Board; Modest; Abbott Vascular, Amgen, AstraZeneca, Boehringer Ingelheim, Bristol-Myers Squibb, Eli Lilly, Janssen, Merck, Novartis, NovoNordisk, Pfizer, Roche, Sanofi-Aventis, Servier, Valeant.

Funding: No

**Funding Component:**

**P251**

**Substitution to Generic Angiotensin II Receptor Blockers: Impact on Risk of Hospitalizations, Emergency Room Consultations and Mortality**

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**Background:** Substitution from brand-name to generic drugs is one way to reduce costs of pharmacological treatments. Generic drugs licensing is obtained through comparative bioavailability studies for which a variation of up to 20% is generally accepted. However, “real-life” efficacy and tolerance of generic drugs are not studied prior to commercialization. We aimed to evaluate the impact of brand-name to generic losartan, valsartan or candesartan substitution on serious adverse events (hospitalizations, emergency room consultations [ER] or mortality). **Method:** Three cohorts of persistent angiotensin II receptor blockers (ARB) users (losartan [brand-name and 8 generics], valsartan [brand-name...
and 5 generics) and candesartan (brand-name and 3 generics) aged ≥ 66 years were constituted using data from the Quebec Integrated Chronic Disease Surveillance System. Generic exposition was determined by substitution time-distribution matching. Time free of adverse events up to 365 days after the onset of generic exposition was compared between groups by survival analysis using Cox regression models adjusted for age, sex, comorbidities, concomitant treatments, socioeconomic status, previous brand-name drug, healthcare resources utilization and prescriber’s speciality, to provide hazard ratio (HR). Sensitivity analysis including non-persistent users was also conducted. Results: Within cohorts (losartan, n = 15,469; valsartan, n = 17,205; and candesartan, n = 25,008), proportions of exposed to generic substitution vs. unexposed who had at least one adverse event were respectively: 35% vs. 25%, 34% vs. 28% and 31% vs. 27% (all, p < 0.0001). When adjusted for potential confounders, risk of hospitalizations and ER were higher for those exposed to generic substitution. Specifically, HR for exposed to generic substitution are the following for losartan, valsartan and candesartan: hospitalizations (HR: 1.23 [p < 0.0001]; 1.22 [p < 0.0001] and 1.08 [p = 0.0317]) and ER (HR: 1.55; 1.20 and 1.16, all = p < 0.0001). Regarding mortality, HR were respectively: 0.63 [p = 0.1456]; 0.95 [p = 0.8487] and 0.43 [p < 0.0001]). Survival was not significantly different for exposed to generic losartan and valsartan substitution. However, even if the time free of hospitalizations and ER was 8% and 16% shorter for patients exposed to generic candesartan substitution, their survival was 2.3 times better when compared to patients who remained on brand-name candesartan (unexposed). Sensitivity analysis yield similar results. Conclusion: Substitution to generic antihypertensive drugs is associated with a significantly reduced delay before hospitalizations and ER for the three ARBs but a better survival for patients exposed to generic candesartan substitution only. Better bioavailability of generics versions of candesartan or differences in health cares between users could explain these differences.


Funding: No

Funding Component:

P252

Duration and Life-stage of Antibiotic Use and Risk of Cardiovascular Disease in Women

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**Background and Aims:** Growing data suggest that antibiotic use, which may alter the gut microbiome, is related to risk of cardiovascular disease (CVD) and mortality. However, evidence from prospective cohort studies is still scarce; and no large prospective study has investigated associations between cumulative antibiotic use during adulthood and risk of CVD. We aimed to examine duration of antibiotic use and risk of CVD among apparently healthy women from the Nurses’ Health Study (NHS).

**Methods:** This study included 36,922 women without history of myocardial infarction (MI), angina pectoris, stroke, or cancer in the NHS and with available data on total days of antibiotics use per year (0 to <15 days, 15 days to <2 months, or 2 months or more) during ages 20-39, 40-59 and after age 60, as reported on the 2004 questionnaire. Incidence of CVD (MI or stroke) over 8 years was assessed. Hazard ratios (HRs) were estimated as categories of duration of use compared with the none to <15 days per year group, using multivariate-adjusted Cox proportional hazards model including traditional risk factors (such as demographic variables, hypertension, diabetes, hypercholesterolemia, smoking, physical activity, Alternative Healthy Eating Index score, body mass index, aspirin, and anti-inflammatory medication), and reasons for antibiotics use (respiratory infection, urinary tract infections, acne or rosacea, chronic bronchitis, or dental), as well as other medications (such as H2 blockers, proton pump inhibitors), and other diseases (such as lung or kidney disease).

**Results:** As compared to women with “none to <15 days per year of use” during age 40-59 yr, those with a history of antibiotics use “15 days to < 2 months” or “2 months or more” had a significantly increased risk of CVD with an adjusted hazard ratio (HR [95%CI]) of 1.19 (1.03, 1.38) and 1.34 (1.08, 1.66), respectively. Reported use of antibiotics for 2 months or more per year after age 60 was also associated with a HR of 1.24 (1.02, 1.51) for CVD. A longer exposure of antibiotics use was more strongly associated with increased risk of stroke than MI. Antibiotic use during young adulthood (age 20-39) was not significantly associated with elevated risk of CVD.

**Conclusions:** Our results suggest greater duration of exposure to antibiotics in middle- and older adulthood may be related to an increased risk of future CVD, independent of traditional risk factors.


**Funding:** No

**Funding Component:**

**P253**

**Proton Pump Inhibitor Use is Positively Associated with Incidence of Cardiovascular Disease**

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**Introduction** - Proton pump inhibitors (PPIs) are used by an estimated 29 million Americans. PPIs increase the levels of asymmetrical dimethylarginine, a known risk factor for cardiovascular disease (CVD). Data from a select population of patients with CVD suggest that PPI use is associated with an increased risk of stroke, heart failure, and coronary heart disease. The impact of PPI use on incident CVD is largely unknown in the general population.

**Hypothesis** - We hypothesized that PPI users have a higher risk of incident total CVD, coronary heart disease, stroke, and heart failure compared to nonusers. To demonstrate specificity of association, we additionally...
hypothesized that there is not an association between use of H2-blockers - another commonly used class of medications with similar indications as PPIs - and CVD.

**Methods** - We used the Rochester Epidemiology Project’s medical records-linkage system to identify all residents of Olmsted County, MN on our baseline date of January 1, 2004 (N=140217). We excluded persons who did not grant permission for their records to be used for research, were <18 years old, had a history of CVD, had missing data for any variable included in our model, or had evidence of PPI use within the previous year. We followed our final cohort (N=58175) for up to 12 years. The administrative censoring date for CVD was 1/20/2014, for coronary heart disease was 8/3/2016, for stroke was 9/9/2016, and for heart failure was 1/20/2014. Time-varying PPI ever-use was ascertained using 1) natural language processing to capture unstructured text from the electronic health record, and 2) outpatient prescriptions. An incident CVD event was defined as the first occurrence of 1) validated heart failure, 2) validated coronary heart disease, or 3) stroke, defined using diagnostic codes only. As a secondary analysis, we calculated the association between time-varying H2-blocker ever-use and CVD among persons not using H2-blockers at baseline.

**Results** - After adjustment for age, sex, race, education, hypertension, hyperlipidemia, diabetes, and body-mass-index, PPI use was associated with an approximately 50% higher risk of CVD (hazard ratio [95% CI]: 1.51 [1.37-1.67]; 2187 CVD events), stroke (hazard ratio [95% CI]: 1.49 [1.35-1.65]; 1928 stroke events), and heart failure (hazard ratio [95% CI]: 1.56 [1.23-1.97]; 353 heart failure events) compared to nonusers. Users of PPIs had a 35% greater risk of coronary heart disease than nonusers (95% CI: 1.13-1.61; 626 coronary heart disease events). Use of H2-blockers was also associated with a higher risk of CVD (adjusted hazard ratio [95% CI]: 1.23 [1.08-1.41]; 2331 CVD events).

**Conclusions** - PPI use is associated with a higher risk of CVD, coronary heart disease, stroke and heart failure. Use of a drug with no known cardiac toxicity - H2-blockers - was also associated with a greater risk of CVD, warranting further study.


Funding: No

Funding Component:

**P254**

**Willingness to Restart Statins: The Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study**


**Introduction:** Many patients who discontinue statins due to side effects can restart treatment without the return of side effects. However, statin rechallenge is often met with resistance. Statins are associated with a larger absolute cardiovascular disease (CVD) risk reduction among high risk individuals, but it is unclear whether individuals with higher CVD risk are more willing to be rechallenged.

**Methods:** Between 2014 and 2016, 12,604 participants in the REasons for Geographic and Racial Differences in Stroke study completed a study examination and a questionnaire about their experiences with statins. Of 6,947 participants who reported ever having taken a statin, this analysis included the 688 (9.9%) who
reported having discontinued treatment due to side effects and who were not currently taking a statin. We asked participants whether they would be willing to restart a statin, and among those who answered no, we asked whether they were willing to restart at a lower dose or less frequently. Data from the study examination were used to define CVD risk factors and 10-year predicted CVD risk was calculated using the Pooled Cohort risk equations.

**Results:** Participant mean age was 62.4 years, 29.6% were African American, and 66.4% were women. Overall, 26.0% (n=179) of participants were willing to be rechallenged with a statin (Table). After adjustment for sociodemographic characteristics, older age, cigarette smoking, hypertension, diabetes, or history of CVD were not associated with an increased willingness to be rechallenged with a statin (Table). Higher 10-year predicted CVD risk was also not associated with willingness to be rechallenged.

**Conclusions:** Over a quarter of participants who discontinued statin treatment due to side effects were willing to be rechallenged. The presence of CVD risk factors and higher predicted CVD risk were not associated with increased willingness to be rechallenged with a statin.

**Disclosures:**

- **G.S. Tajeu:** None.
- **L.D. Colantonio:** None.
- **R.M. Tanner:** None.
- **K.L. Monda:** A. Employment; Significant; Amgen, Inc.
- **R. Dent:** A. Employment; Significant; Amgen, Inc., Esperion Therapeutics. F. Ownership Interest; Modest; Amgen, Inc., F. Ownership Interest; Significant; Esperion Therapeutics.
- **M.E. Farkouh:** C. Other Research Support; Significant; Amgen, Inc.
- **B. Taylor:** A. Employment; Significant; Amgen, Inc.
- **R.S. Rosenson:** B. Research Grant; Significant; Amgen, Inc, Astra Zeneca, Catabasis, Medicines Company. E. Honoraria; Significant; Kowa. G. Consultant/Advisory Board; Modest; Akcea, Amgen, Astra Zeneca, C5, Eli Lilly, Regenron, Sanofi. H. Other; Significant; Royalties.
- **M.M. Safford:** B. Research Grant; Significant; Amgen, Inc. G. Consultant/Advisory Board; Modest; Amgen, Inc.
- **P. Muntner:** B. Research Grant; Significant; Amgen, Inc.

**Funding:** No

**Funding Component:**

**P255**

**Use of Novel Oral Anticoagulants Among Patients With Atrial Fibrillation Increased Even in Those With Severely Impaired Kidney Function**

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Novel oral anticoagulants (NOACs) are increasingly prescribed as substitutes for warfarin in patients with atrial fibrillation (AF). All of the NOACs are at least partially renally cleared, but most trials excluded patients with severe kidney dysfunction. Despite this, labels include dosing for creatinine clearance 15–30 ml/min. The objective of the study was to estimate the prevalence of NOAC use over time among people with AF, stratified by stage of chronic kidney disease (CKD). Study population included 17,280 patients with AF and at least one prescribed anticoagulant (warfarin, dabigatran, rivaroxaban, or apixaban) between 2010 and 2016 in the Geisinger Health System, a large rural health care system in Pennsylvania. Medication information was obtained from both medication orders and records. Average age of the study population was 73.6 years,
46.6% (N=8,044) were women, 98.4% (N=17,009) were Non-Hispanic White, and average estimated glomerular filtration rate (eGFR) was 70.2 ml/min/1.73 m\(^2\). Over the course of 2010-2016, 3.0% (N=513), 6.9% (N=1,184) and 4.6% (N=792) received at least one prescription for dabigatran, rivaroxaban, or apixaban. NOAC ever-users (N=2,392) were younger (69.1 vs. 74.3 years, \(P<0.001\)) and had a higher eGFR (77.7 vs. 69.9 ml/min/1.73 m\(^2\)) than warfarin-only users (N=14,888).

Prescription of NOACs increased from 0% to 14.7% from 2010 to 2016 (\(P<0.001\)). Prescription of NOACs increased in each category of CKD (G1-2, G3 and G4-5, all \(P<0.001\)) (Figure 1). The most frequently prescribed NOAC in 2016 was rivaroxaban (8.2%) among those with eGFR>60 ml/min/1.73 m\(^2\) and apixaban (5.9% and 4.9%) among those with eGFR 30-60 ml/min/1.73 m\(^2\) and eGFR<30 ml/min/1.73 m\(^2\), respectively. Among the 22 patients prescribed apixaban with eGFR<30 ml/min/1.73 m\(^2\) in 2016, 22.7% (5 of 22) had eGFR<15 ml/min/1.73 m\(^2\). In conclusion, NOAC prescriptions increased among patients with AF in all stages of CKD. Further studies to quantify the effectiveness and safety of NOACs compared to warfarin by stage of CKD are warranted.


Funding: No

Funding Component:

P256

**Increased Risk of Ischemic Stroke in Adolescents and Adults with Congenital Heart Disease**

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**Introduction:** Improvements in the treatment of congenital heart defects (CHD) have resulted in the majority of infants born with CHD surviving into adulthood. This new population of adolescents and adults living with CHD have unique challenges for lifelong care, such as suffering prematurely from ischemic strokes.

**Hypothesis:** The aim of this analysis was to examine specific cardiovascular abnormalities that increase the risk of the early development of an ischemic stroke in individuals with CHD.

**Methods:** This study included all patients diagnosed with CHD age 18-65 that sought medical care from 2011 to 2013 at the University of Colorado Hospital, the only adult CHD clinic in Colorado. There were 3,255 individuals mean±SD age of 47±13 years diagnosed with a CHD. Marelli groups were created to categorize the severity of CHD and cardiovascular comorbidities (atrial fibrillation, hypertension, congestive heart failure, and diabetes mellitus) were extracted from the medical records. Logistic regression models were performed to evaluate the association between cardiovascular comorbidities and risk for stroke, adjusting for age, sex, race, insurance status and CHD severity.

**Results:** Of the 3,255 adolescents and young adults with CHD (52.3% male, 47.7% female), 146 (4.49%) were diagnosed with an ischemic stroke. The greatest proportion of ischemic strokes occurred in the shunt CHD severity group (Table). In the multivariable analysis of CHD patients, atrial fibrillation (OR=2.13, 95% CI 1.45-3.12, \(p=0.0001\)) and congestive heart failure (OR=2.60, 95% CI 1.52-4.44, \(p=0.0005\))
were associated with greater than a 2-fold increase in the odds of ischemic stroke after adjusting for age, sex, race, insurance status and CHD severity. Hypertension and diabetes mellitus were not associated with the risk of stroke.

**Conclusion:** Cardiovascular comorbidities were strongly associated with the development of an ischemic stroke in adolescents and adults with CHD independent of CHD severity.

**Disclosures:** L.M. Duca: None. D. Kao: None. A. Khanna: None. T. Crume: None.

**Funding:** No

**Funding Component:**

**P257**

**Prevalence Of Intracranial Artery Stenosis and the Association With Conventional Risk Factors of Cardiovascular Diseases in a General Population of Japanese: SESSA Study**

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Introduction: Community-based studies that report prevalence of intracranial artery stenosis (ICAS) assessed with magnetic resonance imaging (MRI) are scarce.

Hypothesis: We aim to describe the prevalent ICAS using MRI in a general population of Japanese men, and tested the hypothesis that ICAS was associated with conventional cardiovascular risk factors.

Methods: The Shiga Epidemiological Study of Subclinical Atherosclerosis (SESSA) randomly recruited and examined participants from Kusatsu City, Shiga, Japan in 2006-2008. Among 853 male participants in the follow-up exam (2012-2015), we performed 1.5-tesla MRI. All images were evaluated by two board-certified neurosurgeons (by the Japan Neurosurgical Society) who were blinded to participant clinical background. Each artery was graded as no stenosis, <50% stenosis, <99% stenosis and complete occlusion. We defined any-ICAS as ICAS of any grade and heavy-ICAS as ≥50% stenosis. We used multivariable logistic regression to assess independent association between ICAS and risk factors including hypertension, diabetes mellitus (DM), dyslipidemia, smoking, drinking, obesity (body mass index ≥30kg/m²) and history of stroke.

Results: We analyzed 740 men (47-85 years old, mean age 70.0 years) who completed MRI with no missing pertinent information. Thirty-one individuals (4.2%) had history of stroke. We observed at least one lesion of any-ICAS and heavy-ICAS in 30.5% and 6.5% of the participants, respectively. Any-ICAS was most commonly identified in internal carotid artery (21.6% of the entire participants) followed by middle cerebral artery (11.7%). Older age, hypertension, DM, dyslipidemia and prevalent stroke was associated with ICAS. Hypertension and DM were particularly strongly associated with heavy-ICAS (Table). Results were similar when excluding those with stroke history.

Conclusions: This is the first study on prevalence of ICAS and its association with conventional cardiovascular risk factors in a general population of Japanese men. The prevalence of ICAS in Japanese men and the
association with primary risk factors of cardiovascular diseases are revealed and they could be a target for prevention of stroke.


Funding: No

Funding Component:

P258

Racial Disparity in 90-Day Post-Stroke Readmission - An MUSC Perspective

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Background: Readmissions after acute hospitalizations are a cause of both risk and expense, and many of them are potentially preventable. Importantly, risk-standardized hospital readmission rates are sometimes used as a yardstick of the quality of care offered. However, racial variability in readmissions might involve factors beyond quality of care and has not been studied extensively. Objective: To identify differences in readmissions between African Americans and other races and determine preventable readmissions from a pragmatic viewpoint. Methods: We obtained deidentified data from Medical University of South Carolina (MUSC) Electronic Data Warehouse (EDW) on adult admissions with index diagnosis considered as an ischemic stroke (or closely related) using International Classification of Diseases, Ninth Revision (ICD-9) codes 433.x, 434.x, 436.x, 437.x between January 2011 and June 2014. Of these, we determined readmission and reason for readmission over 90-day period. Readmission can be hospital or emergency room readmission. We obtained race as the only linked demographic. Results: Of the 1953 patients admitted with index diagnoses of stroke, 765 (39%), 1148 (59%) and 50 (1%) were African Americans, Caucasians and others, respectively. At 90-days, 256 patients were readmitted as in-patient, of which 128 (50%), 126 (49%) and 2 (1%) were African Americans, Caucasians and others, respectively. On the other hand, 241 patients visited Emergency Room, of which 175 (73%), 65 (26%) and 1 (1%) were African Americans, Caucasians and others, respectively. On adjusting readmissions to index admissions, 17%, 11% and 4% of African Americans, Caucasians and others, respectively, were readmitted in hospital, while 23%, 6% and 2% of African Americans, Caucasians and others, respectively, visited Emergency Room over 90-days period. Conclusions: 90-days readmission rates involve African Americans in a disproportionate manner. This demands further investigation on the etiology of readmission and the care offered.


Funding: Yes

Funding Component: National Center

P259

Smoking Increases Risks of Death and Stroke in Both Men and Women. Absolute Risk Difference of Stroke is Likely to be Larger in Women

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**Background:** Smoking is an important risk factor for cardiovascular disease, however, to what extent smoking increases excessive deaths and strokes in a general population has not been sufficiently examined especially in women.

**Methods:** A total of 10,382 female and male participants aged 65 years or older were divided into two groups according to smoking status (current smoker; never smoker). Past smokers were excluded. Main outcomes were all-cause death and incident stroke. Age-adjusted mortality and incidence rates were estimated in the groups using Poisson's regression analysis. Age-adjusted rate ratios (RR) and excess events (EE per 1000 person-years) attributable to smoking were determined using the rate in never smokers as a reference.

**Results:** There were 1410 deaths and 735 strokes during the 9.0-year observation period (90,099 person-years). Smoking contributed to a 2.3-fold higher risk of death in women and 1.8-fold higher risk in men. It contributed to 12 excess deaths per 1000 person-years in both men and women. The rate ratio and excessive events of stroke were likely to be higher in women than those in men (RR: 2.6 vs. 1.6; EE: 9.3 vs 5.0, see table).

**Conclusion:** Smoking significantly increases risks of death and stroke not only in men but also in women. Absolute risk difference of stroke attributable to smoking is likely to be larger in women than in men.


**Funding:** No

**Funding Component:**

**P260**

**Patients Experiencing Homelessness Have Longer Hospital Lengths of Stay After Admission for Ischemic Stroke or TIA**

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**Introduction:** There is little information available regarding stroke care and outcomes specific to patients experiencing homelessness. This study assesses the provision of stroke care and outcomes for these patients and identifies opportunities to improve their care.

**Methods:** Data was obtained from a large, multi-state health system’s Get With The Guidelines registry for patients discharged between January 2009 and September 2016. Patients with an ischemic stroke or transient ischemic attack (TIA) were included. Patients with time of last known well (LKW) to hospital arrival of more than two weeks or hospital arrival to CT times of more than two days were excluded. Homeless patients were matched to non-homeless patients with a 1:5 ratio using case control matching on age, stroke type, gender and year. Patient characteristics between homeless and housed patients were compared before and after matching using t-tests, Mann Whitney tests, or chi-squared tests, as appropriate. Primary outcomes were discharge modified Rankin score (mRs), with disability categorized as none/slight (mRs ≤ 2) or moderate or greater (mRs > 3) and length of stay (LOS). Logistic regression was used to analyze the relationship between homeless status and mRs, and Cox proportional hazards regression was used to assess the effect of homelessness on LOS. LKW to hospital arrival time and admit National Institutes of Health.
Stroke Scale (NIHSS) score were added as covariates to both models. Adjusted odds ratios (AOR) and hazards ratios (AHR), and their corresponding p-values were reported.

**Results:** A total of 20,516 patients met inclusion criteria with 28 experiencing homelessness. Prior to matching, homeless patients were more likely to be male (78.6% vs 48.9%, p=.007), younger (58 vs 72 years, p<.001) and have longer median LKW to arrival times (921 vs 386 minutes, p=.066). After matching, the analytic sample size was 168 patients with 16.7% (n=28) experiencing homelessness and 83.3% (n=140) housed. Multivariable analyses indicated that homeless patients leave the hospital at a slower rate compared to the non-homeless (AHR=0.666, p=.056). They also had lower disability scores at discharge (AOR=0.104, p=.095); however, this result only approached significance.

**Conclusion:** Patients experiencing homelessness had longer LKW to hospital arrival times indicating an opportunity for targeted intervention around the need for quick arrival after symptoms. In addition, homeless patients also had longer LOS which is likely related to challenges in safely discharging this population. Further research with a larger number of patients is needed in order to compare other aspects of acute stroke care, including treatment rates and time to treatment, and assess ways to address the challenges of shortening last known well to arrival times and safe discharge.

Disclosures: **L. Corless:** None. **L. Lucas:** None. **E. Baraban:** None.

**Funding:** No

**Funding Component:**

**P261**

**HIV-positive Individuals With Undetectable Viral Loads Have suPAR Levels Comparable to HIV-negative Individuals**

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**Introduction:** Individuals with poorly-controlled HIV have high levels of plasma soluble urokinase plasminogen activator receptor (suPAR), a marker of immune activation associated with all-cause mortality, incident myocardial infarction and HIV-associated nephropathy in HIV-positive individuals. Data is conflicting regarding the effect of viral suppression on suPAR levels in HIV-positive individuals, or how these levels compare to individuals without HIV.

**Hypothesis:** HIV-positive individuals with undetectable viral loads (VLs) will have similar levels of suPAR compared to individuals without HIV.

**Methods:** Plasma suPAR was measured by ELISA in 273 HIV-positive (70% Black [n=167], age 42 ± 8 years, 86% female [n=240], 56% detectable viral load [n=150]) and 276 HIV-negative (63% Black [n=169], age 40 ± 9 years, 96% female [n=265]) outpatients. Demographics, medical history and laboratory samples were collected.

**Results:** Compared to HIV-negative individuals, HIV-positive subjects were older (p<0.01), less likely to be female (p<0.001), had lower body mass index (28 ± 7 vs. 30 ± 8 kg/m², p<0.001) and worse renal function (eGFR 92 ± 19 vs. 97 ± 20 mL/min/1.73 m², p=0.004). Median suPAR level was similar for HIV-negative and HIV-positive subjects with undetectable VLs (2436 [1908, 3380] vs. 2667 [1966, 4034] pg/mL, p=0.256), and both were significantly lower compared to HIV-positive subjects with detectable VLs (4252 [3099, 5369] pg/mL, p<0.001).

Within HIV-positive subjects, a detectable viral load was an independent predictor for high suPAR (OR 2.37 [95% CI 1.07-5.25], p=0.03)
after controlling for age, race, sex, body mass, smoking history, hypertension, diabetes, eGFR and CD4+ count.

Conclusions: In conclusion, HIV-positive individuals with undetectable VLs have similar levels of suPAR compared to those without HIV. Lower suPAR levels may account for the lower incidence of cardiovascular events and HIV nephropathy in patients with well-controlled HIV.

Introduction: With improved antiretroviral therapy, the life expectancy of people living with human immunodeficiency virus (HIV) has increased. However, these individuals are now more susceptible to developing cardiovascular diseases (CVD). Prior studies examining the association between HIV and hepatitis C virus (HCV) co-infection and the risk of CVD, compared to HIV mono-infection, have differed in their conclusions. We conducted a systematic review and meta-analysis to clarify and quantify the association between HIV/HCV co-infection and CVD risk. We hypothesized that CVD risk will be synergistically increased by the persistent inflammatory responses of both viruses.

Methods: We searched EMBASE, CINAHL, Google Scholar, PubMed, and Web of science from inception to October 2016 to identify studies on HIV/HCV co-infection and CVD, defined as coronary artery disease, congestive heart failure and stroke. The search was supplemented with a review of the reference list of articles. We used a random-effects model to abstract and pool data on the hazard ratios (HRs) for CVD. Hazard ratios were adjusted for traditional CVD risk factors.

Results: Among the 280 articles reviewed, 4 cohort studies met the inclusion criteria with a total of 33,723 participants. Of these, 8,109 (24%) were HIV/HCV coinfected, 18,958 (56%) were HIV monoinfected while 6,656 (20%) comprised HCV monoinfected, HIV uninfected, and HIV/HBV coinfected participants. Pooled adjusted HRs for the association between HIV/HCV co-infection and CVD was 1.24 (95% CI 1.07-1.40) compared to HIV mono-infection. Test for homogeneity was not statistically significant \(I^2 = 0.0\%, \text{P}=0.397\) (Figure).

Conclusion: We found a consistent positive association showing that individuals with HIV/HCV coinfection had an increased CVD risk compared to those with HIV mono-infection. However, more research is needed to further examine this association, determine potential underlying mechanisms and evaluate whether treatment for HIV and HCV infections can reduce CVD outcomes.
Adjudication of Heart Failure (HF) in an Electronic Cohort of Human Immunodeficiency Virus-infected (HIV+) Persons

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Background: Analyses of administrative data suggest that HIV+ persons have elevated risks for HF from HIV-related and traditional cardiovascular disease (CVD) risk factors. However, none of these studies adjudicated HF diagnoses, which is essential given poor agreement between administrative coding and physician adjudication. We sought to create a reproducible protocol for identifying and adjudicating HF in HIV+ persons and to compare characteristics between those with and without adjudicated HF.

Methods: We screened for and adjudicated HF diagnoses in a cohort of 5,052 HIV+ persons receiving care at an academic center. Screening for possible HF included any of the following: 1) HF diagnosis code, 2) B-type natriuretic peptide (BNP) >100 pg/mL, or 3) intravenous diuretic use. Two physicians then independently reviewed all records. Definite HF was adjudicated if all of the following were present: HF symptoms, physician diagnosis, HF medication use, and objective evidence of myocardial dysfunction. Demographics and clinical characteristics were compared for HIV+ patients with screened+/adjudicated+ HF, screened+/adjudicated- HF, and those who screened- for HF.

Results: There was >96% agreement in HF diagnoses between the two adjudicators (Kappa = 0.91). Race differed significantly across the three groups, with more black patients among those with adjudicated+ HF (Table 1). Patients with adjudicated+ HF were significantly more likely than patients who screened+/adjudicated- HF to have diabetes, hypertension, atrial arrhythmias, a diagnosis of myocardial infarction, and any smoking history (p<0.001 for all). Patients who screened+ for HF (whether adjudicated+ or -) tended to have more advanced HIV than those who screened- based on nadir CD4 T cell count and peak HIV viral load (Table 1).

Conclusions: There are significant clinical differences between HIV+ patients with and without adjudicated HF. These findings underscore the importance of adjudicating HF in future studies characterizing CVD for HIV+ persons.
Cardiovascular disease (CVD) is an important cause of morbidity and mortality among HIV-infected adults. Calculating an individual's excess heart age, or the difference between their chronological age and predicted heart age, can be useful in describing their risk for developing CVD and motivating behavior change to decrease their CVD risk. The overall mean excess heart age is 7.8 and 5.4 years among U.S. men and women, respectively. We evaluated excess heart age among HIV-infected adults in medical care using sex-specific, cholesterol-based models developed from Framingham general CVD risk prediction equations. Included were HIV Outpatient Study (HOPS) participants aged 30-74 y, who had 2 HOPS clinic visits during 2010-2014, had no prior CVD at the start of observation, had >1 y of follow-up, and had non-missing data for all covariates. Age-standardized (2010 U.S. census) and weighted means, prevalence and 95% confidence intervals (CIs) were calculated for participant chronological age, predicted heart age, and excess heart age. From 5,088 HOPS participants assessed for eligibility, 1905 men and 584 women were included in the analysis. Heart age exceeded chronological age by 11.3 and 11.9 y among men and women, respectively (Table). Excess heart age was greatest among non-Hispanic Blacks, persons aged 50-59 y, those with less than high school education, and women with a median CD4+ count ≥500 cells/µL. Predicted heart age was higher than chronological age among HIV-infected men and women and surpassed excess heart age estimates observed in the general U.S. population. Greater excess heart age among HIV-infected adults might result from demographic differences, higher frequency of CVD risk factors including smoking, diabetes, HIV-associated excess chronic inflammation, and possibly lower use rates of antihypertensive or statin drugs. Routine clinical use of heart age calculation may help optimize CVD risk communication and interventions for aging HIV-infected persons.
Results
The sample was 58% female and 28% black, with a mean age of 75.2 years. The incidence of depressive symptoms and low adherence were 7.7% and 7.2%, respectively. The indirect effect (IE) – the portion of the effect of incident depressive symptoms on incident low adherence that is explained by self-efficacy - was significant for women (IE=0.029 95% CI 0.005, 0.068), such that 34.1% of the total effect of incident depressive symptoms on incident low adherence was explained by self-efficacy. The IE for women was significantly different from that for men (IE=-0.003 95% CI -0.019, 0.006). The direct effect of incident depressive symptoms on incident low adherence – the portion of the effect that is not explained by self-efficacy – was significantly different for women and men (direct effect (DE)=0.056 95% CI -0.082, 0.155 and DE=0.205 95% CI 0.060, 0.323, respectively).

Conclusions
Self-efficacy explains some of the relationship between incident depressive symptoms and incident low adherence for women, but not for men.

Purpose
Low adherence to antihypertensive medication is associated with poor cardiovascular outcomes and increased healthcare costs. Less is known about how low adherence relates to health-related quality of life (HRQOL) over time. We tested whether low adherence to antihypertensive medications predicts a decline in HRQOL over one year using data from the Cohort Study of Medication Adherence among Older Adults (CoSMO).

Methods
A telephone survey was administered to hypertensive older adults three times at yearly intervals. Three measures of low adherence captured at first follow-up were used: pharmacy fill (low adherence defined as proportion of days covered (PDC) <0.8), self-report using the 8-item Morisky Medication Adherence Scale (MMAS-8) (low adherence defined as a score <6), and self-report using a published 4-item scale by Krousel-Wood and colleagues (K-Wood-4) (low adherence defined as a score >0). HRQOL was measured using the RAND Medical Outcomes Study 36-item tool. Low HRQOL was defined in two ways: Mental and Physical Component Summary scores (MCS and PCS, respectively) in the lowest tertile. Decline in HRQOL was defined as a ≥10 point decrease from first to second follow-up. Separate multivariable logistic regression models were used to obtain odds ratios (OR) and 95% confidence intervals (CI) for declines in MCS and PCS, after adjusting for sociodemographic and clinical factors. The analysis predicting a decline in MCS was restricted to those without low MCS at first follow-up (n=1234), while the analysis predicting a decline in PCS was restricted to those without low PCS at first follow-up (n=1225).

Results
The sample was 58.2% female and 30.0% black with a mean age of 74.9. Among those without low MCS at first follow-up, the incidence of low MCS at second follow-up was 21.6%; the incidence of low PCS at second follow-up was 15.7% among those without low PCS at first follow-up. After adjusting for sociodemographic and clinical factors, low adherence at first follow-up as measured by the K-Wood-4 was associated with a decline in MCS over one year (OR=1.85, 95% CI 1.13, 3.05), but not with a decline in PCS (OR=0.73, 95% CI 0.47, 1.14). Neither PDC nor MMAS-8 measures predicted declines in MCS or PCS over one year.

Conclusions
Low adherence to antihypertensive medication as measured by the K-Wood-4 predicts a decline in MCS, but not PCS, over one year among older adults with hypertension. Efforts to address low adherence may improve HRQOL for older adults.


Funding: No

Funding Component:

P267

Paradoxical Association Between Breastfeeding Duration and Hypertension in Later Years in Parous Korean Women: A Nationwide, Population-based Study

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Background: The World Health Organization (WHO) recommends exclusive breastfeeding from birth to 6 months, the introduction of nutritious complementary foods at 6 months and continued breastfeeding up to 2 years or above. A U-shaped association between duration of breastfeeding and systolic blood pressure (BP) or hypertension was reported. However, multiple studies have yielded inconsistent findings. Method: Among subjects who participated in the Korea National Health
and Nutrition Examination Survey conducted in 2010-2012, a total of 5,011 parous female, aged over 19 years old were analyzed. Hypertension was defined based on JNC 8 guidelines, or a self-reported current use of antihypertensive medications. Based on the JNC 8 criteria, for patients 60 years of age or older who did not have diabetes or chronic kidney disease, a blood pressure goal of less than 150/90 mmHg was the target goal or diagnosis. The blood pressure goal of diagnosis and control is less than 140/90 mmHg for patients 18 to 59 years of age without major comorbidities, and those 60 years of age or older who had diabetes, chronic kidney disease, or both conditions. We divided the duration of breast feeding into none, less than 6 months, less than 1 year and more than 6 months, less than 2 years and more than 1 year, and more than 2 years.

**Results:** The distribution of systolic and diastolic BP and hypertension prevalence showed U-shape pattern in non-obese women (BMI < 25 kg/m²). Those who breastfed less than 6 months had the lowest blood pressure (123.7±1.1 mmHg for mean systolic BP and 74.2±0.7 mmHg for mean diastolic BP; P=0.06), as well as the lowest prevalence of hypertension (14.6%; P < 0.001) in non-obese women. With increasing duration of breastfeeding, no specific trend was observed in obese women. In non-obese women with BMI < 25 kg/m², compared to women with duration of breast feeding less than 6 months, the odds of hypertension was significantly higher in women with breast feeding more than 2 years in women with [odds ratio (OR): 1.72, 95 % confidence interval (CI): 1.10-2.70], after adjusting for age, body mass index, smoking, drinking alcohol, exercise, income, and education. However, there was no significant association between duration of breastfeeding and hypertension control. **Conclusion:** Our findings suggest that longer duration of breastfeeding might not protect against hypertension in later ages. Previously, breast feeding could be helpful to mother after delivery to normalize her body weight, metabolic panel derangement, however, longer duration of breast feeding especially in non-obese women would not contribute to hypertension prevention. Further prospective studies are warranted to confirm this association.

Disclosures: **H. Lee:** None. **K. Han:** None. **Y. Park:** None.

Funding: No

Funding Component: P267

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**Funding:** No

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Disclosures: **H. Lee:** None. **K. Han:** None. **Y. Park:** None.

**Funding:** No

**Funding Component:**

**P268**

**Impact of Overweight and Obesity in Prevalence and Management of Hypertension**

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**Background:** Obesity defined by body mass index (BMI) and waist circumference (WC) can affect the epidemiology of hypertension differently, however, there were not enough large national wide hypertension studies using two measurements. Some research reported both were associated with diseases including hypertension in a different way such as gender-specifically. So, we will evaluate the prevalence, awareness, treatment, and control of hypertension according to obese status using nationally representative data **Materials and Methods:** Among adults aged ≥19 years who participated in the Korean National Health and Nutrition Examination Survey between 2008 and 2010, a total of 20,578 subjects (8,777 men and 11,801 women) were analyzed according to BMI and WC. General obesity was defined as BMI ≥ 25 kg/m² and abdominal obesity was defined as WC ≥ 90 cm in men and ≥ 80 cm in women, both of which were based on the Asian-pacific criteria. We applied a blood pressure goal of less than 150/90 mmHg for patients 60 years of age or older who did not have diabetes or chronic kidney disease. Patients 18 to 59 years of age without major comorbidities, and those 60 years of age or older who had diabetes, chronic kidney disease, or both conditions, the new blood pressure goal is less than 140/90 mmHg. **Results:** There was the significant increase in the prevalence of hypertension as BMI and WC increased in both genders. Prevalence of hypertension in men was 21.1%, 30.7%, 39.6%, 51.6% with BMI less than 23 kg/m² (normal weight), less than 25 kg/m² and more than 23 kg/m² (overweight), less than 30 kg/m² and more than 25 kg/m² (obese grade I), more than 30 kg/m² (obese grade II), respectively. Prevalence of hypertension in women was 13.1%, 27.4%, 40.2%, and 49.2% in each BMI group. In addition, a prevalence of hypertension was higher in obese individuals than non-obese
individuals in all age groups. In women, awareness increased as BMI and WC increased ($p$ for trend $<0.001$), whereas, control rate has been significantly decreased with increasing BMI ($p$ for trend $= 0.02$). With increasing WC in women, control of blood pressure among treated persons also tended to decrease ($p$ for trend $= 0.04$). However, control rate was not different according to both general and abdominal obese status in men. Compared to those in other age groups, young obese adults less than 40 years had the relatively lower prevalence of hypertension (34.3%) but also had lower awareness (16.8%) and treatment (60.7%). Conclusion: Our findings show that prevalence of hypertension was associated with increasing BMI and WC in both genders, suggesting that obese persons were prone to have hypertension. Control of blood pressure in women was decreased with increasing BMI and WC, suggesting that obese women might be an important target for hypertension control. Lower awareness and treatment of hypertension in young obese adults are not negligible.


Funding: No

Funding Component:

P268

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abdominal obese status in men. Compared to those in other age groups, young obese adults less than 40 years had the relatively lower prevalence of hypertension (34.3%) but also had lower awareness (16.8%) and treatment (60.7%). **Conclusion:** Our findings show that prevalence of hypertension was associated with increasing BMI and WC in both genders, suggesting that obese persons were prone to have hypertension. Control of blood pressure in women was decreased with increasing BMI and WC, suggesting that obese women might be an important target for hypertension control. Lower awareness and treatment of hypertension in young obese adults are not negligible.


Funding: No

Funding Component:

**P268**

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have hypertension. Control of blood pressure in women was decreased with increasing BMI and WC, suggesting that obese women might be an important target for hypertension control. Lower awareness and treatment of hypertension in young obese adults are not negligible.


Funding: No

Funding Component:

P269

Self-reported Dietary Sodium Intake and Six-year Change in Systolic Blood Pressure Among Diverse US Hispanics/Latinos: Preliminary Longitudinal Results From the Hispanic Community Health Study/Study of Latinos

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Introduction: Excess sodium intake is common across all age, sex, racial, and ethnic groups in the US and remains an important modifiable risk factor for elevated blood pressure (BP), a leading contributor to cardiovascular disease. While multiple 24-hour urinary measures of sodium excretion are the preferred objective measure of sodium intake, multiple standardized, interviewer-administered 24 hour dietary recalls offer a useful surrogate measure for longitudinal group comparisons, especially unique among US Hispanics/Latinos of diverse backgrounds. Objectives: To assess whether dietary sodium intake was associated with change in systolic blood pressure (SBP) over six years, overall and by use of BP lowering medication. Methods: The Hispanic Community Health Study/Study of Latinos is an ongoing prospective population-based study of 16,415 diverse Hispanics/Latinos aged 18-74 yr from four US communities. Visit 1 (baseline) was conducted in 2008-2011, and visit 2 is currently ongoing (2014-2017). Dietary sodium intake was averaged from two interviewer-administered 24-hour diet recalls collected at visit 1. Likewise, SBP was the average from three seated measurements in visit 1 and about six years later in visit 2. Change in SBP from visit 1 to visit 2 was calculated. Using linear regression models adjusted for age, sex, study site, follow-up years, Hispanic/Latino background, education, income, nativity, diabetes, chronic kidney disease, dyslipidemia, family history of CVD, BMI, smoking, alcohol use, physical activity, and energy intake, we estimated the association of a 500 mg/day increment of sodium intake on change in SBP. Models were further stratified by self-reported use of BP lowering medication at visit 2. Results: The sample includes 7,904 adults who attended visit 2 by September 2016; average follow-up time was 5.8 years (SE: 0.02). At visit 1 mean age was 44.5 years (SE: 0.05); 57% were female (SE: 0.86). Overall, mean sodium intake was 3171 mg/day (SE: 33); a 500 mg higher sodium intake was associated with a 0.33 mmHg increase in SBP (95% CI: 0.07, 0.60). Among individuals not reporting taking BP lowering medication, mean sodium was 3,181 (SE: 34) and a 500 mg higher sodium intake was associated with a non-significant 0.29 mmHg increase in SBP (95% CI: -0.00, 0.58). Among individuals on BP lowering medication, mean sodium intake was 2,966 (SE: 50) and a 500 mg higher sodium intake was significantly associated with a 0.61 mmHg increase in SBP (95% CI: 0.11, 1.11). Conclusions: Among a large sample of diverse US Hispanics/Latinos, higher sodium intake was associated with small SBP increases in approximately six years. The effect
of sodium on elevated SBP was stronger among individuals on BP lowering medications.


Funding: No

Funding Component:

P270

Long-Term Benefits of Blood Pressure Lowering in Young Adulthood: A Computer Simulation Study

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Introduction Extended periods of exposure to elevated blood pressure (BP) in early adult life contribute independently to later life coronary heart disease (CHD) risk. Currently, there are significant gaps in hypertension awareness, treatment, and control in young adults. The long-term health benefits of controlling high BP in young adults have not previously been quantified. Objective This study aimed to project CHD prevention benefits from controlling raised blood pressure starting in early adulthood compared with control at age 40 or older. Method A state-transition microsimulation model estimated individual-level CHD outcomes, dependent on risk factors exposures and accounting for competing risk of stroke or non-cardiovascular death. Risk for first CHD event after age 40 was conditioned both on time-weighted average of early adult (ages 20-39) diastolic blood pressure (DBP), and raised DBP or systolic blood pressure (SBP) at age ≥ 40. We simulated CHD outcomes in a cohort of US adults with DBP ≥ 85 mmHg any time in young adulthood in 3 scenarios: no treatment, later life SBP control alone, or early DBP control plus later life BP control. Results By age 39, 2.2% of the CVD-free young adult U.S. population was estimated to have early elevated DBP and was eligible for treatment. With follow up until age 69 years, early BP control prevented twice the number of primary CHD events (Table). Conclusion This study quantifies the opportunity cost of failing to control hypertension identified in young adulthood. It is unclear whether early blood pressure control should be achieved by lifestyle or pharmacological intervention.


Funding: No

Funding Component:

P271

Association Between Nitric Oxide Synthase Gene Polymorphism (Glu298Asp) and Blood Pressure in Older Adults: The Atherosclerosis Risk in Communities (ARIC) Study

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Introduction: Endothelial NO synthase (eNOS) gene polymorphism at position 894 (G>T, Glu298Asp) resulting in a T allele is related to higher blood pressure (BP) levels, but the association of Glu298Asp and temporal increase in BP in adulthood has not been studied, nor is
it known whether the association between Glu298Asp and BP is modified by habitual intake of fruits and vegetables, an abundant source of nitrate for conversion to NO. Hypothesis: We hypothesized that homozygous (TT) or heterozygous genotype (GT) status of Glu298Asp is associated with BP increase over a course of 9 years among black and white adults, compared to normal genotype (GG). Further, the association is amplified by higher habitual intake of fruits and vegetables.

Methods: Among 9488 white (mean age: 54.3 years, 47.0% men) and 2861 black members of the ARIC cohort (mean age: 53.4 years, 37.2% men) at baseline (1987-1989), genotyping of the NOS3 Glu298Asp polymorphism (rs1799983) was conducted using the TaqMan assay (Applied Biosystems, Foster City, CA, USA). The rs1799983 levels 1.5-2, 0.5-1.49, <0.5 were categorized as TT, GT, GG, respectively. We used the average of repeated sitting blood pressure at 4 cohort examinations through 1996-1998. Average intake of vegetables and fruit was calculated from food frequency questionnaires at exams 1 and 3, and analyzed as quartiles. A diet score without fruit and vegetables intake was created using principal component analysis. Mixed models were used to estimate the association between NOS3 G894T (TT or GT vs. GG) with level and change of SBP and DBP, adjusting for age, sex, genotypes, BMI, smoking status, diabetes, and physical activity. The analysis was also conducted within each quartile of vegetables and fruit intake, with further adjustment for the diet score without fruit and vegetables intake.

Results: The genotypes of TT, GT and GG of Glu298Asp were present in 800 (8.4%), 4057 (42.8%), 4631 (48.8%) white participants, and 26 (0.9%), 510 (17.8%), 2335 (81.3%) black participants. Among whites with the genotype GT/TT, DBP increased 2.46 mmHg (95% CI: 0.02, 4.90) over 9 years compared to GG participants. The interaction between Glu298Asp and intake of fruit and vegetables was not statistically significant. There was no statistically significant association between GT/TT and SBP, nor with 9-year change of SBP or DBP among black participants.

Conclusion: Carrier status of the GT/TT genotypes of Glu298Asp is associated with higher level of DBP among white adults, but not with SBP over a course of 9 years compared to the GG genotype of Glu298Asp. There is no interaction found between Glu298Asp and intake of fruit and vegetables in association with SBP or DBP.


Funding: No

Funding Component:

P272

Relationship of Potato Consumption, Total and by Preparation Method With Blood Pressure and Body Mass Index: The International Population Study on Macronutrients and Blood Pressure (INTERMAP) US Study

Background: Limited evidence from prospective US cohort studies suggests that higher potato intake is associated with a higher risk of hypertension and obesity. Different preparation methods affect the nutritional composition of potatoes and are related to different dietary choices that may influence associations with blood pressure and body mass index (BMI).

Objective: To investigate potato consumption, total and by preparation method, in relation to blood pressure and BMI.

Methods: We used cross-sectional data of 2,195 participants aged 40 to 59 in 1996-1997 from the United States samples of the population-based INTERMAP study. During four visits, four in-depth multipass 24-hour dietary recalls and eight blood pressure measurements were collected. Reported potato intakes were categorized as fried and non-fried potatoes, using the USDA food grouping system. Potato intakes (g/1000 kcal) were averaged over four days. Regression coefficients per 2SD higher intake were estimated using multivariate linear regression analyses with adjustments for age, sex, sample, lifestyle and disease factors, and other food groups. To assess influence on the association, diet quality (by Dietary Approaches to Stop Hypertension adherence score), BMI, urinary sodium and potassium were added separately to the previous model.

Results: Median intake of total, non-fried, and fried potatoes were 40 g/d, 23 g/d and 8 g/d, respectively. Total and non-fried potato intakes were not associated with blood pressure. The association between fried potatoes and blood pressure varied by sex (P for interaction=0.03). In women, higher fried potato intake (2SD: 20 g/1000 kcal) was associated with a +3.00 mmHg (95%CI: 1.29, 4.71) higher systolic and +1.26 mmHg (95%CI: 0.15, 2.38) higher diastolic blood pressure, which prevailed after additional, but separate, adjustments for BMI, diet quality, urinary sodium and potassium. Potato chips contributed predominantly (79%) to fried potato intake and accounted for the direct association of fried potatoes and blood pressure (+3.77 mmHg systolic (95%CI: 1.92, 5.62), and +1.80 mmHg diastolic (95%CI: 0.62, 2.98)). The association between fried potatoes and blood pressure was not found in men. In the total population, higher fried potato intake was positively associated with BMI (+0.62, 95%CI: 0.14, 1.09) but attenuated after adjustment for diet quality. Total and non-fried potatoes were not associated with BMI.

Conclusions: In contrast to non-fried potato intake, fried potato consumption was directly related to blood pressure in women. This finding is in line with results of previous US cohort studies and suggests that the association of potatoes with blood pressure may depend on preparation method.


Funding: No

Funding Component: P273

Longitudinal Association Between Body Weight Change and 6-year Change of Blood Pressure in Japanese Men

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Objective: Overweight is associated with increases in the risks of hypertension and cardiovascular disease. However, long-term and especially repeated measures analysis about relationship between body weight (BW) change and blood pressure (BP) change is only a little. We investigate the longitudinal relationship between BW change and years-long change of BP in a prospective cohort study.
Participants: A total of 2546 male employees aged 25-53 years without use of antihypertensive drug in a metal products factory in Japan.

Measurements: The BP was annually measured once in the right arm after 5 min of rest in a seated position, by well-trained nurses using a standard mercury sphygmomanometer from 2003 (baseline) to 2009. Physical examinations and information on lifestyle and use of medicine were annually measured or confirmed during the same period. The associations between difference of BW from 2003 to 2008 and 6-years change of systolic and diastolic BP from 2003 to 2009 were analyzed with generalized estimating equation models. Covariates in full adjusted model were age, body mass index, and smoking and drinking status in baseline.

Results: Mean ± standard deviation (SD) of age, height, and BW in 2003 was 39.3 ± 8.0 years, 170.6 ± 6.0 cm, and 68.2 ± 9.9 kg, respectively. Mean ± SD of BW in 2008 was 68.8 ± 10.2 kg. Mean ± SD of systolic and diastolic BP in 2003 were 119.7 ± 14.6 and 74.3 ± 11.3 mmHg, respectively. Systolic and diastolic BP in 2009 were 120.5 ± 15.1 and 76.4 ± 10.9 mmHg, respectively. In full adjusted model, 1 kg increase of BW in 5 years was significantly associated with 0.17 mmHg higher systolic BP (P = 0.024) and 0.113 mmHg diastolic BP (P = 0.012) in 6 years.

Conclusions: Beyond relevant covariates, increasing BW significantly elevated both systolic and diastolic BP.

Disclosures: S. Nagasawa: None.

Funding: No

Funding Component: P274

Pregnancy-induced-hypertension and the Risk of Postpartum Hypertension Among Gestational Diabetes Women

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Background: Previous studies in the general people indicated that pregnancy-induced hypertension (PIH) increased the risk of subsequent hypertension after delivery. Some studies found that women with gestational diabetes mellitus (GDM) had an increased risk of PIH. However, very few studies have assessed the association between PIH and the risk of postpartum hypertension among GDM women. Aims: To evaluate the association between PIH and the risk of postpartum hypertension among GDM women. Methods: We performed a retrospective cohort study in 1261 GDM mother at 1-5 years after delivery using the baseline data from Tianjin Gestational Diabetes Mellitus Prevention Program. Cox regression models were applied to assess the single and joint associations of having a history of PIH, maternal pre-pregnancy BMI (normal weight, overweight and obesity), and weight change from pre-pregnancy to postpartum with the risk of subsequent hypertension among the GDM women. Results: GDM people with a history of PIH, high pre-pregnancy BMI, and weight gain more than 7 kg from pre-pregnancy to postpartum were associated with an increased risk of postpartum hypertension. Joint effects analysis revealed that the positive association between a history of PIH in the index pregnancy and the risk of postpartum hypertension was consistent in GDM women with different levels of pre-pregnancy BMI or weight gain from pre-pregnancy to postpartum. Conclusion: A history of PIH increases the risk of subsequent hypertension in postpartum 1-5
years among GDM women. We suggest highlight the pregnancy guide in different stages and pay more attention on this group of people.


Funding: No

Funding Component:

P275

Hypertension, Diabetes, and Obesity Among African Immigrants in the 2010 - 2014 National Health Interview Surveys

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Background: Cardiovascular disease (CVD) is the leading cause of death in the United States (US). Immigrants of African-ancestry are a fast-growing population in the US. However, little is known about the prevalence of CVD risk factors such as hypertension, diabetes, and obesity in this population.

Hypothesis: We hypothesized that sex-differences exist in the prevalence of cardiovascular risk factors among African immigrants.

Methods: We performed a retrospective analysis of the National Health Interview Surveys for the 2010-2014 period. We examined demographic and CVD history variables to determine if differences existed by sex in the prevalence of CVD risk factors. We performed multivariable logistic regression analyses and computed predictive margins (with standard errors) to obtain the predicted probabilities of hypertension, diabetes, overweight/obesity, and hyperlipidemia.

Results: A total of 2,019 adult African immigrants were included in the sample. Table 1 describes the socio-demographic characteristics of the respondents. Overall, 61% (1234 of 2019) of the sample was overweight/obese, 18% (403 of 2019) were hypertensive, and 16% (47 of 2019) had a history of CVD. Males were significantly more likely than females to have diabetes (OR(95% CI): 1.79(1.16,2.78); p<0.05). Females had a 0.42 (95% CI: 0.21-0.83; p=0.01) odds of hyperlipidemia compared to males and females were 0.76 (95% CI: 0.59-0.99; p<0.05) times less likely to be hypertensive compared to males. There was no difference in the prevalence of overweight/obesity between the sexes.

Conclusion: In conclusion, we observed significant sex-differences in the prevalence of hypertension, diabetes, and hyperlipidemia. It is important to highlight sex-differences in CVD risk factors among African immigrants to inform the development of effective preventative health interventions. Culturally-appropriate public health strategies and policies designed to meet the specific needs of African immigrants may reduce the prevalence of CVD risk factors and improve health outcomes.

Disclosures: R.N. Turkson-Ocran: None. N.A. Ukonu: None. Y.Y. Commodore-Mensah: None.

Funding: No

Funding Component:

P277

Orthostatic Hypotension Predicts Arterial Stiffness Later in Life

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Arterial stiffness is a major risk factor for myocardial infarction, stroke, end-stage renal disease and other cardiovascular diseases. It is now recognized that measures of central arterial function are better and more useful predictors of vascular health outcomes than measures of traditional blood pressure, and
pulse wave velocity (PWV) is now considered the gold standard non-invasive method for measuring aortic stiffness. The aim of the present study was to test the hypothesis that orthostatic changes (hypo- or hypertension) may be related to arterial stiffness, as inferred by PWV over a five year period, with consideration given to other cardiovascular risk factors, lifestyle and PWV-related variables. Orthostatic hypotension was defined as a fall in systolic blood pressure of 20 mm Hg or more, or in diastolic blood pressure of 10 mm Hg or more, and orthostatic hypertension as a rise in systolic blood pressure or 20 mm Hg or more. The major prospective analysis was undertaken on 503 community-dwelling participants (mean age 61 years, 60% women) from the Maine-Syracuse Longitudinal Study (MSLS). At baseline, the prevalence of orthostatic hypotension and hypertension was 3.9% and 4.9%, respectively. Orthostatic blood pressure variables were related to PWV, after adjustment for demographic, cardiovascular, lifestyle and PWV-related factors. Arterial stiffness was significantly greater in those with orthostatic hypotension (12.1 ± 0.56 m/s) than in those without (10.5± 0.11 m/s), measured up to five years later, with full multivariate adjustment. Orthostatic hypertension was not associated with arterial stiffness. In conclusion, we found that orthostatic hypotension predicts arterial stiffness later in life.

Disclosures: G. Crichton: None. M. Elias: None.

Funding: No

Funding Component:

P278

Potential Value of Long-term Intensive BP Treatment in 40-year Patients: A Computer Simulation Study

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Introduction Intensive blood pressure (BP) goals are considered for high cardiovascular disease (CVD) risk adults ≥50 years old; the long-term value of intensive BP goals in younger high CVD risk patients has not been studied.

Objectives We used individual patient computer simulations to assess the incremental value of intensive BP goals in high CVD risk patients as young as 40 years. Methods Six age/sex cohorts of 100,000 individuals were assembled by sampling NHANES surveys 1999-2010. BP and other risk factor trajectories were projected from ages 60 to 69, 50 to 69, and 40 to 69 years based on Framingham Offspring Cohort analyses. One BP treatment scenario simulated treating BP <140/90 mmHg in all patients ≥140/90; a second scenario added to the first a goal <BP 130/90 mmHg in patients with systolic BP ≥130 and 10-year CVD risk ≥10%. Costs included added treatment and side-effect costs and avoided CVD costs. Incremental cost-effectiveness ratios (ICERs) assessed changes in costs and quality-adjusted life years due to adding intensive BP goals in each cohort. Results Intensive goals were generally cost-effective in high-risk CVD risk patients (Table). Treating 40-year old cohorts was the highest value strategy. This was because of large life-year gains when events are prevented early in life and because hypertensive 40-year-olds “age into” much higher BPs and CVD risk over time. To illustrate the latter, mean untreated systolic BPs at age 60 were 152, 148, and 146 mmHg, and mean 10-year CVD risk scores were 17%, 15% and 13% for 40-, 50- and 60-year-old male cohorts, respectively. Conclusion Intensive BP goals were projected to be cost-effective over a 30-year time horizon in high-risk hypertensive patients as young as 40 years old.
Introduction: Convenience meals that are ready-to-eat (RTE) or ready-to-heat (RTH) are typically considered unhealthy choices because they are often high in saturated fat, sodium, sugar, or processed foods. Frequent RTE and RTH meal consumption is hypothesized to increase obesity risk. This research aimed to examine differences in RTE and RTH meal consumption by race/ethnicity in a large sample of US adults. Furthermore, we aimed to determine if associations between RTE and RTH meal consumption and obesity differ by race/ethnicity.

Hypothesis: Differences in RTE and RTH meal consumption will exist between racial/ethnic groups. RTE and RTH meal consumption will be associated with increased body mass index (BMI) among all racial/ethnic groups.

Methods: Cross-sectional data on 14,307 participants of the National Health and Nutrition Examination Survey (NHANES) years 2009-2012 were analyzed. Participants were 49.0% Non-Hispanic white, 23.2% Non-Hispanic black, and 27.8% Hispanic or Latino. Self-reported food purchasing behaviors were captured via a questionnaire. Participants were asked to record the total number of RTE meals (i.e. meals prepared away from home at a food retail outlet) they consumed in the past 7 days, and the total number of RTH meals (i.e. frozen meals) they consumed in the past 30 days. Stratified multivariable-adjusted linear regression models were used to examine associations between RTE and RTH meal consumption and BMI by racial/ethnic group. Analyses were adjusted for the NHANES sampling scheme.

Results: Mean BMI was 28.1 (±0.1). About 39% of participants were obese. On average, Non-Hispanic white participants consumed significantly more RTE meals and RTH meals than Non-Hispanic black and Hispanic participants. Hispanic participants, on average, consumed RTE and RTH meals the least. After adjusting for covariates such as age, education level, household size, and participation in the Supplemental Nutrition Assistance Program, increased consumption of RTE meals was significantly associated with increased BMI among Non-Hispanic whites and Non-Hispanic blacks. There was no association between RTE meal consumption and BMI among Hispanics. RTH meal consumption was not associated with BMI among any racial/ethnic group.

Conclusions: Racial/ethnic differences in the association between RTE and RTH meal consumption and obesity were observed. More research is needed to better understand the contribution of food purchasing behaviors to racial disparities in chronic disease.
**Yutong Dong**, Norman Pollock, Anas Raed, Samip Parikh, Jigar Bhagatwala, Bernard Gutin, Haidong Zhu, Medical Coll of Georgia, Augusta Univ, Augusta, GA

**Introduction:** Greater dietary fiber intake has shown cardiometabolic benefits in adults. Previously, we have shown that dietary fiber intake is inversely associated with adiposity and inflammation in youth. However, evidence of the relations of fiber intake to insulin resistance and blood pressure in adolescents is lacking.

**Hypothesis:** We hypothesized that greater daily dietary fiber intake would be associated with lower insulin resistance and blood pressure. Additionally, insulin resistance may mediate the relationship between fiber intake and blood pressure.

**Methods:** Seven hundred and sixty-six Southeastern US adolescents from age 14 to 18 were recruited (50.3% females; 49.2% African-Americans). Diet was assessed via four to seven independent 24-hour recalls. Seated systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured five times at 1 minute intervals after 10 minute rest and the last three measurements were averaged. Percent body fat (%BF) was measured by dual-energy x-ray absorptiometry. Fasting blood samples were measured for fasting glucose and fasting insulin. Homeostatic Model Assessment for insulin resistance (HOMA-IR) was then calculated.

**Results:** Multiple linear regressions with bootstrapping, adjusting for age, sex, race, Tanner stage, %BF, and energy intake, revealed that dietary total fiber intake was negatively associated with HOMA-IR, SBP, and DBP (standardized β = -0.22, β = -0.09, and β = -0.12; all p < 0.05). Subcategorizing fiber into soluble and insoluble fiber revealed that both types were negatively associated with HOMA-IR (p < 0.01). However, only soluble fiber intake was negatively associated with both SBP and DBP (all p < 0.01). No significant race and gender interactions with fiber were identified. Furthermore, a mediation test identified HOMA-IR as a mediator between soluble fiber intake and SBP and DBP (95% CI: -0.34; -0.04; 95% CI: -0.15; -0.01 respectively).

**Conclusions:** Our data suggest that greater consumption of fiber may reduce insulin resistance and blood pressure in adolescents. Furthermore, insulin resistance may mediate the relationship between soluble fiber intake and blood pressure.

**Disclosures:** Y. Dong: None. N. Pollock: None. A. Raed: None. S. Parikh: None. J. Bhagatwala: None. B. Gutin: None. H. Zhu: None.

**Funding:** Yes

**Funding Component:** Greater Southeast Affiliate (Alabama, Florida, Georgia, Louisiana, Mississippi, Puerto Rico & Tennessee)

**P281**

**Longitudinal Associations of Diet, Screen Time, and Physical Activity Behaviors With Cardiometabolic Risk Factors Among Chinese Children and Their Parents**

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**Background:** Understanding intergenerational differences in associations of urbanization-related lifestyle behaviors with cardiometabolic disease (CMD) risk factors in children and their parents is important in rapidly urbanizing China.

**Objective:** We tested the intergenerational differences in longitudinal associations of away-from-home eating, snacking, screen time, and leisure-time sports with high waist-to-height ratio (WHtR), elevated blood pressure (BP), elevated hemoglobin A1c (HbA1c), and elevated C-reactive protein (CRP) among Chinese children and their parents.

**Method:** We studied 5,180 children (aged 7-17y) and their parents participated in China Health and Nutrition Survey (1991-2009) with
measured WHtR, BP, HbA1c, and CRP. We used three-day 24-hour dietary recall to derive away-from-home eating (non-consumer, <1 meal/day, and ≥1 meals/day) and consumption of fruit/vegetable snacks (any/none) and other snacks (any/none). We used a seven-day physical activity recall to collect screen time (≤1 hr/day, 1-2 hrs/day, and >2 hrs/day) and leisure-time sports (any/none). Random-effects logistic regression was used to examine the associations of lagged behaviors with CMD risk factors.

Results: We detected intergenerational differences in associations between lagged behaviors and risk factors (P_interaction<0.1). Generation-specific models showed that lagged away-from-home eating ≥1 (versus no) meals/day was negatively associated with parents’ high WHtR (OR=0.68, 95% CI=0.53, 0.89) but positively associated with children’s high WHtR (OR=1.46, 95% CI=1.01, 2.12) at follow-up. Lagged fruit/vegetable snack consumption was negatively related to parents’ high WHtR, parents’ elevated BP, and children’s high WHtR at follow-up. Lagged screen time was positively associated with parents’ high WHtR and children’s high WHtR, elevated BP, and high CRP at follow-up. The behavior-risk factor associations did not differ across years.

Conclusion: CMD risk factors were negatively associated with fruit/vegetable snack consumption and positively associated with screen time in both generations. Away-from-home eating was associated with higher WHtR in children but lower WHtR in parents. Generation-specific intervention strategies may be needed for behavioral changes to reduce CMD risk.


Funding: No

Funding Component:

P282

Potato Consumption, Average Blood Pressure, and the Incidence of Hypertension in 2 Mediterranean Cohorts

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Objectives: To assess the association between potato consumption, blood pressure changes and the risk of hypertension in two Mediterranean populations.

Design: Separate analyses were performed in the PREDIMED (PREvención con Dieta MEDiterránea), a multicenter nutrition intervention trial, and the SUN (“Seguimiento Universidad de Navarra”) project, an open, prospective cohort, both in Spain.

Participants: The PREDIMED trial included 6,940 participants aged 55-80 years at high risk for cardiovascular disease. The SUN project included 13,837 middle-aged participants who were university graduates.

Main outcome measures: In PREDIMED, generalized estimating equations adjusted for lifestyle and dietary characteristics were used to assess changes in blood pressure across quintiles of total potato consumption during a 4-year follow-up. Controlled blood pressure levels during follow-up were also assessed. For
SUN, multivariable-adjusted hazard ratios (HR) for incident hypertension during an average 6.7-year follow-up were calculated.

**Results:** In PREDIMED, the mean (SD) total potato intake was 81.9 (40.6) g/day. No overall significant differences in blood pressure changes were detected based on consumption of potatoes. For total potatoes, the mean change in systolic BP after multivariate adjustment was quintile 5 (Q5) vs. quintile 1 (Q1): -0.90, 95% CI: (-2.56 to 0.76) mmHg, p for trend=0.14 and for diastolic BP it was Q5 vs. Q1: -0.02, 95% CI: (-0.93 to 0.89) mmHg, p for trend=0.81. In SUN, the mean (SD) total potato consumption was 52.7 (33.6) g/day and no significant association between potato consumption and hypertension incidence was observed: HR: for total potato consumption, Q5 vs. Q1: 0.98, 95% CI: (0.80 to 1.19), p for trend=0.84.

**Conclusions:** Potato consumption is not associated with changes in blood pressure or risk of hypertension in Mediterranean populations and this might be explained by relatively low consumption of potatoes and characteristics of the traditional Mediterranean diet, particularly the custom of accompanying potatoes with vegetables or legumes and dressing them with olive oil.

Disclosures: **E.A. Hu:** None. **M.A. Martínez-González:** None. **J. Salas-Salvadó:** None. **D. Corella:** None. **E. Ros:** None. **M. Fitó:** None. **E. Gomez-Gracia:** None. **R. Estruch:** None. **F. Arós:** None. **M. Fiol:** None. **J. Lapetra:** None. **L. Serra-Majem:** None. **X. Pintó:** None. **M. Ruiz-Canela:** None. **C. Razquin:** None. **M. Bullo:** None. **J.V. Sorlí:** None. **H. Schröder:** None. **C. Rebholz:** None. **E. Toledo:** None.

**Funding:** No

**Funding Component:**

**P283**

**Changes in Sugar-sweetened and Diet Soda Consumption in Relation to Weight and Waist Circumference Change in a Cohort of Mexican Women**

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**Introduction:** Obesity is associated with an increased risk of many NCDs, including cardiovascular diseases. Consumption of soda has been linked to weight gain. Mexico is the second largest consumer of soda in the world and close to 70% of Mexican women are overweight or obese. **Hypothesis:** We hypothesize that increase consumption of sugar-sweetened soda will be associated with increases in weight and weight circumference.

**Methods:** We evaluated changes in soda consumption and short-term weight and waist circumference gain in the Mexican Techers Cohort. A subsample of 11,218 participants reported reproductive history, lifestyle factors, and medical conditions and responded to a 137-item semi-quantitative food-frequency questionnaire (FFQ) at baseline in 2006 and at follow-up in 2008. Participants self-reported height and weight and were provided a measuring tape and instructions to assess their waist circumference. We used multivariable linear regression to estimate the impact of 2-year change in sugar-sweetened and diet soda consumption on change in weight and waist circumference, adjusting for potential confounders. **Results:** In multivariable analyses, each additional sugar-sweetened soda serving/day was associated with 0.95 kg (95% CI 0.71, 1.20) increase in weight and 0.94 cm (95% CI 0.48, 1.39) increase in waist circumference over the two-year study period. Changes in diet soda consumption were not associated with changes in weight or waist circumference. **Conclusions:** An increase in sugar-sweetened
soda consumption was associated to short-term weight gain in Mexican women. Accumulated over time, even modest weight gain may have important health implications. Our results underscore the urgent need to rapidly reduce sugar-sweetened beverage consumption in this population.

Disclosures: **D. Stern:** None. **N. Middaugh:** None. **M. Rice:** None. **R. López-Ridaura:** None. **W. Willett:** None. **M. Lajous:** None.

Funding: No

Funding Component:

**P284**

**The Prospective Association Between Unprocessed Meat Consumption and Incident Cardiovascular Disease in Korean Adults**

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**Introduction:** Cumulative evidence has shown that total meat consumption is associated with the risk of cardiovascular disease (CVD) in Western societies. However, epidemiological information is limited regarding such associations in the Korean population whose consumption level of meat is much lower than the global average. **Hypothesis:** We hypothesized that higher intake levels of unprocessed total meat would not increase the overall risk of CVD incidence, and healthier alternatives to red meat (such as poultry) would have protective effects in middle-aged Korean population. **Methods:** Ansung-Anasan cohort 2001-12 analyses were conducted from 2001 to 2012 among 9,370 adults, aged 40-69 years, without CVD or cancer at baseline, from two communities, Ansan (urban) and Ansung (rural). Dietary information was ascertained at baseline and at the second follow-up visit. Total meat consumption was estimated as the sum of unprocessed red meat (sum of beef, pork, and organ meat) and chicken consumption. Cox proportional hazards models were used to estimate multivariable-adjusted hazard ratios (HR) and 95% confidence intervals (CI). **Results:** During a median follow-up of 7.8 years, 486 incident CVD cases were identified. In the fully adjusted Cox regression model, relative risks of CVD across increasing quintiles of total meat intake were 1.0 (reference), 0.72 (95% CI 0.55-0.95), 0.57 (95% CI 0.42-0.78), 0.69 (95% CI 0.51-0.95), and 0.69 (95% CI 0.48-0.97). Regarding specific types of meat, frequent chicken consumption was significantly associated with decreased risks of CVD, showing participants in the highest quintile of chicken intake were 1.5 times less likely to develop CVD than those in the lowest quintile (95% CI: 0.47-0.99), and this association showed a dose-response relationship for all statistical models ($P$ for trend <0.05). **Conclusion:** Higher intakes of unprocessed total and red meat showed inverse associations with incident CVD in a large, prospective, population-based cohort study of middle-aged Koreans. These findings require further confirmation from other populations whose meat intake is relatively lower than the global average.

Disclosures: **K. Park:** None. **J. Son:** None. **J. Jang:** None. **H. Chung:** None. **R. Kang:** None. **K. Lee:** None. **M. Shin:** None.

Funding: No

Funding Component:

**P285**

**Small Dose of Medium Chain Fatty Acids From Coconut Oil Does Not Enhance Thermogenesis in Overweight Adolescents**

**Janna LaBarrie**, Marie-Pierre St-Onge, Columbia Univ, New York, NY
Background: Previous research has shown that consumption of medium chain triglycerides (MCT) in overweight adults can increase energy expenditure and improve weight management, but no research has been done in children. Our study tests the effects of a test oil enriched in MCT from coconut oil, on energy expenditure, satiety, and metabolic markers in overweight and obese adolescents.

Methods: We conducted a randomized, double blind, crossover study in which 15 children, age 13-18 y, with a body mass index >85th percentile for age and sex, were enrolled. Two test meals were administered which contained 20 g of fat from either corn oil or an MCT-enriched baking fat (providing approximately 4.7 g of fatty acids with chain lengths ≤12C). A fasting blood sample was taken before breakfast and the thermic effect of food (TEF) was assessed using indirect calorimetry for 6 h. During the test, satiety was measured using visual analog scales (VAS) and additional blood samples were obtained from an intravenous catheter at times 30, 45, 60, 120, and 180 min post-meal for measurement of hormones and metabolites.

Results: There was no significant effect of fat type, time, or fat type x time interaction on TEF, appetite and satiety, glucose, and insulin area under the curve (AUC). However, there was a significant effect of fat type on leptin (P = 0.027), triglycerides (P = 0.020), and peptide YY (P = 0.0085) whereby leptin and triglyceride concentrations were lower with corn oil consumption and peptide YY concentrations were higher.

Conclusions: Our results do not suggest that this MCT-rich test oil enhances thermogenesis and satiety in children. Given that this is the only current study of its kind, more research is needed into the use of MCT as a tool in weight management in overweight and obese children.

Disclosures: J. LaBarrie: None. M. St-Onge: B. Research Grant; Significant; USDA-SBIR Sub-award from Prosperity Organic Foods. G. Consultant/Advisory Board; Modest; FreeLife LLC.

Funding: No

Funding Component:

P286

Egg Consumption is Associated With Cardiovascular Disease Risk Factors in the Coronary Artery Risk Development in Young Adults Study

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Objective: The role of eggs in cardiovascular disease risk remains uncertain. Studies implicate a metabolite of choline, trimethylamine N-oxide (TMAO), in the development of cardiovascular disease (CVD). We tested the association between egg consumption and CVD risk factors over 20 years of follow-up.

Methods: Study participants were from the CARDIA Study, a multicenter cohort of black and white Americans established in 1985/86 (baseline n=5,115; ages 18-30). Egg consumption was calculated from reported intake on a diet history at baseline and years 7 and 20 of follow-up. Eggs were categorized as: ≤1.0, 1.1-3.5, 3.6-6.9, and ≥7 per week. CVD risk factors were assessed at each exam, including blood pressure, lipids, and insulin resistance (defined by homeostatic model assessment, HOMA-IR). Multivariable-adjusted fixed effects (within-subject) regression models quantified prospective associations between time-varying egg consumption and CVD risk factors.

Results: In the regression (Table), 7+ eggs per week was negatively associated with systolic and diastolic blood pressure and >3.5 eggs per week was positively associated with HDL-C. Total cholesterol and LDL-C were positively associated with low-to-moderate consumption, but not with higher consumption.

Conclusion: At higher levels of intake, eggs were negatively associated with blood pressure and positively associated with HDL-C; at low-to-
Disclosures: **K.A. Meyer:** B. Research Grant; Significant; NHLBI, Egg Nutrition Center.

Funding: No

**Funding Component:**

**P287**

**Systematic Review of Dietary Trans-fat Reduction Policies: Evidence for an Effectiveness Hierarchy?**

**Lirije Hyseni,** Helen Bromley, Chris Kypridemos, Martin O’Flaherty, Ffion Lloyd-Williams, Maria Guzman-Castillo, Jonathan Pearson-Stuttard, Simon Capewell, Univ of Liverpool, Liverpool, United Kingdom

**Background** The four major risk factors prioritised in WHO non-communicable disease prevention strategies are tobacco, alcohol, physical inactivity and, crucially, poor diet. Trans-fatty acid intake in most countries still exceeds the WHO target of 2g/day, mainly reflecting consumption of industrial trans-fats in junk food. Furthermore, the most effective policies for reducing trans-fats remain unclear. We therefore systematically reviewed the evidence on trans-fat policy interventions to inform future prevention strategies. We also explicitly compared “upstream” interventions covering whole populations with “downstream” interventions targeting individuals.

**Methods** A pre-piloted search strategy was used to systematically search six electronic databases (Cinahl, CRD, CDSR, Medline, SCI and SCOPUS) for papers evaluating the effectiveness of trans-fat interventions, with intake (g/day) as the main outcome measure. Two researchers independently screened, extracted and graded the papers for quality. Each study was then categorised on a continuum ranging from “downstream” interventions targeting individuals (dietary counselling, media campaigns or nutrition labelling) to more “upstream” structural interventions covering the entire population - reformulation, regulation, fiscal policies and comprehensive strategies involving multiple policies. A narrative synthesis was used to summarise and compare the effectiveness of different interventions.

**Results** After screening 996 candidate papers, a total of 22 papers were included in this systematic review: 12 empirical studies and 10 modelling studies. Quality was variable. The largest trans-fat reductions occurred in Denmark. Multiple interventions decreased intake from 4.5g/day in 1976 to 1.5g/day in 1995 and then virtually zero after a legislative ban in 2005. The US now intends to emulate this approach. No studies quantifying tax interventions were identified. Voluntary reformulation reduced trans-fat intake by 1.5g/day followed by worksite interventions (1.2g/day) and food labelling (0.8g/day). Dietary counselling targeting individuals achieved the smallest reductions (0.8g/day).

**Conclusions** Multi-component interventions including a legislative ban to eliminate trans-fats from foods appear the most effective strategy to minimise intake, as achieved in Denmark, and ongoing in the US. However this approach remains underused. Reformulation and other multi-component interventions can also achieve useful reductions. By contrast, more “downstream” interventions targeting

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moderate levels, eggs were positively associated with total cholesterol and LDL-C. P
settings or individuals consistently achieve much smaller reductions. This “effectiveness hierarchy”, previously observed in tobacco and alcohol control, might perhaps be considered more often when planning future prevention strategies; for instance to control other harmful nutrients such as salt or sugar.

Disclosures: **L. Hyseni**: None. **H. Bromley**: None. **C. Kypridemos**: None. **M. O’Flaherty**: None. **F. Lloyd-Williams**: None. **M. Guzman-Castillo**: None. **J. Pearson-Stuttard**: None. **S. Capewell**: None.

Funding: No

Funding Component:

P288

**Dietary Inflammation is Associated With Depression Independent of Traditional Cardiovascular Disease Risk Factors in the National Health and Nutrition Examination Survey**

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**Background**: Studies suggest that cardiovascular disease (CVD) is a risk factor for depression. Both heart disease and stroke increase the risk of developing depressive symptoms and CVD increases vulnerability to late-life depression. Comorbid depression has serious health consequences, including decreased compliance with treatment and rehabilitation. Reducing the rate of comorbid depression may improve adherence and outcomes, while reducing disability and cost. Development of CVD and depression are also linked to increased systemic inflammation. It is thought that inflammatory processes occurring in CVD may increase susceptibility to depression. One potentially modifiable source of systemic inflammation is diet. We thus examined the association of inflammatory diet and CVD risk score on depression.

**Methods**: Using 2007-2012 National Health and Nutrition Examination Survey data, we calculated a Dietary Inflammatory Index score (DII), which represents the role of diet in systemic inflammation using the 24-hour dietary recall interview. Sex-specific CVD risk scores were calculated using a modified Framingham Risk equation. Current depression was determined using the Patient Health Questionnaire. Only participants with complete information and without prevalent CVD were included (n= 11,624). Pearson χ² test and t-test were used for group comparisons. Using multivariable logistic regression, adjusted for age, sex, race, education, household income, supplement use, cholesterol-lowering medication, history of cancer, BMI and physical activity, we examined associations between: 1) CVD risk and current depression, 2) DII and current depression, adjusting for CVD risk, and 3) the joint effects of both CVD risk and DII on depression.

**Results**: Individuals with current depression were: younger, more likely to be female, non-white, have a high school degree or less, household income <$35,000, less physically active; and had higher: BMI, energy intake, CVD risk, and DII. In multivariable analysis, individuals with the highest two quartiles of CVD risk compared to those with the lowest quartile had increased odds of current depression (OR_{Q3}: 1.61, 95% confidence interval [CI]: 1.24-2.10; OR_{Q4}: 1.47, CI: 1.08-2.00). Individuals with the highest two quartiles of DII compared to those with the lowest quartile, while controlling for CVD risk, had increased odds of current depression (OR_{Q3}: 1.41, CI: 1.07-1.84; OR_{Q4}: 1.46, CI: 1.16-1.84). Individuals with both CVD and DII scores in the 4th quartile had a higher risk of depression than those with low DII and CVD risk (OR: 2.21, CI: 1.57-3.13).

**Conclusions**: A pro-inflammatory diet is associated with increased odds of depression independently of CVD risk status. These results suggest that modifying the intake of pro-inflammatory foods may reduce the prevalence of depression with possible consequential benefits for those at high CVD risk.
The Neighborhood Food Environment and Change in Body Mass Index: A Systematic Review and Meta-Analysis of Longitudinal Studies

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Introduction: The neighborhood food environment - locations and density of different types of stores and restaurants - is of great interest to reduce obesity. However, prior meta-analyses have focused on cross-sectional studies, for which reverse causation is a major limitation. Meta-analyses restricted to longitudinal study designs evaluating the food environment and change in BMI have yet to be conducted.

Hypothesis: We hypothesized that increased exposure to fast food restaurants would be associated with increased change in BMI.

Methods: Eleven databases were searched for longitudinal studies evaluating convenience stores, fast food restaurants, grocery stores, or supermarkets and change in BMI. Inclusion criteria consisted of: (1) interventional, quasi-experimental, or cohort studies; (2) adult or children populations; (3) any country; (4) geographic density or distance of food outlets; (5) a multivariable-adjusted change in BMI over time and corresponding uncertainty. Data were extracted independently and in duplicate, and studies pooled using fixed and random-effects models. Heterogeneity was quantified using Cochrane’s Q, and publication bias using funnel plots, Egger’s test, and Begg’s test.

Results: 13 studies including 98,268 subjects were identified. In random effects models, no significant association was seen between food environments and change in BMI (Figure). A nonsignificant trend was seen toward lower BMI with increasing density of supermarkets; however, a similar nonsignificant trend was also observed between increasing density of fast food restaurants and lower BMI. Evidence for publication bias was not identified.

Conclusion: In available longitudinal studies, no significant relationships were identified between food environments and change in BMI. Our novel findings support the need for further longitudinal and especially interventional studies of how the built food environment, including new measures related to cost and accessibility, may influence health and weight.
The omega-3 index (O3I; erythrocyte EPA+DHA \% of total fatty acids) is directly associated with favorable cardiovascular and cognitive outcomes. In spite of its utility as a biomarker of omega-3 status, there remains unexplained variability in its response to EPA+DHA supplementation. De-identified data (n=841) from 9 published intervention studies were used to predict changes in the O3I. All studies provided data on EPA+DHA supplementation dose and duration, pre- and post-O3I values, and standard demographic factors. Stepwise regression analysis was performed to select variables and create a predictive model, using \% change as the outcome variable. The mean age and weight of the participants was 48 ± 16 years and 83 ± 18 kg (BMI: 29 ± 5). The cohort was 49\% (n=409/841) male and 86\% (n=722/841) white. Treatment groups took an average of 2115 ± 1048 mg/day of EPA+DHA (range: 300 - 3600 mg/day; placebo groups took 0 mg/day) for 11.5 ± 4.0 weeks (range: 4 - 20 weeks). The O3I increased from 5.28 ± 1.58\% to 9.27 ± 2.59\% in the supplemented individuals (n=434), and was unchanged in the placebo groups (5.30 ± 1.52\% to 5.30 ± 1.50\%; n=407; P<0.0001). Variables that were selected into the model were age, sex, weight, dose of DHA, dose of EPA, duration, baseline O3I and an interaction between weight and age. The model \(R^2\) was 0.75 and the root mean square error was 0.18. The correlation between the predicted and observed O3I changes was 0.84 (P<0.0001; Figure). The model predicts individual changes in the O3I with reasonable accuracy, and may be useful for selecting the appropriate supplemental EPA+DHA doses and duration for clinical research studies that aim to reach a target O3I level.

Disclosures:  K.H. Jackson: A. Employment; Significant; OmegaQuant Analytics, LLC. R. Walker: None. G.C. Shearer: None. W.S. Harris: F. Ownership Interest; Significant; OmegaQuant Analytics, LLC.

Funding: No

Funding Component:

P292

Re-evaluation of the Relations of Egg Consumption to Serum Total Cholesterol, Cause-specific and All-cause Mortality

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Background: We previously reported that egg consumption was related to age-adjusted serum total cholesterol (TCH), and all-cause mortality in the 1-2-eggs/wk group was significantly lower than that in the 1-egg/d group in women, whereas no such relations were noted in men, using 14 year follow-up of NIPPON DATA80. Re-evaluation of these relations in a different cohort is needed.

Methods: We analyzed the relations of egg consumption to serum total cholesterol (TCH) and cause-specific and all-cause mortality by using the NIPPON DATA90 database with a 15-year follow-up. At the baseline in 1990, a nutritional survey was performed by using the food-frequency method, and data were collected on study participants, ages 30 years and over, from randomly selected areas in Japan. We followed 4,799 female participants without history of stroke or myocardial infarction (mean age 52.8 y) for 15 years.

Results: The participants were categorized into 5 egg consumption groups on the basis of their
responses to a questionnaire (seldom, 1-2/wk, 1/2 d, 1/d, and ≥2/d). There were 218, 1507, 1622, 1409, and 43 women in each of the 5 groups, respectively. Age-adjusted TCH was not related to egg consumption (206.4, 206.3, 207.0, 207.7, and 203.8 mg/dL in the 5 egg consumption categories, respectively, P=0.737, analysis of covariance). There were 199 cardiovascular disease (CVD), 221 cancer, and 642 all-cause mortality during follow-up. Cox analysis, adjusted for confounding factors, found that all-cause and cancer mortality in the ≥2/d group were significantly higher than that in the 1-egg/d group (HR in the ≥2/d vs the 1-egg/d group: all-cause, 1.88 [95%CI: 1.12-3.16]; cancer, 2.77 [1.32-5.80]), and that cancer mortality in the 1-2-eggs/wk group was significantly lower than that in the 1-egg/d group (0.70 [0.50-0.99]). Egg consumption was not associated with CVD mortality. 

Conclusions: Loss of the relation of egg consumption to TCH might be due to that hypercholesterolemic individuals avoided eating eggs. Positive association of egg consumption with cancer and all-cause mortality needs further evaluation, and it may indicate that limiting egg consumption has some health benefits, at least in women in Japan.


Funding: No

Funding Component:

P293

The Effect of Diet Beverage Intake on Measures of Diabetes Control: A Pilot Study

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Introduction: Diet beverages are calorie free beverages sweetened with non-nutritive sweeteners (NNS). People with diabetes are at high macro and microvascular risk and are the highest per capita consumers of diet beverages as they tend to consume them directly in place of sugar sweetened beverages. This behavior has been endorsed by dietetic and scientific organizations; and diet beverages are marketed synonymously with better health, suitable for weight loss, and thus advantageous for diabetes control. The underlying public health concern is the lack of data to support or refute this concept. To begin addressing this evidence gap we carried out a randomized, two period crossover trial testing the effect of habitual diet beverage intake compared to habitual bottled water intake (avoidance of all NNS) on clinical markers of diabetes control and potential mechanistic pathways. Hypothesis: Habitual diet beverage intake will raise glycemia, lower kidney function, and lower diet quality compared to water intake. Methods: We carried out a randomized, two period crossover trial of 12 adults with type 2 diabetes who were being treated with oral medications and were free of other major chronic disease. In two separate 4 week periods with a washout period between them, participants were randomized to consume 24 oz. a day of a diet beverage (DB) of choice in 1 period and 24 oz. a day of bottled water (H2O) in the other while maintaining usual lifestyle habits and diabetes treatment regimens across periods. The primary outcome was change in glycemia (fructosamine). Secondary outcomes were kidney function (eGFR via serum creatinine) and diet quality (healthy eating index score, HEI-2010). All clinical measures were collected by standardized protocol and laboratory measurement. Diet was assessed by 3 random 24 hour recalls each period (1 weekend, 2 weekday) using a web based automated self-administered platform and diet quality was calculated by estimating the HEI-2010. Mixed-model repeated measures linear regression was used to analyze the continuous outcomes data. Results: 10 women and 2 men, mean (SD) age 58.3 (7.9) years with mean (SD) HbA1c % of 7.1 (1.4) at baseline were randomized and completed the study. Glycemia (fructosamine) was reduced, mean (SE) of -3.9 (3.2) umol/L
during the H2O period and increased 0.6 (3.2) umol/L during the DB period, \( p=0.36 \). The results for kidney function (eGFR) were: H2O: -0.4 (3.7) v. DB: -2.3 (-3.7) mL/min/1.73m\(^2\), \( p=0.72 \). Diet quality was lower during the DB period relative to the H2O period (58.0 v. 61.5, \( p=0.25 \)). **Conclusion:** Although the magnitude and precision of the treatment effects limits the inference, these results suggest the need for larger and longer trials to more definitively test this hypothesis and inform the role diet beverages may have in diabetes control.

Disclosures: **A. Odegaard:** None. **K. Hirahatake:** None.

Funding: No

Funding Component: P294

**The Chinese Great Famine and Major Depression Disorder: the CHARLS study**

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**Objectives:** To estimate the prevalence of major depression and experience severe famine during the Chinese Great Famine in middle-aged and older Chinese population, and to evaluate the impact of famine experience on risk of major depression in late adulthood.

**Methods:** We estimated the prevalence of major depression and severe famine in participants of the China Health and Retirement Longitudinal Study (CHARLS). CHARLS surveyed a representative sample of 17,708 middle-aged and older Chinese adults. SAS PROCFREQ procedure was applied to estimate famine and depression prevalence taking into account the survey design and responding rate. Depression was measured using Center for Epidemiological Studies Depression Scale (CES-D) short form. Famine was based on self-report, and was categorized into none, slight, moderate, and severe. We evaluated famine experience and major depression risk in late adulthood in cohorts of different development stages when famine occurred, using logistic regression adjusting for important demographic, socioeconomic, biomedical, and chronic comorbidities. Odds ratios (ORs) and corresponding 95% confidence intervals (CIs) are presented.

**Results:** A total of 11.60% of the middle-aged and older Chinese adults experienced severe famine in 1959-1961. Famine significantly increased risk of major depression in late adulthood among those who experienced famine during fetal, mid-childhood, young teens, and adulthood. Compared to those who did not experience famine, those with severe famine experience were 3.00 (95% CI: 1.53-5.89), 1.94 (95% CI: 1.39-2.71), 1.89 (95% CI: 1.15-3.10), and 2.32 (95% CI: 1.62-3.32) times more likely to have major depression in late adulthood among the fetal, mid-childhood, young teens, and adulthood cohorts, respectively. Even adjusting for all variables, there are still significant trends between famine severity and risk of major depression. However, famine experience was not associated with late adulthood depression risk among infant, toddler, preschool, or teenagers cohorts.

**Conclusion:** More than 11.6% of the Chinese population experienced severe famine. Exposure to famine during fetal, mid-childhood, young teens, and adulthood stages increased risk of depression in late adulthood.

Disclosures: **L. Shen:** None. **C. Huang:** None. **C. Li:** None.

Funding: No

Funding Component: P295

**Dietary Pattern Mediates the Association Between Education Level and Metabolic Syndrome in Korean Adults**
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**Introduction:** Emerging evidences have inconsistently reported that dietary components mediate the relationship between low socioeconomic status (SES) and higher cardiometabolic risk, but the findings are limited in Korean. **Hypothesis:** We tested the hypothesis whether the education level as a proxy for SES is associated with the prevalence of metabolic syndrome and this association is mediated by dietary pattern. **Methods:** We used nationally representative data from the Korea National Health and Nutritional Examination Survey (2008-2011) for cross-sectional analyses (Total number of subjects=22,607, 30-64 yrs). Dietary data were assessed using food frequency questionnaire including 63 food items and were categorized into seven food groups based on the Korea nutrient database. Metabolic syndrome was defined using revised National Cholesterol Education Program criteria. The possible mediating effect of dietary components (fruit, vegetable, red meat, milk, and soft-drink) on the association between education level and metabolic syndrome was tested using a multiple mediation model. **Results:** Education levels had direct and indirect effects via dietary consumption patterns on the prevalence of metabolic syndrome. Higher education level was directly associated with lower prevalence of metabolic syndrome (Odds ratio [OR]: 0.854, 95% Confidence Intervals [CIs]: 0.817-0.894). Regarding the mediating effect of dietary patterns, higher education level was indirectly associated with decreased prevalence of metabolic syndrome by high in fruit intake (OR: 0.983, 95% CIs: 0.947-0.992), red meat intake (OR: 0.991, 95% CIs: 0.985-0.996), milk intake (OR: 0.994, 95% CIs: 0.992-0.998), and by low in soft-drink intake (OR: 0.995, 95% CIs: 0.992-0.998). Gender modified the association between education level and metabolic syndrome prevalence. In women, there was significant inverse relationship between education level and the prevalence of metabolic syndrome with significant mediating effect of dietary pattern on metabolic syndrome. Conversely, mediating effect of dietary pattern was not observed in men. **Conclusions:** In conclusion, there was inverse association between education level and prevalence of metabolic syndrome, which is partially explained by specific dietary components in Korean adults. Our results provide information for establishing dietary guideline and nutrition policy to prevent and manage metabolic syndrome.


Funding: No

Funding Component:

P296

**Dietary Habits in Primary Care Patients with Recent Intentional Weight Loss**

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**Introduction:** Primary care physicians are uniquely positioned to provide counselling for weight loss, yet lifestyle habits of primary care patients with recent, intentional weight loss are unclear. Our objective was to characterize diet and exercise habits in primary care patients with recent, intentional weight loss, comparing those with greater (≥10%) to those with lesser (5 to <10%) weight loss. **Methods:** This cross-sectional analysis of baseline data from a weight loss maintenance clinical trial in a primary care setting included patients, 18-75 years old, with ≥5% intentional weight loss via lifestyle change in the past 2 years. Recent weight loss was confirmed with medical
records. Dietary habits were measured by the Connor Diet Habits Survey. Results: Participants (n=192, 74% female, 87% white) had mean (SD) age 53 (12) years, body mass index 30.4 (5.9) kg/m², and recent weight loss of 11 (8) %.

Participants had a high burden of comorbidities: high blood pressure (50%), dyslipidemia (43%), diabetes (14%), and cardiovascular disease (10%). Participants reported high median intake of fruits and vegetables (5 servings/day), and low intake of fried foods (1 servings/wk), desserts (1 serving/wk) and sugar-sweetened beverages (0 serving/wk) (see Table). Participants ate at restaurants on average twice/wk and most drank skim milk. Those with greater weight loss had higher intakes of fruits and vegetables (p=0.04) and low fat foods/recipes (p=0.02); other dietary habits were not related to amount of recent weight loss (see Table). Conclusions: Despite the plethora of studies that support and refute a variety of dietary recommendations to promote weight loss, dietary habits in primary care patients with a high burden of comorbidities and recent, intentional weight loss were consistent with conventional wisdom including: more fruits and vegetables, limited added sugars, and more low fat foods and recipes. Future research should test the effects of this eating pattern in a primary care setting for weight loss and maintenance.

Funding Component:

P297

Intensity-specific Physical Activity Measured by Accelerometry and Mortality in Women: The OPACH Study

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Background: Associations for cardiovascular disease (CVD) and all-cause mortality with intensity-specific physical activity (PA) exposures assessed by questionnaire may be underestimated by exposure measurement error, especially in older adults. We examined accelerometer measured PA and CVD and all-cause mortality in 6,374 race-ethnically diverse women (White, 49.4%, Black 33.7%, Hispanic 16.9%) ages 63-91 (mean 78.7 years) followed a mean of 2.5 years as part of the Objective Physical Activity and Cardiovascular Health (OPACH) Study. Methods: Vector magnitude counts/15-sec epoch from hip worn Actigraph GT3X+ triaxial accelerometers (required ≥4 of 7 days with ≥10 hr/day wear time) were used to define time spent in low light (LLPA; 19-225 counts/15-sec), high light (HLPA; 226-518), and moderate-to-vigorous (MVPA; ≥519) PA based on cutpoints determined from a calibration study among similarly aged women. Cox regression was used to estimate hazard ratios (HR) and 95% confidence intervals (CI) for these associations. Results: There were 270 (4.2%) all-cause deaths and 78 (1.2%) CVD deaths during 14,205 person-years of follow-up. Adjusting for awake-time accelerometer wear-time, age, and race, HRs (CI) for CVD mortality associated with a 30-min/day increment in PA were 0.82


Funding: No
These associations were similar following additional adjustments for smoking, age at menopause, and number of prevalent comorbidities (CVD HRs = 0.83, 0.49, 0.54, respectively, P≤0.01 all; all-cause HRs = 0.86, 0.62, 0.58, respectively, P<0.001 all). Similar results were observed after discarding the first 6 months of follow-up (CVD HRs = 0.84, 0.49, 0.50; all-cause HRs = 0.87, 0.63, 0.59). In a final model mutually adjusting for total light PA (LLPA and HLPA combined) and MVPA, each 30-min increment in light PA and MVPA was associated with HRs for CVD mortality of 0.84 (0.75, 0.93) and 0.67 (0.47, 0.96) respectively; and with all-cause mortality of 0.90 (0.85, 0.95) and 0.66 (0.55, 0.80), respectively. Conclusions: Higher levels of both light intensity PA and MVPA measured by accelerometry are associated with lower CVD and all-cause mortality in older women. Because light intensity PA accounts for the majority of daily PA energy expenditure in older women’s lives, these results could have important public health implications and should be confirmed.


Funding: No

Funding Component:

P298

Associations Between Time-varying Physical Activity and Physical Performance Measures in Postmenopausal Women: the Women’s Health Initiative

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Introduction
Maintaining regular physical activity (PA) may delay the onset of functional disability and preserve mobility later in life. Whereas many population-based studies have reported the prospective relationship of initial PA levels to later-life functional status, few studies have examined the longitudinal relationships between changes in PA to changes in physical functioning. This study examined associations between changes in PA and changes in standard physical performance measures (PPM) over 6-years in older women.

Methods
Recreational PA was reported using the WHI questionnaire; gait speed, timed chair stand, and grip strength were assessed in clinic using standardized protocols. Exposures were assessed at baseline, years 1, 3 and 6 of the Women’s Health Initiative Clinical Trials (n=5092 women; mean age = 69.8 y). Mixed effects linear regression models were used to evaluate the association between time-varying PA and change in each PPM. Potential interactions between time-varying PA and race and age (<70 y; ≥70 y) were also tested.

Results
At baseline, 23.0% women were categorized as sedentary (SED; <100 MET-min/wk), 30.4% as light PA level (100-<500 MET-min/wk), 27.5% as moderate (500-<1200 MET-min/wk); and 19.1% as high PA (≥1200 MET-min/wk). Significant, dose-response associations between PA and improvements in all PPMs were observed over the 6 y follow-up after adjusting for demographic, lifestyle, and clinical factors.
Compared to SED, women in the high PA groups showed better grip strength (0.48 kg higher; $P<0.01$), more chair stands (0.35 more; $P<0.001$), and faster gait speeds (0.06 m/s faster; $P<0.001$). Older women ($\geq 70$ y) benefited more from higher levels of PA than the younger women ($P$ interaction for age=$0.014$), as reflected by their greater increase in chair stands ($P<0.001$); however, interactions between PA and race were not significant.

Conclusions
These findings provide evidence that, in postmenopausal women, maintaining higher PA levels over time is associated with benefits in lower extremity function, as compared to being sedentary. These data are consistent with the view that regular PA plays an important role in maintaining functional status during aging, particularly in older women.


Funding: No

Funding Component:

**P299**

**Resistance Exercise and Obesity Prevention**

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**Introduction:** Obesity is a significant cardiovascular disease (CVD) risk factor. There is still little evidence, however, on the effects of resistance exercise (RE), independent of and combined with aerobic exercise (AE), on the development of obesity. **Hypothesis:** We hypothesised that RE, independent of AE, has significant benefits in obesity prevention.

**Methods:** Participants were 12,583 men and women aged 18 to 89 years (mean age, 47) who received a preventive medical examination during 1987-2005 in the Aerobics Center Longitudinal Study. Participants were free of CVD, cancer, and obesity at baseline. RE, AE, and meeting the 2008 US Physical Activity Guidelines (RE $\geq$ 2 days/week and AE $\geq$500 MET-minutes/week) were determined by self-reported leisure-time exercise. Obesity was defined as body mass index of $\geq$30 mg/kg$^2$ using measured weight and height. Cox regression was used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) of incident obesity by RE levels after adjusting for baseline age, sex, examination year, current smoking, heavy alcohol drinking, and meeting the AE guidelines. **Results:** During an average follow-up of 5.6 years, 919 (7.3%) developed obesity. Individuals meeting the RE guidelines (26%) had a 20% lower risk of developing obesity (HR: 0.80; 95% CI: 0.68 to 0.94) after adjusting for potential confounders and meeting the AE guidelines. The HRs (95% CIs) of incident obesity were 0.80 (0.60-1.05), 0.68 (0.52-0.88), 0.92 (0.68-1.26), and 0.84 (0.62-1.13) in weekly RE time of 1-59, 60-119, 120-179, and $\geq$180 minutes/week, respectively, compared with no RE. We found similar results in both men and women. In the combined analysis of RE and AE, HRs (95% CIs) of incident obesity were 0.65 (0.46-0.92) in meeting RE guidelines only, 0.72 (0.62-0.83) in meeting AE guidelines only, and 0.61 (0.51-0.73) in meeting both RE and AE guidelines, compared to meeting none of the guidelines. **Conclusions:** We found that RE, independent of and combined with AE, is associated with significantly lower risk of developing obesity, suggesting that RE should be added to habitual physical activity.

Disclosures: D. Lee: None. C. Lavie: None. X. Sui: None. S. Blair: None.

Funding: No

Funding Component:
**P300**

**Associations of Sarcopenia and Low Muscular Strength With All-cause Mortality Among US Older Adults: The National Health and Nutrition Examination Surveys 1999-2002**

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**Background:** Sarcopenia is defined as aging-related loss of muscle mass and knee extension strength serves as a marker of lower extremity muscular strength in populations. Sarcopenia and low muscular strength (LMS) may be important but understudied risk factors for aging-related morbidity and mortality in the older and elderly populations. However, data from prospective studies are limited.

**Objective:** We aimed to prospectively examine individual or joint associations of sarcopenia and LMS with all-cause mortality in a nationally representative sample of US older adults in the National Health and Nutrition Examination Survey (NHANES).

**Methods:** Data sources included the NHANES 1999-2002 with public-use 2011 linked mortality files, which comprised 4,449 participants aged 50 years and older with complete data on body composition by dual-energy x-ray absorptiometry and isokinetic knee extensor strength measurement. Sarcopenia was defined by two definitions proposed by the National Institutes of Health Sarcopenia Project according to appendicular lean mass (ALM) and ALM divided by BMI (ALM/BMI). LMS was defined as the lowest 25% of measurements of knee extensor strength. Weighted multivariable logistic regression models were used to account for multistage stratified and clustered sampling. Models were adjusted for age, sex, race, BMI, smoking, alcohol use, education, leisure time physical activity, sedentary time, and history of cardiovascular diseases, diabetes, cancer, chronic obstructive pulmonary disease, or chronic kidney disease. **Results:** Overall, the weighted prevalence of sarcopenia was 23.1% defined by ALM and 17.0% defined by ALM/BMI; the weighted prevalence of low muscular strength was 19.4%. In the multivariate-adjusted models, sarcopenia was significantly associated with increased risk of all-cause mortality for ALM/BMI definition (OR: 1.44; 95% confidence interval [CI], 1.06-1.97) but not for ALM definition (OR: 1.37; 95% CI, 0.90-2.09) while LMS was strongly associated with all-cause mortality (OR: 2.32; 95% CI, 1.70-3.18). In the joint analyses, a significantly increased all-cause mortality was observed only among participants with LMS and non-sarcopenia (OR range: 2.03-2.50) and those with LMS and sarcopenia (OR range: 2.15-2.56) while those without sarcopenia and LMS were the reference group. **Conclusions:** Low knee extensor strength indicative of low muscular strength was independently and significantly associated with an increased risk of all-cause mortality among US older adults regardless of the presence or absence of sarcopenia.

Disclosures: R. Li: None. J. Xia: None. X. Zhang: None. J. Guo: None. Y. Song: None.

Funding: No

Funding Component:

**P301**

**The Association of Physical Activity and Inflammation is Independent of Central Obesity in the Multi-Ethnic Study of Atherosclerosis**

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**Purpose**—Physical activity is associated with decreased adiposity-related inflammation in adults. Whether this association is independent of central obesity is unknown but important for understanding the mechanisms associated with reducing cardiometabolic disease risk through physical activity. This study examined whether associations of physical activity and obesity-related inflammatory markers were independent of central adiposity.

**Methods**—Between 2002 and 2005, 1970 participants from the Multi-Ethnic Study of Atherosclerosis completed detailed health history and physical activity questionnaires, underwent physical measurements including computed tomography to quantify abdominal visceral and subcutaneous fat, and measurements of adiponectin, leptin, interleukin-6, tumor necrosis factor-alpha, and resistin. Statistical analyses included analysis of covariance and multivariable-adjusted regression.

**Results**—The mean (range) age of participants was 64.7 (55-84) years and 50% were female. After adjustment for age and sex, and compared to the lowest quartile, inflammatory markers in the highest quartile of moderate-to-vigorous physical activity were 16% higher for adiponectin and 30%, 26% and 9% lower for leptin, interleukin-6, and resistin, respectively (p<0.05 for all). In linear regression adjusted for demographics, dyslipidemia, hypertension, diabetes, smoking, glomerular filtration rate, renin and aldosterone, each standard deviation increment of moderate-to-vigorous physical activity was associated with significantly higher levels of adiponectin (β=0.04) and lower levels of leptin (β=-0.06), interleukin-6 (β=-0.08), and resistin (β=-0.05, p<0.05 for all). The associations with leptin, interleukin-6, and resistin were independent of total and central adiposity (p<0.05), whereas the association between moderate-to-vigorous physical activity and adiponectin was attenuated by central adiposity (p>0.05). There were no significant interactions by race/ethnicity or sex.

**Conclusions**—Moderate-to-vigorous physical activity was associated with a more favorable profile of inflammatory markers, independent of relevant cardiometabolic disease risk factors including central obesity.


Funding: No.

Funding Component:

P302

Energy Expenditure Responses to Exercise Training in Older Women: The Influence of Baseline Physical Activity

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**Introduction:** Components of energy expenditure are not static. There is debate over whether there is a reduction in non-exercise activity thermogenesis (NEAT) that compensates for energy cost of exercise training. The purpose of this study was to determine the changes in components of energy expenditure following exercise training, and whether any of the changes differ by dose of exercise. **Methods:** Older inactive women (60-75 years, less than 20 minutes of structured exercise for 3 times/week, n=72) participated in 4 months of exercise training of lower- or higher-dose (8 and 14 kcal/kg body weight weekly, respectively). The exercise was treadmill walking, 3 to 4 times per week, at 50-55% of heart rate reserve. Total daily energy expenditure (TDEE) by the doubly labeled water method, resting metabolic rate (RMR) via indirect calorimetry, and total physical activity by ActiGraph accelerometers (counts per minute), were measured at baseline and in the
last two weeks of exercise training. Exercise energy cost was determined by speed, slope, and duration of walking according to the American College of Sports Medicine guideline. NEAT was calculated as (TDEE x 0.9 – RMR – exercise energy cost). **Results:** There were no group differences in the changes in energy expenditure measures (p for time x group interaction > 0.10 for all). TDEE, RMR, NEAT and total physical activity did not change at the end of exercise training (p > 0.05 for all). However, a significant baseline physical activity x time interaction was found for several energy expenditure measures. Data were therefore stratified into tertiles based on baseline physical activity. In the highest tertile, TDEE remained unchanged but NEAT and total physical activity decreased (p < 0.05 for all). In contrast, in the mid- and lowest tertiles, NEAT remained unchanged, total physical activity increased, and TDEE was unchanged or increased (p < 0.05 for all). **Conclusions:** In this group of older women, 4 months of aerobic exercise training did not change any of the energy expenditure measures in the overall sample. However, baseline physical activity levels influenced the energy expenditure responses, indicating reductions in NEAT and total physical activity despite participation in exercise training in those who had higher physical activity level at baseline.

Disclosures: **X. Wang: B. Research Grant; Significant; NIH R00AG031297. K. Bowyer:** None. **R. Porter:** None. **C. Breneman:** None. **S. Custer:** None.

Funding: No

Funding Component:

**P303**

High Birth Weight Modifies Estimated Effects of Physical Activity on Cardiometabolic Health in Females

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**Background:** Birth weight and physical activity are independently associated with cardiometabolic health outcomes. Low or high birth weight are indicators of adverse prenatal development, which may alter physiological response to physical activity later in life. However, few studies have explored the potential interaction between birth weight and physical activity as determinants of cardiometabolic health.

**Objective:** We evaluated the hypothesis that high or low birth weight modifies the association of early life physical activity with cardiovascular disease or diabetes later in life.

**Methods:** We analyzed data from the National Longitudinal Study of Adolescent and Adult Health (Add Health), a nationally representative cohort of US adolescents followed into adulthood (n=20,745) with four data collection waves between 1994 and 2008. Outcomes were assessed in early adulthood: (1) predicted 30-year cardiovascular disease (CVD) risk, computed by a validated algorithm based on objective measures, and (2) prevalent pre-diabetes and diabetes (PDM/DM; ordinal regression) each as a function of birth weight (low, normal, high; LBW, NBW, HBW) and self-reported moderate-to-vigorous physical activity frequency (MVPA) in adolescence and young adulthood, adjusting for age, smoking, and sociodemographic factors.

**Results:** A greater proportion of women born at LBW had diabetes than NBW and HBW women (10.8% versus 5.9% and 5.4%, respectively). In adjusted analyses, MVPA in adolescence (MVPA1) and early adulthood (MVPA3) were not significantly associated with predicted CVD...
risk and prevalent pre-diabetes diabetes in men or women overall. However, greater MVPA1 was associated with lower predicted 30-year CVD risk in HBW females (estimated effect coefficient -0.02 [95% CI: -0.03, -0.005, \( p=0.02 \)), \( p=0.05 \) for HBW×MVPA1 interaction), and the HBW×MVPA1 interaction on PDM/DM approached significance in females (\( p=0.12 \)). In females and males of LBW or NBW, MVPA1 was not significantly associated with predicted 30-year CVD risk or PDM/DM and LBW×MVPA1 interactions were not significant.

Conclusions: Greater adolescent physical activity was most strongly associated with lower 30-year CVD risk in young women born at HBW. A similar association with prevalent DM/PDM approached significance, with greater adolescent physical activity most strongly associated in HBW women. Females born at HBW may be especially sensitive to the effects of physical activity on reducing risk of cardiometabolic disease later in life, with important implications for disease prevention and health policy.


Funding: No

Funding Component:

P305

Daily Walking Time and Pneumonia Mortality Among Elderly With/Without Medical History of Myocardial Infarction or Stroke

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Several studies report that daily walking reduces the risk of pneumonia. However, the elderly often experience underlying chronic diseases such as myocardial infarction (MI) or stroke which also increase the risk of pneumonia; thus, the association of walking with pneumonia may merely be a result of confounding of the underlying conditions. Therefore, we explored the links between daily walking and pneumonia mortality stratified by the presence of medical histories in 22,280 Japanese elderly (9,067 men and 13,213 women) aged 65 to 79 years from 1988-1990. The Cox proportional hazards model was used to calculate hazard ratio (HR) and 95% confidence interval (CI) for pneumonia mortality (ICD10: J9-18, J69) adjusted for age, sex, and possible confounders. P for trend was calculated across the categories of walking time. After a median of 11.9 years’ follow-up, 1,203 participants died of pneumonia. In participants without a medical history of MI or stroke, the HR of pneumonia mortality in participants who had walked at baseline for ≥1 h/day was 0.73 (95% CI, 0.62-0.85; \( P \) for trend <0.001), compared with those who had walked for 0.5 h/day. Participants with a medical history of MI who walked for ≥1 h/day also showed significantly decreased risk of pneumonia mortality (HR, 0.49; 95% CI, 0.27-0.92; \( P \) for trend = 0.01). No significant associations were found among participants with a medical history of stroke (HR, 0.82; 95% CI, 0.39-1.72), although \( P \) for trend was statistically significant (\( P \) for trend = 0.003). However, the HR of pneumonia mortality in participants who had walked at baseline for <0.5 h/day was 1.46 (95% CI, 1.19-1.78) in participants without a medical history of MI or stroke, 1.06 (95% CI, 0.46-2.25) in participants with a medical history of MI, and 2.83 (95% CI, 1.35-5.95) in participants with a medical history of stroke. Our findings suggest that longer walking time may be beneficial in reducing the risk of pneumonia mortality in elderly populations.

Funding: No

Funding Component:

P306

**Skeletal Muscle Mass is Related to Physical Activity and Dietary Behavior in Adolescents**

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**Background:** As the most abundant insulin-sensitive tissue, skeletal muscle plays a crucial role in systemic glucose metabolism. Physical activity and healthy diet are beneficial at preserving skeletal muscle in the elderly; however, their role on skeletal muscle mass in adolescents has not been reported. **Objective:** We hypothesized that higher physical activity and healthy diet behaviors are associated with greater skeletal muscle mass. **Design:** A cross-sectional, observational study in 640 healthy European and African American aged 14-18 years. **Measurements:** Diet was assessed by four to seven 24-h recalls, and physical activity was determined by 7-day accelerometry. Healthy diet behaviors included higher energy intake from protein, lower energy intake from fat, higher consumption of fruit, vegetable, whole grain foods and lower consumption of sweetened soft drinks. Fat-free soft tissue mass (FFM) and fat mass (FM) were measured using dual-energy X-ray absorptiometry. The residual derived from the regression of FFM on height and FM was used as an index of skeletal muscle mass. This is an index independent of the influence from height and fat mass. **Results:** Multiple linear regression, adjusting for age, sex, race, and total energy intake, revealed that skeletal muscle mass was positively correlated with both moderate (P<0.001) and vigorous physical activity (p<0.001). In addition, skeletal muscle mass was positively correlated with energy intake from polyunsaturated fatty acid (p=0.023) and consumption of whole grain foods (p=0.029) while negatively correlated with energy intake from saturated fatty acid (p=0.003) and consumption of sweetened soft drinks (p=0.003). In the final model including all of the significant predictors, physical activity, energy intake from saturated fatty acid, and consumption of sweetened soft drink are all independent contributors to skeletal muscle mass. **Conclusions:** For the first time, our adolescent data suggest that engage in physical activity increase while greater consumption of saturated fatty acid and sweetened soft drinks reduce skeletal muscle mass.

Disclosures: G. Hao: None. N. Pollock: None. R. Harris: None. B. Gutin: None. S. Su: None. X. Wang: None.

Funding: No

Funding Component:

P307

**Associations Between Physical Activity and Cardiac Functional Measures Assessed by Echocardiography: Echocardiographic Study of Latinos (ECHO-SOL)**

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Introduction:
Physical activity (PA) is associated with cardiovascular health benefits including prevention of age-related cardiac remodeling, systolic and diastolic dysfunction, and adaptive pro-hypertrophic effect. In this study, we aim to measure the associations between PA and LV structure and function in a diverse Hispanic/Latino population.

Methods:
Participants included 1,818 self-identified Hispanic/Latino men and women, age 45-74 from the Echocardiographic Study of Latinos (ECHO-SOL). Standard echo measures included M-mode, two-dimensional (2-D), spectral, tissue Doppler, and color flow. Participants wore an Actical hip accelerometer for 1 week. Multivariable regression models were completed to relate PA to echocardiographic parameters.

Results:
The mean ± SE age for the cohort was 56 ± 0.4, 57% were female, the prevalence of diabetes was 28%, hypertension 50%, hypercholesterolemia 49%, and coronary heart disease 7%. Average moderate to vigorous PA (MVPA) was 20.9 ± 1.1 min/day and sedentary time ± SE was 736.5 ± 8.1 min/day. In multivariable models adjusted for age, gender, diabetes, hypertension, hypercholesterolemia, coronary heart disease, alcohol and cigarette use, we found the following: left atrium volume index (LAVI) decreased by quartiles of MVPA (p-value < 0.001). Global circumferential strain (GCS) decreased across these quartiles of MVPA. Moreover, LAVI decreased by 0.3 per 100 min/day of sedentary time (p-value < 0.01) and GCS also decreased across quartiles of sedentary time.

Conclusion:
MVPA was significantly associated with lower LAVI. There was also a significant association with sedentary behavior. Our findings illustrate the complex relationship between PA, sedentary time, and cardiac structure and function.


Funding: No

Funding Component:

P308

Physical Activity is Associated With Lower Atherosclerotic Risk and Arterial Stiffness in Youth

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Introduction
The prevalence of cardiovascular (CV) risk factors in young people has increased related to the pediatric obesity epidemic. An association between physical activity (PA) and target organ damage has been firmly established in adults, and such damage confers increased CV event risk. There is an urgent need to implement prevention strategies for CV disease in youth. Promoting PA holds promise in this regard. However, in order to be a useful marker, PA needs to be quantified accurately.
and feasibly in the clinical setting, and its relationship to preclinical CV disease in youth needs to be understood. **Objective** We aimed to 1) examine the relationship between a subjective measure of PA and an objective measure in a young cohort, 2) determine the association of PA and other CV risk factors, and 3) test the hypothesis that PA is an independent determinant of target organ damage. **Methods** Adolescents and young adults were recruited from an ongoing study of the effects of risk factors on CV aging. At baseline adolescents with type 2 diabetes mellitus were matched by age, sex, and race to lean and obese control subjects without diabetes. These analyses were performed at 5 years follow-up on 249 subjects (mean age 22 ± 3.9 years). PA was measured with the International Physical Activity Questionnaire (IPAQ) and the Actical accelerometer. Target organ damage was assessed with echocardiography and vascular structure and function testing. Subjects were stratified into tertiles of average PA with the lean group as the standard. Differences in endpoints by PA tertile were tested by analysis of variance and χ2 tests. General linear models were constructed and used to test for independent associations. **Results** Responses to the IPAQ differed greatly from objective accelerometry. There was a weak trend toward increased CV risk factors and target organ damage in those with the lowest IPAQ scores. When subjects were stratified into tertiles of by accelerometry the less active subjects had significantly worse CV risk profiles as indicated by higher Pathobiological Determinants of Atherosclerosis in Youth (PDAY) scores, and more signs of target organ damage including stiffer arteries as indicated by greater carotid-femoral pulse wave velocities. These differences did not reach statistical significance when adjusted for metabolic variables. **Conclusion** PA is associated with CV risk factor clustering and target organ damage in young people. Measuring PA in this population is feasible, but has limitations. This study confirms the utility of PA in predicting the presence of target organ damage. Our study is the first to demonstrate a negative, cross-sectional relationship between PA and PDAY score. Future opportunities for research include examining the contribution of different levels of PA on CV aging as well as the effect of increasing PA over time.

Disclosures: **S.G. Wittekind**: None. **N.M. Edwards**: None. **P.R. Khoury**: None. **C.E. McCoy**: None. **T.R. Kimball**: None. **E.M. Urbina**: B. Research Grant; Significant; NIH R01 HL076269, NIH R01 HL105591, NIH UL1 TR001425.

**Funding:** No

**Funding Component:**

**P309**

**The Role of Traumatic Stress in Association Between Physical Activity and Cardiovascular Disease Risk Factors Among Hispanic/Latino Adults: The Hispanic Community Health Study/Study of Latinos (HCHS/SOL) Sociocultural Ancillary Study**

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**Background:** Physical activity (PA) is associated with lower risk, and chronic stress with increased risk of CVD risk factors (RFs) such as hypertension (HTN) or type 2 diabetes. Little is known about potential interactions between PA and traumatic stress (TS) in relation to CVD risk factors. **Objective:** To assess whether the association of
PA with CVD RFs is modified by the presence of traumatic stress (TS).

**Methods:** Cross-sectional data from 4,169 adults ages 18-74 in 2008-11, who participated in the HCHS/SOL Sociocultural Ancillary Study and had complete information on key variables, were analyzed using complex survey design methods. TS was assessed by self-reported lifetime exposure to traumatic events; scores were categorized into tertiles based on number of stressors: low=0-1; intermediate=2; high=≥3. PA was assessed by the Global PA Questionnaire and grouped into 4 levels: inactive, low, intermediate, and high activity. CVD RFs included HTN, obesity, diabetes, smoking, and hypercholesterolemia. Multivariate logistic regression was used for analyses.

**Results:** Compared to high PA levels, intermediate PA was significantly associated with HTN, inactivity was associated with obesity, and inactivity and intermediate PA were associated with diabetes (Table). Significant interaction between PA with TS was observed for HTN (p<0.001) but not for other CVD RFs. For effect modification by TS, among persons with low TS, intermediate PA was associated with 2.1 times higher odds of HTN vs. high PA levels. Among those with intermediate TS, low PA was associated with 2.3 times higher odds of HTN, and among those with high TS, inactivity was associated with 2.1 times higher odds of HTN vs. high PA levels.

**Conclusion:** A statistical interaction was observed between traumatic stress and physical activity among those with hypertension (but not with other CVD risk factors), and the odds of HTN varied by TS. Further evaluation is needed to determine physical activity recommendations to prevent hypertension among those with traumatic stress.


**Funding:** No

**Funding Component:**

**P310**

**Effect of Static Stretching Exercise on Aortic Pulse Wave Velocity**

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**Introduction:** Large-artery stiffness (i.e., aortic stiffness) is an independent predictor of hypertension which is a leading cause of excess cardiovascular morbidity and mortality. Carotid-femoral pulse wave velocity (cf-PWV) is considered the ‘gold-standard’ measure of arterial stiffness because it measures along the aorto-iliac pathway, which buffers blood pressure (BP) the most. While there is well-documented evidence on the health benefits of aerobic and resistance exercise, the information for the effect of stretching on aortic stiffness is limited. Previous studies have shown that
arterial stiffness is associated with trunk flexibility. Stretching exercise targeted to improve flexibility may exert a beneficial effect on reducing aortic stiffness. **Objectives:** This study aimed to examine effects of a single bout of a structured static stretching exercise on aortic stiffness as well as trunk flexibility, blood pressure (BP), and heart rate (HR). **Method:** This study has a pretest-posttest design without a control group. Thirty healthy women from the community were instructed to follow a video demonstration of a structured whole-body static stretching lasting 30 minutes. Each stretching was designed to improve range of motion and enhance flexibility in 10 body areas, and all stretching motions were performed in the sitting position. Aortic stiffness was measured by cf-PWV using the SphygmoCor system (AtCor medical, AU). Trunk Flexibility was measured by the sit and reach method. BP and HR were measured using the WelchAllyn Monitor (WelchAllyn, USA).

**Results:** After stretching exercise, cf-PWV (m/s) was significantly reduced (M=6.93, SD=1.54 vs M=6.29, SD=1.17; t(29)=2.708, p =.011). In addition, HR (bpm) was significantly decreased (M=64.88, SD=6.29 vs M=61.77, SD=6.29; t(29) = 7.170, p=.000). A significant increase of lumbar flexibility (inches) was also detected (M=13.37, SD=4.3 vs M=16.45, SD=4.79; t(29) = 12.248, p=.000). Systolic BP and diastolic BP (mmHg) were decreased after stretching exercise from M=107.87 (SD 10.75) to M=106.82 (SD 12.48), from M=63.37 (SD 6.71) to M=61.88 (SD 6.47), respectively; however, the differences did not reach the statistical significance. **Conclusions:** Findings of the current study highlight the potential benefit of static stretching exercise on aortic stiffness independent of BP. The results also demonstrate that HR was significantly decreased after the stretching exercise. Given no sign of over-activity of sympathetic function, a structured static stretching exercise may be prescribed as an effective intervention to reduce aortic stiffness for the people with high risk of cardiac events. In addition, stretching motions that were conducted in the sitting position can be cautiously utilized as an effective intervention for stroke patients, post-surgery patients, and people who have unsteady walking.

**Disclosures:** **J.G. Logan:** C. Other Research Support; Modest; Oscar and Ruth Lanford Research Award, University of Virginia School of Nursing. **S. Kim:** None. **M. Lee:** None. **S. Yeo:** None.

**Funding:** No

**Funding Component:**

**P311**

**Occupational Physical Activity and Cardiovascular Risk Profile Among the Adult Population of the Southern Cone of Latin America**

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**Introduction** There are no published data in relation to this topic at population level from the Southern Cone of Latin America. Hence, we assessed the hypothesis that higher levels of occupational PA will be associated with lower plasma levels of lipoproteins, apolipoproteins, C reactive protein, blood pressure and lower body mass index (BMI) compared to those of the subjects who performed sedentary activities at work **Methods** The CESCAS I study is a population-based prospective cohort study with a 4-stage stratified sampling of a general population from four mid-sized cities in Argentina, Chile and Uruguay. PA was assessed using the International Physical Activity Questionnaire long form. We expressed the total PA score per week as total metabolic equivalent per minutes per week. To test univariate associations between tertiles (T) of occupational PA and continuous variables we used simple linear regression models and chi-square test for categorical variables. The changes in crude and adjusted means of systolic
and diastolic blood pressure, BMI, lipoproteins, C reactive protein and apolipoproteins AI and B were tested using multivariate linear regression models.

**Results** The working population consisted in 1,868 men and 1,672 women. In men, T3 compared to T1 (reference category) showed lower prevalence of university education (12.4% vs. 26.9%; p 0.001 (90 and 235 of 1,868, respectively)), obesity or overweight (76.0% vs. 82.9%; p 0.001 (553 and 724 of 1,868, respectively)) and higher prevalence of active transportation (60.2 vs. 51.9%; p 0.002 (453 and 439 of 1,868, respectively)). In multivariate analysis, T2 vs. T1 showed a reduction of BMI (mean adjusted difference -1.0; p 0.001), systolic blood pressure (-2.5 mmHg; p 0.027), glycemia (-3.9 mg/dL; p 0.024), triglycerides (-32.0 mg/dL; p 0.003) and higher mean values of high density lipoprotein (HDL) (2.5 mg/dL; p 0.02) and apolipoprotein AI (13.7 mg/dL; p 0.002). When compared, T3 vs. T1 only showed lower mean values of BMI and triglycerides and higher values of HDL but with a lower magnitude. In women, T3 compared to T1 showed a reduction of university education (20.4 vs. 29.5%; p 0.001), lower sleep hours (7.4 vs. 7.7; p 0.007) and higher prevalence of major depressive episode (16.9 vs. 11.5; p 0.003). In multivariate analysis, T3 compared to T1 showed higher levels of HDL (mean adjusted difference 2.0 mg/dL; p 0.025)

**Conclusions** Moderate or high physical activity at work was not associated with an increased cardiovascular risk profile. On the contrary, the results showed that this population would have a lower cardiovascular risk, especially in those who perform moderate intensity activities compared to those performing sedentary activities. The lack of associations in woman could be related to a better baseline risk profile and the higher prevalence of active transportation in all categories of occupational PA compared to men.

**Disclosures:** R. Poggio: None. L. Gutierrez: None. V. Irazola: None. N. Elorriaga: None. A. Rubinstein: None.

**Funding:** No

**Funding Component:**

**P312**

**High State and Trait Hopelessness Levels Predict Lower Home-based Exercise Participation in Patients With Coronary Heart Disease**

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**Introduction:** Hopelessness is associated with increased adverse events and decreased survival in patients with coronary heart disease (CHD). Hopelessness can persist in these patients and reduce their participation in hospital-based cardiac rehabilitation (CR) exercise following an acute event. Because the majority of CHD patients do not attend a hospital-based CR exercise program, examination of factors affecting home exercise is needed. The purpose of this study was to describe the impact of hopelessness levels on both home- and hospital based CR exercise participation in patients with CHD. **Hypothesis:** It was hypothesized that higher state and trait hopelessness levels would adversely affect both home- and hospital-based CR exercise participation. **Methods:** The Theory of Hopelessness Depression was used as a foundation for study aims. Using a descriptive, longitudinal design, 282 patients who had been hospitalized with a CHD event were asked to complete the State-Trait Hopelessness Scale (STHS) during their hospitalization and the STHS and the Cardiac Rehabilitation Exercise Participation Questionnaire at 3, 8, and 12 months after hospital discharge. Patients who provided data at any two concurrent time points over the year were included in the analyses. Regular exercise was defined as...
walking or biking ≥3 days/week in a home- or hospital-based Phase II CR exercise program. Logistic regression was used to evaluate the relationship between STHS scores on the likelihood that patients would participate in regular exercise in home- or hospital-based Phase II CR settings. **Results:** Patients were predominantly male (64.9%) with a mean age of 65.4±9.7 years. Patients had persistent, modest levels of state and trait hopelessness across all time points. High levels of state and trait hopelessness were predictive of lower home-based exercise participation (state: OR 0.4, 95% CI [0.1, 0.7], p=0.002; trait: OR 0.4, 95% CI [0.2, 0.8], p=0.01) but not hospital-based Phase II CR exercise, after adjusting for age and sex. **Conclusions:** These findings demonstrate the importance of assessing hopelessness in patients with CHD and provide critical evidence of the need for clinicians to encourage CHD patients who are feeling hopeless to participate in CR exercise, particularly in the home setting.


**Funding:** No

**Funding Component:**

**P313**

**Dog Walking is Associated With Increased Home-based Exercise in Patients with Coronary Heart Disease**

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**Introduction:** Dog ownership and dog walking have been associated with increased physical activity in the general population. Although evidence suggests an association between pet ownership and increased survival in patients with coronary heart disease (CHD), little is known about how dog ownership and dog walking may be associated with exercise habits in CHD patients. **Hypothesis:** The purpose of this study was to examine dog ownership and dog walking and their relationship with frequency of home- and hospital-based CR exercise in patients with CHD. It was hypothesized that CHD patients who walk their dogs would report more frequent home- and hospital-based CR exercise. **Methods:** The study was based on Self-Determination Theory. A prospective observational design was used. A total of 122 patients with CHD completed a dog ownership and walking survey during their hospitalization and were asked to complete the Cardiac Rehabilitation Exercise Participation Tool by mail at 3, 8 and 12 months later. Patients self-selected whether they walked or biked in a home- or hospital-based Phase II CR exercise setting and self-reported number of days per week of exercise in each setting. **Results:** The sample was predominantly male (n=82; 67.2%) with a mean age of 64.7±9.1 years. Forty-two patients (34.4%) reported owning a dog. There were no differences in participation in home or Phase II CR exercise in dog owners versus non-dog owners (home CR: 57.1% vs. 62.5%, p=0.57 and Phase II CR: 31.0% vs. 32.5%, p=0.86). Among dog owners, 23 (54.8%) reported walking their dog at least 1 day/week. There were no significant differences in Phase II CR exercise among non-dog owners, dog owners who did not dog walk, and those who walked their dogs at least 1 day/week (owners/walkers: 34.8%, owners/non-walkers: 26.3%, non-owners: 32.5%; p=0.83). However, patients who owned but did not walk their dog reported significantly lower levels of home exercise compared to patients who owned and walked their dogs at least 1 day/week (owners/non-walkers: 36.8% vs. owners/walkers: 73.9%, p=0.019) and compared to non-dog owners (owners/non-walkers: 36.8% vs. non-owners: 62.5%; p=0.047). **Conclusions:** Results suggest that dog ownership is not equivalent to dog walking when examining exercise frequency in CHD.
patients. Dog owners were no more likely to exercise than non-dog owners. However, findings show a beneficial effect on home-based exercise for CHD patients who walk their dogs at least one day a week. Healthcare professionals should encourage CHD patients who are dog owners to walk their dogs as a strategy to increase home-based exercise.

Disclosures: **S.L. Dunn**: None. **M.J. Sit**: None. **H.A. DeVon**: None. **D. Makidon**: None. **N.L. Tintle**: None.

Funding: No

Funding Component:

**P314**

**Higher C-Reactive Protein Levels Among Women with a History of Hypertensive Disorders of Pregnancy**


**Introduction**: Women with a history of pregnancy complications, including hypertensive disorders of pregnancy (HDP: preeclampsia and gestational hypertension) and preterm delivery (<37 weeks), have an increased risk of cardiovascular disease (CVD). There is limited knowledge of the pathway linking pregnancy outcomes and CVD, but chronic inflammation may play a role. **Methods**: We selected parous women from the Nurses’ Health Study II who had the inflammatory biomarkers C-reactive protein (CRP; n=2,987) or interleukin (IL)-6 (n=2,916) assessed in stored blood samples provided after pregnancy, between 1996 and 1999. Women were selected from previous nested case-control biomarker studies. Robust linear regression models were used to separately evaluate the mean differences in CRP and IL-6 and 95% confidence intervals (CIs) associated with a history of HDP compared to no such history and with a history of preterm delivery compared to no such history. Models were adjusted for age at blood draw, pre-pregnancy body mass index and smoking, and variables related to lab selection. **Results**: Ten percent (285 of 2,987) of women had a history of HDP, while 12% (358 of 2,987) had at least one preterm delivery prior to blood draw. Median time from first pregnancy to blood draw was 17 years (range: 1-37 years). Mean CRP levels were 2.00 mg/L and 1.57 mg/L, while mean IL-6 levels were 1.56 pg/mL and 1.42 pg/mL in women with and without a history of HDP, respectively. In women with and without preterm delivery, mean CRP levels were 1.54 mg/L and 1.62 mg/L and mean IL-6 levels were 1.39 pg/mL and 1.44 pg/mL, respectively. Plasma levels of CRP were 0.36 mg/L (95% CI: 0.12, 0.60) higher, on average, in women with a history of HDP compared to those with all normotensive pregnancies. Plasma IL-6 levels were not significantly higher among women with a history HDP (0.06 pg/mL, 95% CI: -0.16, 0.27). There were no significant differences in CRP (-0.11 mg/L, 95% CI: -0.30, 0.07) or IL-6 (-0.08 pg/mL, 95% CI: -0.25, 0.10) levels in women with a history of preterm delivery. **Conclusion**: CRP was elevated in women with a history of HDP in the decades following pregnancy, suggesting a potential inflammatory response. An altered inflammatory profile was not present in women with a history of preterm delivery. Further investigation is needed to confirm these inflammatory responses in women with a history of pregnancy complications and to evaluate the utility of CRP as a potential risk marker in CVD screening.


Funding: No
Preterm Delivery is Associated with Maternal Cardiovascular Risk Factors


Background: Women with a history of delivering a child preterm have a higher risk of cardiovascular disease (CVD). We sought to evaluate whether these women are also at higher risk of developing CVD risk factors after adjustment for multiple pre-pregnancy risk factors. Methods: We examined the association between preterm delivery (<37 weeks) and development of subsequent chronic hypertension, hypercholesterolemia, and type 2 diabetes mellitus (T2DM) among 59,315 women in the Nurses’ Health Study II. We restricted our study population to parous women who did not experience gestational diabetes or a hypertensive disorder in their first pregnancy and were free of CVD risk factors of interest and events at baseline. Multivariable Cox proportional hazards models were used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for the associations between preterm delivery in first pregnancy and each CVD risk factor. We additionally investigated the association between preterm delivery over a woman’s entire reproductive history and CVD risk factors. Results: Compared to women who delivered their first pregnancy at term, preterm delivery was associated with HRs of 1.13 (95% CI: 1.07, 1.19) for chronic hypertension, 1.06 (95% CI: 1.02, 1.11) for hypercholesterolemia, and 1.21 (95% CI 1.08, 1.35) for T2DM, after adjusting for age, race/ethnicity, parental education, and other pre-pregnancy risk factors (e.g., BMI, smoking, family history of chronic hypertension and T2DM). These associations were stronger in the very preterm group (<32 weeks) than in the moderate preterm group (≥32 to <37 weeks). The risk was highest in the first 10 years after a preterm first birth with HRs of 1.45 (95% CI: 1.23, 1.71) for chronic hypertension, 1.13 (95% CI: 1.02, 1.25) for hypercholesterolemia, and 2.14 (95% CI: 1.33, 3.45) for T2DM. When investigating a woman’s entire reproductive history, we found that, compared to women with at least two births all of which were at term, women with a preterm first birth were at increased risk of chronic hypertension regardless of the gestation lengths of future pregnancies, while women with a preterm first birth and no future births had the highest risk of T2DM. Conclusions: Women with a history of preterm delivery have higher risk of developing chronic hypertension, hypercholesterolemia, and T2DM after pregnancy. These results suggest potential benefits of including preterm delivery in CVD risk scores and screening.


Funding: No
Background: Sex-specific features, including adverse pregnancy outcomes (i.e., gestational hypertension, preeclampsia, gestational diabetes), have been associated with increased risk for CVD. However, there is limited research characterizing these associations with menopause features or with subclinical vascular measures at late midlife, when CVD risk increases.

Objective: To evaluate associations between reproductive factors (i.e., gestational hypertension, preeclampsia, and gestational diabetes) with validated and reliable markers of subclinical vascular damage and remodeling; carotid intima-media thickness (cIMT), adventitial diameter (cAD), carotid plaque presence, and brachial-ankle pulse wave velocity (baPWV).

Methods: A cross-sectional analysis was conducted with 1454 women (50% white, 31% black, 6% Hispanic, 13% Chinese) from the Study of Women’s Health Across the Nation (SWAN). Women were included if they completed a detailed reproductive history questionnaire and had a carotid ultrasound at visit 12 or 13. baPWV was performed at the same follow-up visit. Associations between reproductive history and subclinical CVD were tested using linear and logistic regression models adjusting for demographics and traditional CVD risk factors (age, site, race/ethnicity, financial strain, BMI, SBP, LDL-c, HDL-c, HOMA-IR). Additional models were adjusted for sex hormone levels and number of births.

Results: Women were on average 60 years old and mostly postmenopausal (94%). Two hundred fifty-six women (18%) were nulliparous. Approximately 10% of parous women had a self-reported history of gestational hypertension or preeclampsia, and 4% reported gestational diabetes. Among parous women, gestational hypertension was associated with higher mean cIMT (β±SE=0.053±0.015mm; P=0.0003) and preeclampsia was associated with higher odds of plaque (OR=1.7; 95% CI: 1.1, 2.6; P=0.01) in fully adjusted models. History of gestational diabetes was related to higher baPWV (β±SE=64.6±28.4cm/s; P=0.009). Associations between adverse pregnancy outcomes and subclinical vascular measures remained significant after adjusting for baseline estradiol and number of births. Compared to nulliparous women, parity≥3 was associated with higher cAD (β±SE=0.10±0.05mm; P=0.02) when controlling for demographics, but not after adjustment for CVD risk factors. Age at menarche, age at menopause, hormone ever use, and bilateral oophorectomy were not associated with subclinical vascular measures at late midlife.

Conclusions: Adverse pregnancy outcomes (i.e., gestational hypertension, preeclampsia, and gestational diabetes) converge to put women at excess risk for CVD, but may affect the vasculature through distinct pathways. Further studies are necessary to assess the joint effects of early and late midlife reproductive factors on future CVD.


Funding: No

Funding Component:

P317

Area Traffic Density Contributes to the Risk of Gestational Diabetes in a Sample of Central Ohio Pregnancies

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Background: The prevalence of gestational diabetes mellitus (GDM) in the US and the state
of Ohio is approximately 9.0%. GDM is associated with increased risks for mother and child, including macrosomia, preterm birth, preeclampsia, and development of type 2 diabetes. In addition to known risk factors, the role of exposure to environmental pollutants in development of GDM warrants further investigation. Because exposure to traffic-related pollutants has been shown to influence the development of type 2 diabetes, we assessed the contribution of exposure to high traffic to the development of GDM during pregnancy among women without prior diabetes history.

**Methods:** A population of 275 pregnant women in Ohio reported perceived exposure to high traffic areas and health behaviors. Clinical information and addresses were obtained through their electronic health records. Using ArcMap™ 10.2.2 (ESRI), addresses were geocoded to assess individual exposures, and linked with area exposures and demographic indicators at the level of the census block group from EJScreen (EPA). A woman was classified as “near” a major roadway if one fell within a 500m buffer of her home. Distance to nearest major roadway was also calculated. Logistic regression was used to examine the association between quintiles of traffic exposure at the census block group level, self-reported proximity, individual-level proximity, health behaviors, and demographic factors with development of GDM. Because assessment of individual-level exposures may be difficult to use in clinical and large scale population settings, a model was also fit using only data publically available from EJScreen and self-report.

**Results:** The prevalence of GDM was 8.0% (22/275) and distribution of demographics factors were similar between those with and without GDM. After adjustment for potential confounders, quintile of traffic exposure was significantly associated with development of GDM (p=0.036). Compared to those residing in block groups in the lowest quintile, the odds of GDM for those in the second quintile were 8.1 times greater [95% CI 1.2, 56.3] and for those in fourth quintile were 10.4 times greater [95% CI 1.6, 67.6]. Addition of individual-level proximity factors did not significantly improve the model (p=0.08).

**Conclusions:** This study suggests that living in an area with high traffic density contributes to the risk of developing GDM. For both the clinical practitioner and public health researcher it is difficult or impractical to obtain individual level environmental exposure data. From our analysis, the individually calculated exposure proxies did not significantly improve the fit of the model. We suggest examining ways to combine self-report measures with existing environmental data, such as EJScreen, to identify populations at elevated risk.

Disclosures: **C.E. Bollinger:** None. **S. Patel:** None. **D.B. Hood:** None. **J.K. Bower:** None.

Funding: No

Funding Component:

**P318**

**Wide State-By-State Variation in Maternal Mortality and Chronic Diseases That Contribute to Pregnancy Complications**

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**Background:** Among developed countries, the United States has the highest maternal mortality rate. Between 1987 and 2011, the US maternal mortality rate more than doubled from 7.2 to 17.8 deaths per 100,000 live births. More than 1,300 pregnancy-related deaths occurred in the United States in 2011-2012. Additionally, an increasing number of women have chronic health conditions, such as hypertension, diabetes, and chronic heart disease, that increase their risk of pregnancy complications, including maternal mortality. Reducing the prevalence of these diseases may be an important step toward reducing maternal mortality. To examine the current state of
maternal mortality and chronic diseases in the United States, the geographical variation of these factors was examined. Methodology: State-level prevalence estimates were calculated for diabetes, heart disease, and hypertension awareness among women of reproductive age (18 to 44 years) using data from the 2013-2014 Behavioral Risk Factor Surveillance System. State-level maternal mortality rates were calculated using CDC's 2010-2014 National Vital Statistics System. Maternal mortality was defined as the number of deaths from any cause related to or aggravated by pregnancy or its management (excluding accidental or incidental causes) during pregnancy and childbirth or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, per 100,000 live births. Results: The maternal mortality rate is 6.8 times higher in Georgia (39.3 deaths per 100,000 live births) than in Massachusetts (5.8 deaths per 100,000 live births). Nationally, there are an estimated 19.9 maternal deaths per 100,000 live births. The prevalence of chronic diseases that increase risk of pregnancy complications also vary by state. For example, diabetes (excluding gestational diabetes) ranges from a low of 1.9% of women aged 18 to 44 in Alaska, Minnesota, and Wisconsin to a high of 4.8% in Alabama. Nationally, an estimated 3.1% of women aged 18 to 44 have been told by a doctor that they have diabetes. Conclusion: The prevalence of chronic diseases in women of reproductive age vary based on state of residence, as does the maternal mortality rate. Raising awareness about the variation in these measures is an important step toward identifying what strategies are being utilized in states with a low prevalence of diabetes, heart disease, and hypertension, and determining how their public health efforts may help those states facing challenges in these areas.

Disclosures:  S. Milder: G. Consultant/Advisory Board; Significant; United Health Foundation. J. Kenealy: G. Consultant/Advisory Board; Modest; United Health Foundation. M. Honors: G. Consultant/Advisory Board; Modest; United Health Foundation. T. Eckstein: G. Consultant/Advisory Board; Significant; United Health Foundation.

Funding: No

Funding Component:

P319

Do Pregnancy Complications Elevate Cardiovascular Risk After Pregnancy? An Examination of Cardiometabolic Biomarker and Risk Factor Trajectories Up to the First Nine Months Postpartum in Low Income Women

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Introduction: Preeclampsia, having a small for gestational age (SGA) baby or preterm delivery are associated with later maternal cardiovascular disease (CVD) risk. Therefore, we sought to examine whether peripartum CVD biomarker and risk factor trajectories differed among women with and without CVD-related pregnancy complications. Methods: In the Maternal Adiposity Metabolism and Stress (MAMAS) Study, we studied n=110 overweight and obese women in the MAMAS study of 8-week mindful eating and stress reduction intervention, we used mixed linear regression analysis to compare trajectories of CVD risk factors at three periods: 1) intrapartum at 12-20 weeks gestation, 2) 3 months postpartum, and 3) 9 months postpartum. CVD biomarkers/ risk factors studied included serum glucose, insulin, HOMA-IR, leptin, ghrelin, lipids, ALT, IL-6, IL-10, tumor necrosis factor, and blood pressure (BP). Covariates for multivariable adjustment included age, maternal smoking, prepregnancy
Results Women had mean age = 28 y (SD 6), mean prior pregnancies=0.8 (SD 1.0), 13% were White, 36% African American and 32% Latina; n=22 women had one or more CVD-related pregnancy complications. Peripartum glucose and systolic BP trajectories were statistically greater in complicated versus normal pregnancies (p values=0.008 and 0.01 respectively) (Figure). Trajectories for lipids, insulin, HOMA-IR, adipokines, ALT, IL-6 and diastolic BP were elevated in complicated versus normal pregnancies, but did not reach statistical significance. Conclusions: Glucose and systolic BP rise were significantly higher from early pregnancy to 9 months postpartum among low income women with complicated vs. uncomplicated pregnancies. Cardiometabolic risk factor modification among women with CVD-related pregnancy complications in the peripartum period may be warranted.


Funding: No

Funding Component: National Center

P320

Is Co-occurring Endometriosis Among Women With Myocardial Infarction Associated With Worse In-hospital Outcomes? Findings From the Nationwide Inpatient Sample

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Background: Recent studies have shown that patients with endometriosis have an increased risk of coronary artery disease. Inflammatory diseases that increase the risk of coronary artery disease have also been shown to worsen outcomes. We sought to evaluate the effect of co-occurring endometriosis among women with myocardial infarction (MI) on stroke, length of stay (LOS) and in-hospital mortality.

Methods: Data was obtained from the Healthcare Cost and Utilization Project’s Nationwide Inpatient Sample (NIS). We studied women ages 18 and above hospitalized for MI between 2007 and 2011. Admissions for endometriosis, MI and outcomes data were extracted using ICD-9 CM codes. We estimated weighted frequencies and proportions for all patients admitted for MI, co-occurring endometriosis and for all covariates. We then performed bivariate parametric tests of association as appropriate. In order to evaluate the independent effect of co-occurring endometriosis and MI on stroke, LOS and in-hospital mortality, we constructed multivariate regression models.

Results: We found a total of 420,940 hospital admissions for myocardial infarction. Out of these, 80 had co-occurring endometriosis. Women with these co-occurring conditions were more likely to be white (67.5%) and privately insured (53.8%). In adjusted models, compared to those without, women with co-occurring endometriosis and MI did not have a significantly higher risk of stroke (aOR=1.10, 95% CI: 0.27 - 4.56) or prolonged LOS (aOR=1.29, 95% CI: 0.45 - 3.04). Risk was not found to be increased for in-hospital mortality (aOR=0.71, 95% CI: 0.26 - 1.95).

Conclusion: Our study shows that co-occurring endometriosis among women with MI was not significantly associated with worse in-hospital outcomes. Larger, prospective, studies with
longer follow-up time after discharge are needed to further evaluate this association.

Disclosures: A. Akinjero: None. O. Adegbala: None. T. Akinyemiju: None.

Funding: No

Funding Component:

P321

Pregnancy Loss is Associated With Subclinical Cardiovascular Disease in Mexican Women

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Introduction: Cardiovascular disease (CVD) in women often develops in the absence of conventional risk factors. Prenatal loss, a common pregnancy outcome, may result in physiologic changes that could affect future risk of myocardial infarction. Little is known about the impact of pregnancy loss on early markers of CVD risk. Hypothesis: Pregnancy loss affects carotid artery intima-media thickness (CIMT). Methods: We conducted a cross-sectional analysis among 1,769 disease-free women from the Mexican Teachers’ Cohort who had been pregnant to evaluate the relation between pregnancy loss and CIMT. In 2008 participants answered a baseline questionnaire on reproductive history, risk factors for chronic disease and medical conditions that was updated in 2011. We defined pregnancy loss as abortion and/or stillbirth. Between 2012 and 2016, CIMT was measured by trained neurologists using ultrasound in three clinical sites. We log-transformed CIMT and defined carotid atherosclerosis as CIMT ≥0.8mm or plaque. We used multivariable linear and logistic regression models to assess the relation between pregnancy loss, CIMT and carotid atherosclerosis. Results: Mean age of participants was 49.8 (SD ± 5.1) years. The prevalence of pregnancy loss was 22% (394 of 1769), while we observed carotid atherosclerosis in 23% (405 of 1769) of participants. Comparing participants who reported a pregnancy loss to those who did not, the multivariable-adjusted odds ratio for carotid atherosclerosis was 1.52 (95% CI 1.12, 2.06). Women who experienced a stillbirth had 2.32 higher odds (95% CI 1.03, 5.21) of carotid atherosclerosis than those who did not. Mean CIMT appeared to be higher in women who reported a pregnancy loss relative to those who did not, however, in multivariable analyses, pregnancy loss and stillbirth were not significantly associated with CIMT. Conclusions: Abortion and stillbirth may be associated with a higher risk of CVD. Additional investigation on potential underlying mechanisms for this association is required.


Funding: No

Funding Component:

P322
The Association Between Parity and Sleep Duration: a Study From the AHA Go Red for Women Strategically Focused Research Network (SRFN)

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Background: Prior research has shown a J-shaped association between parity and increased risk of cardiovascular disease (CVD), and several confounding factors have been identified. Sleep is emerging as an important, potentially modifiable risk factor for CVD, however few data have examined the relationship between parity and sleep.

Methods: We studied 50 women in the AHA Go Red for Women Strategically Focused Research Network who provided information on pregnancy history and sleep patterns (56% non-white (n=28), mean age = 41±18 y). The Pittsburgh Sleep Quality Index was used to assess sleep duration and quality, and the Insomnia Severity Index was used to assess level of insomnia. Parity was assessed using a standardized questionnaire as any pregnancies lasting > 6 mo. We used linear and logistic regression to examine the cross-sectional relation between sleep (duration, quality, and insomnia severity) and parity.

Results: Prior pregnancy was reported in 32% (16 of 50) women and 36% (18 of 50) sleep ≤ 6 h/night. Parous women were significantly older (55 vs 34 y), more likely to have a BMI ≥ 25 kg/m², HTN, and hyperlipidemia compared to nulliparous women. Sleep duration was significantly shorter in parous women (6 h vs 7 h), and the relationship remained significant for primiparous women (1 birth) after adjustment (Figure). More than half of parous women reported poor sleep quality (56%, 9 of 16) and insomnia (63%, 10 of 16) compared to 29% of nulliparous women (10 of 34) who reported each sleep disorder. After adjustment for age, there was no difference in sleep quality or insomnia between groups (p>0.05).

Conclusion: In a diverse cohort of women, sleep duration was inversely related to parity. Primiparous women may be at heightened risk for the adverse cardiometabolic consequences of inadequate sleep duration, and may represent a teachable moment for CVD prevention. Ongoing studies to examine the relationship between sleep and pregnancy may provide important information on the pathways through which these risk factors modify future CVD.

Disclosures: N.A. Bello: None. J. Catov: None. B. Aggarwal: None.

Funding: Yes

Funding Component: National Center

P323

Cardiac Rehabilitation is Associated With Decreased Mortality in HIV Patients With Cardiovascular Disease

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Background: Human immunodeficiency virus (HIV+) patients are at high risk for cardiovascular disease (CVD). While cardiac
rehabilitation (CR) reduces mortality in uninfected (HIV-) patients with CVD, there are no specific data on CR use in CVD patients with HIV. Methods: We analyzed data on 7650 veterans (28.4% HIV+) eligible for CR from the Veterans Aging Cohort Study, an observational cohort of HIV+ and HIV- veterans. CR eligibility was defined as a hospitalization for acute myocardial infarction, percutaneous coronary intervention, coronary artery bypass grafting, or cardiac valve surgery from 2003-2012, identified using ICD9 and CPT codes. CR use was ascertained from VA and non-VA facilities within one year of discharge from the index CVD hospitalization using CPT codes. We evaluated the association between CR and mortality after adjusting for age, eligibility diagnosis, race, sex, and comorbidities using Cox proportional hazard models. Results: CR use was low in HIV+ and HIV- veterans (9.1% vs. 9.6%, respectively, p=0.06). Among the 7650 CR eligible veterans, there were 2211 deaths over 25,715 person-years of follow-up. Mortality rates were higher among those who did not receive CR, regardless of HIV status (Figure). In adjusted models stratified by HIV status, CR was associated with a significant reduction in mortality for HIV+ (hazard ratio [HR] 0.39, 95% confidence interval [CI] 0.26-0.59) and HIV- veterans (HR 0.52, 95% CI 0.42-0.65). Among those receiving CR, HIV was not associated with an increased risk of mortality (Figure) even after adjusting for confounders (HR 1.01, 95% CI 0.63-1.61). Conclusions: CR utilization in both HIV+ and HIV- veterans is low. Participation in CR programs is associated with a significant reduction in mortality, regardless of HIV status. When CR is utilized, however, the risk of mortality is the same for HIV+ and HIV- veterans. CR may be particularly important for reducing mortality in HIV+ patients with CVD.
**Hypothesis:** Substantial statin underutilization will exist regardless of differences between guidelines.

**Methods:** We included 32,440 adults (45% male, 63% non-white, 28% uninsured/Medicaid) with DM aged 40 to 75 years who received care within 16 CHC groups in eleven states in the Community Health Applied Research Network (CHARN) during 2013. Statin prescribing was analyzed as a function of concordance with the National Cholesterol Education Program Adult Treatment Panel (ATPIII) 2001 guideline and ACC/AHA 2013 guideline.

**Results:** More patients were concordant with the ACC/AHA (52.8%) versus ATPIII (36.2%) guideline. Female gender was independently associated with lower concordance for both guidelines [OR 0.90 CI (0.85-0.94) and OR 0.84 CI (0.80-0.88) respectively]. Black race was associated with lower concordance with ATPIII but not ACC/AHA. Being insured, Asian/Pacific Islander or primarily Spanish speaking were associated with greater concordance for both guidelines. 35% (11526/32440) of the cohort were concordant with neither guideline (Figure), the majority (80%) having no statin prescribed. 28% (9168/32440) were concordant with ACC/AHA guidelines but not ATPIII guidelines. 8.5% of these patients had an LDL >160 despite having a medium or high intensity statin prescribed. 12% (3772/32440) were concordant with ATPIII but not ACC/AHA guidelines. Most of these patients had an LDL between 70-99 mg/dl with no or a low intensity statin prescribed.

**Conclusions:** Opportunities exist to improve cholesterol management in DM patients in CHCs. Addressing care gaps could improve cardiovascular disease prevention in this high risk population.


**Funding:** No

**Funding Component:**

**P325**

**Utilization of Cardiac Rehabilitation in Eligible Medical Cardiac Patients**

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**Introduction:** Cardiac rehabilitation (CR) is recommended for patients who suffer an acute coronary syndrome (STEMI, non-STEMI, or unstable angina), stable angina, or who receive a percutaneous coronary intervention (PCI). CR reduces both all-cause and cardiovascular mortality and reduces hospitalizations. Despite these benefits the rate of participation among eligible patients in the United States is low-estimated around 20%. Our aim is to identify the rate of participation among our patients, identify patient subsets with low levels of participation, and to identify and remove barriers to participation.

**Methods:** We performed a review of all patients treated at a tertiary care hospital from February 2014 to January 2015 with a condition that qualifies for CR based on current ACC/AHA guidelines. We excluded patients with a surgical indication. We limited our search to patients
residing in zip codes within 40 miles of a CR facility within our hospital system (five centers in southwest Virginia). Patients were considered to have participated in CR if they attended at least 1 session of phase two CR occurring within 1 year of hospitalization.

**Results:** We identified 1910 eligible patients, of these 249 (13%) participated in cardiac rehabilitation. Those who participated in CR tended to be younger (mean age 65 versus 70 years), male (71% versus 59%), and nonsmokers (smoking rate 19% in participants versus 25% in nonparticipants). Those with ACS were most likely to participate (167 of 879 eligible patients, 19%), followed by stable angina (19 of 134, 14%) and PCI (63 of 897, 7%).

**Conclusion:** The benefits of CR are substantial including enhanced quality of life and improved survival. We believe all eligible patients should be encouraged to participate in CR. The next phase of our analysis will include identification and removal of barriers to participation. We are actively educating providers on patient eligibility and the benefits of CR with an emphasis on underrepresented demographics (women, elderly, smokers, after PCI, etc).

Disclosures: **T.R. Larsen:** None. **J. McMunn:** None. **S. Gohar:** None. **J.L. Austin:** None.

Funding: No

Funding Component:

**P326**

**Myocardial Ischemia and Mobilization of Circulating Progenitor Cells**


**Background:** Circulating progenitor cells (CPCs) are involved in vascular repair and regeneration. Low levels of CPCs in patients with CAD have been linked to adverse cardiovascular outcomes. The response of CPCs to transient myocardial ischemia in patients with CAD has not been studied before. We aimed to investigate the CPC response to exercise provoked myocardial ischemia (demand ischemia), and compare it to myocardial ischemia detected during pharmacological stress test (flow mismatch).

**Methods:** 570 patients with stable CAD underwent 99mTc sestamibi myocardial perfusion imaging during exercise (69%), or pharmacological stress (31%). Myocardial ischemia was defined as a new or worsening impairment in myocardial perfusion using a 17-segment model. CD34+ CPCs were enumerated by flow cytometry at rest and 30 min after stress testing. The change in CPC count was compared between patients with and without myocardial ischemia using mixed linear models.

**Results:** Mean age was 63±9 years, 76% males, 36% with previous myocardial infarction. The incidence of myocardial ischemia was 31% and 41% during exercise and pharmacological stress test, respectively. No difference was observed in resting CPC between patients undergoing exercise vs pharmacological stress test, nor between patients with or without myocardial ischemia. However, patients who developed myocardial ischemia during exercise stress had a significant decrease in CPC with stress in comparison to those without myocardial ischemia (-12% vs 4%, respectively, p=0.006). Furthermore, the change in CPCs was inversely correlated with the magnitude of myocardial ischemia (R=-0.13, p=0.023), suggesting a greater CPC reduction with larger ischemic burden. These findings remained significant even after adjustment for age, gender, race, BMI, previous myocardial infarction, resting levels of CPCs and hematocrit change with stress. No difference was observed in CPC
response to pharmacological stress test (change of -1% vs 3%, for patients with and without myocardial ischemia, respectively, \(p=0.96\)).

**Conclusion:** Exercise stress-induced myocardial ischemia is associated with a decrease in CPC counts, likely due to increased homing of stem cells to the ischemic myocardium. Whether the extent of CPC uptake has prognostic implication, or whether the CPC response can be altered with intervention needs further investigation.

Disclosures: **M. Hammadah:** None. **A. Samman Tahhan:** None. **I. Almheid:** None. **B. Kindya:** None. **M. Ghafeer:** None. **N. Abdelhadi:** None. **O. Levantsyevch:** None. **A. Alkholder:** None. **W. O’Neal:** None. **M. Obideen:** None. **H. Mohamed Kelli:** None. **S. Sullivan:** None. **K. Wilmot:** None. **R. Ramadan:** None. **P. Pimple:** None. **P. Sandesara:** None. **P. Raggi:** None. **A.J. Shah:** None. **J. Kim:** None. **E.K. Waller:** None. **E.V. Garcia:** None. **B. Pearce:** None. **D. Sheps:** None. **A. Quyyumi:** None. **V. Vaccarino:** None.

Funding: No

**Funding Component:**

**P327**

**Migraine and Cardiovascular Risk Profile in a Sample of Hong Kong Chinese Women**

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**Background:** Migraine has been found to be a risk marker for several cardiovascular diseases (CVDs). Some studies have shown that migraineurs had unfavorable cardiovascular risk profile, which might partially explain the mechanisms that link migraine to CVD. But the results are still controversial. The relevant study in Chinese population was lacking. The aim of this study was to evaluate the cardiovascular risk profile in a sample of Hong Kong Chinese women with and without migraine.

**Methods:** Three rounds of mail surveys were conducted among Chinese female nurses aged 35 to 65 years in Hong Kong. In total 1253 nurses were enrolled in analysis. Information on traditional CVD risk factors, including body mass index (BMI), blood pressure (BP), hypercholesterolemia, diabetes mellitus (DM), smoking, alcohol drinking, physical activity, and family history of CVD, together with the physician-diagnosed migraine, was collected by a self-administered questionnaire. The self-reported anthropometric variables and BP have been validated in a pilot study. **Results:** The overall prevalence of physician-diagnosed migraine was 7.9%. Women with migraine had higher systolic and diastolic BP than those without migraine (118.2 mmHg vs. 113.1 mmHg, 73.8 mmHg vs. 70.0 mmHg; both \(P<0.001\)). More than half of the migraineurs (57.3%) had the family history of CVD, which was higher than non-migraineurs (33.0%, \(P<0.001\)). Compared with non-migraineurs, the migraineurs were more likely to have hypertension (OR: 2.00, 95% CI: 1.14-3.51), high cholesterol (OR: 1.70, 95% CI: 1.02-2.85), and family history of CVD (OR: 2.72, 95% CI: 1.78-4.15). There were no statistically significant differences regarding obesity, smoking, alcohol drinking, physical activity, and DM between migraineurs and non-migraineurs (all \(P>0.05\)). In the logistic regression analysis, after adjustment for age and BMI, the odds of having hypertension in migraineurs were 105% greater than in non-migraineurs (OR: 2.00, 95% CI: 1.14-3.51), high cholesterol (OR: 1.70, 95% CI: 1.02-2.85), and family history of CVD (OR: 2.72, 95% CI: 1.78-4.15). There were no statistically significant differences regarding obesity, smoking, alcohol drinking, physical activity, and DM between migraineurs and non-migraineurs (all \(P>0.05\)).

**Conclusion:** We did not find an overall worse cardiovascular risk profile among Chinese women with migraine. While family history of CVD and hypertension were significantly associated with migraine. Further prospective studies with larger sample size are needed in Chinese population.
Disclosures: Y. Xie: None. S. Ho: None. A. Loke: None.

Funding: No

Funding Component:

P328

Association of Functional and Structural Social Network Components With Medication Adherence Among Participants With Coronary Heart Disease Risk Factors: the REasons for Geographic and Racial Differences in Stroke Study

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Prior research suggests that functional (e.g., practical support) social network components are more strongly associated with chronic disease health outcomes than structural (e.g., social network size, frequency of social contacts) components. Yet, it is unclear whether strong social networks help improve health outcomes by promoting medication adherence, particularly among those with coronary heart disease (CHD) risk factors. We included 17,133 black and white adults aged ≥45 years from the REasons for Geographic and Racial Differences in Stroke (REGARDS) study who had diabetes, hypertension, dyslipidemia, or prevalent CHD and used medications for these conditions. Functional (i.e., someone to care for you while sick or disabled vs no-one available) and structural (i.e., presence vs absence of adults in household, married/in a marriage-like relationship vs not partnered, number of close friends and relatives, and number of close friends and relatives seen at least monthly) social network components were self-reported and medication adherence was assessed using the Morisky scale. A weighted composite score was created using the structural components and participants were categorized as reporting high vs low structural support based on the median. Multi-variable adjusted logistic regression models adjusted for demographics, CHD risk factors and cumulative number of medications, were used to estimate the association between functional and structural social network components and medication adherence. Prevalence of high medication adherence was 68.9%. Compared to participants who reported that they had no one to care for them while sick or disabled, participants who reported that someone was available had higher prevalence of medication adherence [OR=1.15 (95% CI: 1.04, 1.26)]. Participants who reported higher structural support (composite score above median) had similar prevalence of medication adherence compared to participants who reported lower structural support [OR=1.09 (95% CI: 0.87, 1.37)]. In conclusion, interventions aimed at providing social support for people with CHD risk factors may need to consider preferentially focusing on enhancing functional aspects of individuals’ social networks as a means of potentially improving medication adherence and ultimately cardiovascular health.

Disclosures: F.L. Mondesir: B. Research Grant; Significant; AHA Greater Southeast Affiliate Predoctoral Fellowship. A.P. Carson: B. Research Grant; Modest; Amgen. R.W. Durant: B. Research Grant; Modest; Amgen. M.W. Lewis: None. M.M. Safford: B. Research Grant; Modest; Amgen, diaDexus. E.B. Levitan: B. Research Grant; Modest; Amgen.

Funding: Yes

Funding Component: Greater Southeast Affiliate (Alabama, Florida, Georgia, Louisiana, Mississippi, Puerto Rico & Tennessee)

P329
Educational Attainment and Lifetime Risk of Cardiovascular Disease: the Atherosclerosis Risk in Communities Study

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Background: Estimates of lifetime risk may help raise awareness of the extent to which educational inequalities affect risk of cardiovascular disease (CVD). To date, no study has reported the lifetime risk of CVD according to categories of educational attainment.

Objectives: To estimate the lifetime risk of CVD from 45 through 85 years according to educational attainment.

Methods: We followed 13,948 whites and African Americans initially free of CVD from 1,987 through 2,013, and used a life table approach to estimate lifetime risks of life-threatening CVD events (coronary heart disease, heart failure and stroke) according to educational attainment (grade school, high school without graduation, high school graduation, vocational school, college with or without graduation, and graduate/professional school). We adjusted for competing risks of death from underlying causes other than CVD.

Results: During the 269,210 person-years of follow-up, we documented 4,512 CVD events, and 2,401 non-CVD deaths. Educational attainment displayed an inverse dose-response relation with cumulative risk of CVD, which became evident in middle-age, with the most striking gap between those not completing versus completing high school. Lifetime risk estimates of CVD from age 45 years though 85 years were 55.0% (95% confidence interval, 51.4-58.6) for grade school, 50.5% (47.3-53.3) for high school education without graduation, 41.7% (39.5-43.8) for high school graduation, 39.7% (35.5-43.4) for vocational school, 39.2% (36.4-41.4) for college with or without graduation, and 36.1% (31.9-39.7) for graduate/professional school. For both men and women, and whites as well as African Americans, those who did not graduate from high school had a sizably higher lifetime CVD risk. There was a similar pattern for cumulative CVD risk to 65 years. Lower family income and parental educational attainment were also associated with greater lifetime CVD risk, but individuals with more than a high school education had a lower lifetime risk than those with less educational attainment, regardless of their income or parental educational attainment. Conclusions: Educational attainment was inversely associated with the lifetime risk of CVD, and cumulative risk differences were already evident during middle-age, suggesting that greater educational attainment might promote lower lifetime risk of CVD.


Funding: No

Funding Component:
P330

Childhood Material Deprivation and Self-reported, Physician-diagnosed Myocardial Infarction in a Southern Cohort of Middle-aged African American Men and Women

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Introduction: The antecedents of cardiovascular disease occur early in life. However, most studies reporting associations between childhood social conditions and adult myocardial infarction (MI) have been conducted on European and US white populations.

Hypothesis: We hypothesized that adverse childhood social conditions would be associated with increased risk for MI in a Southern cohort of middle-aged African American men and women.
Methods: Multiple logistic regression models were used to investigate sex-specific associations between childhood material deprivation and 13 year incidence of self-reported-physician diagnosed MI among 413 Black men and 754 Black women in the Pitt County (NC) Study. Cohort members were aged 25 to 50 years in 1988, the baseline year, and were re-interviewed in 2001. For this study, childhood was defined as birth to age 13 years; and childhood material deprivation was measured by a composite index of receipt of public assistance, food insecurity, and the lack of household heat, electricity, or plumbing. Odds ratios (OR) of the association between childhood material deprivation and adult MI were estimated after adjusting for both childhood and adulthood socioeconomic position, demographics, lifestyle, co-morbidities and psychosocial factors. For women, menopausal status was also controlled.

Results: Men exposed to 1-2 types of childhood material deprivation had 38% lower odds of MI than men unexposed to such deprivation during childhood, OR = 0.62; 95%CI: (0.41, 0.92). However, men exposed to 3+ types of material deprivation during childhood were 3 times more likely to report a physician-diagnosed heart attack than men who were unexposed, OR = 3.07; 95%CI: (1.79, 5.29). No difference in 13 year MI risk was observed between women exposed to 1-2 types of childhood material deprivation and women who were unexposed, OR = 1.23; 95%CI: (0.70, 2.16). However, women exposed to 3+ types of early-life material deprivation were 5 times more likely to report a physician-diagnosed MI compared to women who were unexposed, OR = 5.20; 95%CI: (2.58, 10.48).

Conclusions: Our findings suggest that early childhood is a sensitive period wherein severe socioeconomic disadvantage may trigger, or exacerbate, biological processes that increase risk of MI, by middle age, in African American men and women.

Disclosures: D.S. Barrington: None. S.A. James: None.

Funding: No

Funding Component:

P331

Self-Efficacy to Manage Health After Stroke is Related to Quality of Life

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Self-Efficacy to Manage Health after Stroke is Related to Quality of Life


Objective: An acute stroke may serve as a major life event that disrupts health-related quality of life. We examined psychosocial and demographic factors related to functioning and well-being after stroke among patients discharged from two health care systems: Veterans Health Administration (VHA) and a Joint Commission Stroke Center.

Methods: We enrolled 258 participants into a randomized controlled trial to evaluate a stroke self-management program which targeted functional recovery and risk factor management. All participants completed written consent and a baseline assessment which included demographics, depressive symptoms, self-efficacy, stroke specific, health-related quality of life (SSQoL) and psychosocial factors. We conducted multivariate analyses to evaluate factors related to baseline SSQoL using a social cognitive framework.

Results: We enrolled our sample, on average, within 81.5 days after hospital discharge for stroke/TIA. Our sample included 19% women with an average age of 61.7 (10.8) years. The
average NIH stroke scale score was 3.0 indicating minor stroke. Across the total and subdomains of SSQoL, self-efficacy to manage stroke health and symptoms was associated with overall better SSQoL (0.16, p<0.0001), social role functioning (0.12, p ≤ 0.01), family role functioning (0.16, p≤0.0003), and work role functioning (0.31, p<0.0001). Depressive symptoms were significantly related to poorer SSQoL across all subdomains; however distance walked in a mobility test was not significantly related. Optimism was related to total SSQoL (p<.07) and perceived energy (p<0.02). Demographics were not significantly related to SSQoL in the multivariate models.

Conclusions: As social cognitive theory suggests, self-efficacy to manage symptoms and health after stroke and a sense of optimism for recovery are significantly related to greater stroke specific, health-related quality of life shortly after hospital discharge for stroke. Post stroke programs which target building self-efficacy and providing optimism for recovery may enhance SSQoL. Our stroke self-management program targets these concepts and we are currently evaluating our prospective outcomes.

Disclosures: T.M. Damush: B. Research Grant; Significant; VA Research Grant 30%, VA QUERI Center Grant. J. Mackey: None. K. Thomas: None. C. Saha: None. J. Slaven: None. F. Lincoln: None. J. Fleck: None. L. Myers: None. C. Ivan: None. L. Williams: B. Research Grant; Significant; VA QUERI Center.

Funding: No

Funding Component:

P332

Self-perceived Psychological Factors and Their Impact on Ideal Cardiovascular Health by Gender: the Baptist Health South Florida (BHSF) Employee Study

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Introduction: Psychological factors including stress are associated with adverse cardiovascular (CV) disease outcomes. Gender differences exist in both the perception of stress and the magnitude of the stress response. We hypothesize that self-perceived psychological stressors would have a greater impact on women compared to men as measured by the American Heart Association Life’s Simple Seven (LS7) health metrics.

Methods: This was a cross-sectional study conducted among employees of BHSF. The LS7 metrics (smoking, physical activity, diet, body mass index, blood pressure, cholesterol and glucose) were each scored as ideal (2), intermediate (1), or poor (0), with composite scores ranging from 0 to 14. Total scores were categorized as optimal (11-14), average (9-10) and inadequate (0-8). We used multinomial logistic regression to compare psychological factors obtained by questionnaire (self-perceived stress, life satisfaction, hopelessness, sadness, depression, anxiety) with the LS7 score (inadequate score served as reference). The model was stratified by gender and adjusted for age, ethnicity, and education level.

Results: Of the 9,056 participants, 74% were female, 17% white, 57% Hispanic, 16% black, with a mean age of 43±12 years. Self-perceived adverse psychological factors were associated with being less likely to achieve adequate and optimal LS7 scores (Table). For example both women and men, respectively, with self-perceived stress were less likely to have optimal LS7 metrics [OR 0.47 (95% CI 0.40-0.56) vs. 0.50...
There were some interactions by gender (P <0.05), but the results were qualitatively similar in both men and women. **Conclusions:** In an ethnically diverse population, participants with negative self-perceived psychological factors are more likely to have inadequate CV health as measured by LS7. Contrary to our hypothesis, in general, men and women were similarly affected by adverse psychological factors. Addressing psychological stressors may be one mechanism to improve CV health.


**Funding:** No

**Funding Component:**

**P333**

**Homelessness is an Independent Risk Factor for Cardiovascular Disease Hospital Readmission in the California Health Care Utilization Project**

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**Introduction:** Persons who experience homelessness have been shown to have a high prevalence of cardiovascular risk factors, and high incidence of cardiovascular mortality, however little is known about the outcomes of patients experiencing comorbid homelessness and recurrent CVD admissions. We sought to study the effects of homelessness on CVD readmission in California.

**Methods:** We identified all patients admitted with a primary diagnosis of CVD (including ischemic heart disease, stroke and heart failure) in the HCUP California database between 2005 and 2009. Homelessness was defined using an HCUP indicator variable. We used multivariable Cox proportional hazards model to determine risk of readmission for potential sociodemographic and clinical confounder variables (see Table).

**Results:** There were 2,889 hospital admissions for CVD in patients who were identified as homeless during the baseline period (by means of a homelessness indicator). Of those, there were 928 hospital readmissions (median time to readmission=39 days). When adjusted for clinical and lifestyle factors (see Table), homelessness independently predicted recurrent CVD [HR of 1.44 (95% CI, 1.36-1.52)].

**Conclusions:** In HCUP CA, homelessness independently predicted CVD readmission. Our findings suggest a potential need for development and study of interventions to improve post-hospital management of CVD in patients experiencing homelessness.

**Disclosures:** E.F. Shalen: None. G. Nah: None. E. Vittinghoff: None. Z.H. Tseng: None. G.M. Marcus: None. M.A. Albert: None. N.I. Parikh: None.

**Funding:** No

**Funding Component:**

**P334**
Primary Prevention Aspirin Use in an African American Population: The Impact of Health Beliefs and Social Norms

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Background: Cardiovascular disease (CVD) is a leading cause of death that disproportionately impacts African Americans. Aspirin (ASA) is a simple, low-cost medication that lowers the risk of a first heart attack or stroke by 12-22%. This study investigates the prevalence of primary prevention ASA use among a metropolitan, predominantly African American population. It examines the association between primary prevention ASA use and measures of health beliefs, social norms, and perceptions of CVD risk hypothesized to influence ASA use.

Methods: Between April and August 2015, trained community health workers administered 10 minute, in-person surveys to a convenience sample of adults ages 45–79 years within the Minneapolis-St. Paul metro area. The survey defined demographics, CVD history, atherosclerosis risk factors and ASA use. CVD risk perceptions and ASA-related health beliefs and social norms were evaluated using a 4 point Likert scale. Logistic regression with adjustment for age and number of risk factors was used to examine the association of demographics and health beliefs with ASA use.

Results: Of the 797 survey participants, 590 had no CVD history. Of these, 460 (78%) were between the ages of 50–69, the range recently defined in the 2016 United States Preventive Services Task Force (USPSTF) recommendation. Overall primary prevention ASA use was 38% and increased as the number of CVD risk factors (RF) increased, from 21% (0 RF) to 62% (≥ 3 RF). After adjusting for age and risk factors, ASA use was associated with diabetes (OR 2.6, 95% CI: 1.6-4.2) and current smoking (OR 0.4, 95% CI: 0.2-0.6). If a participant discussed ASA use with a doctor, they were much more likely to use ASA (OR 5.5, 95% CI: 3.7-8.1). Participants who believed ASA could prevent a heart attack or stroke were also more likely to use it (OR 4.6, 95% CI: 1.9-11.4). ASA use was higher among participants who perceived that their peers were using ASA (OR 3.7, 95% CI: 2.0-6.6), and among participants who believed those close to them thought they should use ASA (OR 6.6, 95% CI: 4.1-10.5). Perceived safety and ease of use were also positively associated with ASA use, (OR 9.8, 95% CI: 5.0-19.3 and OR 23.2, 95% CI: 8.2-65.5 respectively).

Conclusion: Increased primary prevention aspirin use was associated with positive beliefs regarding the expectations and behaviors of participants’ social network, and about perceived effectiveness, safety and convenience of the medication. Novel interventions to increase primary prevention ASA use could focus on promoting conversations with physicians about appropriate ASA use, and normalizing ASA for at-risk individuals within communities.


Funding: No

Funding Component:

P335

Health Care Discrimination and C-Reactive Protein in US Adults

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Background: Healthcare discrimination has been documented and remains common in the US. However, little is known about the association between healthcare discrimination and objective health indicators such as C-reactive protein (CRP), a marker of inflammation and a correlate of cardiovascular outcomes. Methods: We used 2008-2012 data from the Health and Retirement Study, a
nationally representative study of US adults ages 54+, to examine the association between self-reported experiences of healthcare discrimination and high sensitivity CRP among those reporting a history of chronic disease (N=12,110). Dried blood spots were assayed for CRP. Respondents were asked how often they received poorer service or treatment than other people from doctors or hospitals (six-point likert scale ranging from “almost every day” to “never.”) Participants reporting any healthcare discrimination were compared to those reporting “never.” We used Generalized Estimate Equation (GEE) models to examine the associations between healthcare discrimination and CRP (< vs. ≥ 3 g/L), specifying a compound symmetry working correlation structure to take account of the dependency of repeated measures of the biomarker. To examine whether the relationship differs across the outcome distribution, quantile regression models were fitted, examining the 10th, 25th, 50th, 75th, and 90th percentiles of the CRP distribution, and accounting for repeated measurements. All models were adjusted for age, sex, race/ethnicity, education, log-household size adjusted wealth and income, current employment, marital status, and year indicators. Results: In 2008, 18% of participants reported past experiences of health care discrimination. Report of healthcare discrimination was associated with increased odds of CRP ≥ 3 g/L (OR: 1.12, 95% CI: 1.02, 1.24), similar in magnitude to a 6-year age difference. Health care discrimination was not associated with CRP at the 10th (β=0.01; 95% CI: -0.04, 0.06) or 25th percentile (β=0.05; 95% CI: -0.03, 0.14). At the 50th percentile (~2.1 g/L) and at 75th percentile of CRP (~4.5 g/L), participants who reported experiencing health care discrimination had 0.14 g/L (95% CI: 0.01, 0.26) and 0.32 g/L (95% CI: -0.04, 0.61) higher CRP, respectively, than participants who did not report health care discrimination. Conclusion: Adults reporting prior healthcare discrimination have elevated levels of CRP. The estimated effect was largest for people at the higher end of the CRP distribution, who would be at greater risk of adverse cardiovascular outcomes.


Funding: Yes

Funding Component: Western States Affiliate (California, Nevada & Utah)

P336

Predicting Future Trends in Disability Individuals With Cardiovascular Disease: A Modelling Study to 2030

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Background Most industrialised countries have experienced remarkable reductions in mortality from cardiovascular disease (CVD) and other chronic diseases since the 1970s. Yet CVD and dementia together account for half of all disability in the elderly in the US, UK and beyond. However recent trends in CVD morbidity and disability prevalence in the US and UK offer some encouragement: concerns regarding a potential increase in the burden of these diseases do not appear to be materialising. Meanwhile, clinicians and service planners urgently need reliable forecasts of the burden of CVD and disability. Previous studies have not modelled the complex interactions of CVD, dementia and disability over time. In this study, we therefore set out to forecast trends in CVD related disability in England and Wales up to 2030. Methods As part of the IMPACT-Better
Ageing Model study, we developed and validated a probabilistic Markov model. This model tracked health transitions in the England and Wales population (60 million) through ten states characterised by the presence or absence of CVD, dementia, disability and death from 2015 to 2030. Disease occurrence and age/sex/year specific transition probabilities were derived from the English Longitudinal Study of Ageing (ELSA). We estimated future CVD and disability prevalence. As observed in ELSA, we assumed continuing parallel downward trends in CVD incidence and mortality and a 2.7% annual decline in dementia incidence. Uncertainty was estimated using Monte Carlo simulation. **Findings** By 2030, approximately 2,100,000 individuals (2,000,000-2,200,000 95% Uncertainty Intervals) will live with CVD in England and Wales (a 35% decrease from 2015). Standardised CVD mortality rates will plummet by 75%. However, approximately 910,000 (882,000-946,000 95% UI) of these CVD patients will live with disabilities (a 19% decrease from 2015). Approximately 185,000 (178,000–192,000 UI) CVD patients will additionally be living with dementia. Despite the rapid decreases in CVD and disability burden, the standardised prevalence of disability among CVD individuals will therefore increase from 35.2% to 39.6%. **Interpretation** Our model predicts a 35% reduction in the total burden of CVD in England and Wales by 2030. However, over one third of the individuals with CVD will also be living with poor functional levels. That will represent a substantial burden for our already hard-pressed health and social care services. Our results suggest that recent efforts on CVD prevention might not be enough, thus emphasizing the need for more effective prevention of all non-communicable diseases and dementia as the major causes of disability. Policies focusing on the shared NCD risk factors of poor diet, tobacco, alcohol and inactivity could substantially reduce the burden of these dread diseases and greatly benefit the future functional level of senior citizens in the UK, USA and elsewhere.

Disclosures: **M. Guzman Castillo:** None. **S. Ahmadi-Abhari:** None. **P. Bandomo:** None. **M. Shipley:** None. **A. Steptoe:** None. **A. Singh-Manoux:** None. **M. Kivimaki:** None. **S. Capewell:** None. **E. Brunner:** None. **M. O’Flaherty:** None.

Funding: No

Funding Component:

**P337**

**Social Network Size is Associated With Healthy Lifestyle Factors: Results From the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)**

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**Background:** Social ties within social networks have been shown to influence healthy lifestyles. However, little is known about the association among size of familial social networks, social network dynamics (such as frequency of contact and perceived connectedness), and healthy lifestyle factors in Hispanic/Latino adults. We examined cross-sectional associations of central family social network size, as well as frequency of contact with central family members (children, parents, in-laws) and perceived connectedness to extended family members (uncles, aunts, and other relatives), with individual healthy lifestyle factors. **Methods:** Data were analyzed from 15,511 self-identified Hispanic/Latino adults ages 18-74 years from the Hispanic Community Health Study/Study of
Latinos (HCHS/SOL). Size of central family, frequency of contact with central family members in past 2 weeks, and perceived connectedness to extended family, were categorized into approximate tertiles based on the distribution of the data. Healthy lifestyle factors included alcohol use (men <30g/day; women <15g/day), not currently smoking, body mass index [BMI] 18.5 to <25.0 kg/m², physical activity in the highest sex-specific 40%, and healthy diet in the highest sex-specific 40%. Survey logistic regression was used to compute odds ratios [OR] and 95% confidence intervals [CI], with models adjusted for age, sex, education, income, Hispanic/Latino background, employment status, religion, church attendance, marital status, acculturation, and language preference. Results: Compared to participants with a central family social network of 0-3 individuals, those with a family social network of 4-5 members were significantly less likely to have a healthy diet (OR: 0.86; 95% CI: 0.74, 0.99) or a healthy BMI (OR: 0.74; 95% CI: 0.65, 0.85). Also, those with 6-11 members were also significantly less likely to have a healthy BMI (OR: 0.58; 95% CI: 0.49, 0.69). Individuals reporting frequent contact with 3-4 and 5-11 family members were less likely to have a healthy BMI (OR: 0.76; 95% CI: 0.66, 0.87; OR: 0.60; 95% CI: 0.51, 0.72; respectively) versus those reporting frequent contact with only 0-2 family members. However, individuals who reported feeling connected to 3-5 extended family members were more likely to have a healthy diet (OR: 1.16; 95% CI: 1.00, 1.36) and healthy BMI (OR: 1.15; 95% CI: 1.00, 1.33), and those who felt connected to 6-7 extended family members were more likely to be non-smokers and to have a healthy BMI (OR: 1.16; 95% CI: 1.00, 1.34; OR: 1.20, 95% CI: 1.20; 95% CI: 1.04, 1.38; respectively) versus those who reported feeling connected to 0-2 extended family members. Conclusions: These findings suggest that social network size and dynamics may play an important role in influencing healthy lifestyle factors among Hispanic/Latino adults. Further, specific influences may differ based on the type of relationship.


Funding: No

Funding Component:

P338

Medical Cost Hardship and Incident Cardiovascular Disease (CVD) Among High Risk Individuals in the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Introduction: Having trouble paying for medical care (i.e., medical cost hardship) may impair disease management and thus increase risk of clinical CVD events among adults with CVD risk factor conditions.

Hypothesis: We hypothesized medical cost hardship was associated with incidence of CVD among individuals with diagnosed hypertension, hypercholesterolemia, or diabetes.

Methods: CARDIA recruited 5,115 individuals aged 18-30 years in 1985-6 (year 0); we included 2,273 participants who self-reported hypertension, hypercholesterolemia, or diabetes or were taking prescription medications for these conditions at years 10, 15, 20, or 25 (45.2% of all participants). At these visits, medical cost hardship was also queried. CVD events were adjudicated from records of
hospital admissions, outpatient procedures, and deaths through 2013. Median follow-up time from initial risk factor diagnosis was 12.4 years. Adjusted Cox proportional hazards models determined hazard ratios (HRs) for the first incident CVD event, examining initial and time-varying medical cost hardship.

**Results:**
At first report of hypertension, hypercholesterolemia, or diabetes, 27% of subjects reported medical cost hardship, while 51% did so at subsequent examinations. There were 131 CVD events during follow-up. Adjusting for demographic and socioeconomic factors, initial medical cost hardship was a more robust predictor of incident CVD than time-varying cost hardship, HRs 1.54 (95% CI: 1.03, 2.30) and 1.36 (0.88, 2.12), respectively (Table). Risk factor control partially attenuated the association between medical cost hardship and CVD, as did access to healthcare. We found no significant interaction by race and sex.

**Conclusions:**
Medical cost hardship was associated with incident CVD in this sample of high-risk individuals, possibly via risk factor control or access to care. Identification of cost hardship at the time of high-risk diagnosis may facilitate connection to low-cost care, improving risk factor control and preventing clinical CVD.

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**Volunteering and Favorable Cardiovascular Health in Hispanic/Latinos: The Hispanic Community Health Study/Study of Latinos (HCHS/SOL) Sociocultural Ancillary Study**

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**Introduction:** Volunteering - a social capital indicator - has been associated with a lower burden of CVD risk factors in middle-aged and older adults. The prevalence of volunteering and its association with favorable cardiovascular health (i.e., low CV risk, LR) has not been examined among diverse Hispanic/Latino adults. **Hypothesis:** Volunteering is positively associated with LR independent of sociodemographic and lifestyle factors; this association is modified by acculturation. **Methods:** Our analysis included 4,385 participants, ages 18-74 years, from the HCHS/SOL Sociocultural Ancillary Study (2010-2011), a population-based cohort of US Hispanics/Latinos. Multivariate logistic regression (survey weighted) was used to examine cross-sectional associations of self-reported current regular volunteering (yes vs. no) with LR (definition in Table). We tested whether these associations varied by acculturation (assessed as language preference [English vs. Spanish] and length of residence in the US [<10 vs. ≥10 years]). **Results:** The prevalence of regular volunteering was 15.4%. Volunteers were more likely to be English speakers, have lived in the US ≥10 years, and had higher income and education than non-volunteers. Association of volunteering with LR


Funding: Yes

Funding Component: National Center

P339
varied by length of residence in the US but not with language preference (P for interactions=0.06 and 0.77, respectively). Among persons with ≥10 years of residence in the US, volunteering was associated with more than 2 times higher odds of being at LR vs. non-volunteering in the fully adjusted model (Table). No association of volunteering with LR was observed among those living in the US <10 years. **Conclusions:** Volunteering was associated with LR among Hispanic/Latino adults who have lived in the US for ≥10 years independent of sociodemographic and lifestyle factors. Future research should examine the mechanisms underlying this association, as well as the longitudinal associations of volunteering with incidence of CVD risk factors to assess reverse causality.


Funding: No

Funding Component:

P340

**Structural Social Support and Cardiovascular Disease Risk Factors in Hispanic/Latino Adults With Diabetes: Results From the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)**

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**Introduction:** There is mounting evidence linking social support to restorative health processes and favorable cardiovascular risk profiles. However, observational studies have yielded inconsistent findings on the associations of social support networks with cardiovascular health in Hispanic/Latino adults with diabetes. We examined the cross-sectional associations of structural social support and traditional cardiovascular disease (CVD) risk factors in a diverse sample of Hispanic/Latino adults with diabetes. **Hypothesis:** Persons with lower indices of social support will have higher odds of adverse CVD risk factors. **Methods:** This analysis included 2,994 adult participants ages 18-74 with diabetes from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL—2008-2011). Select items from the Social Network Inventory were used to assess indices of structural social support, i.e., network size (number of children, parents, and in-laws) and frequency of familial contact. Standardized methods were used to measure diabetes and other CVD risk factors -- abdominal obesity, body mass index, hypertension, hypercholesterolemia, and smoking status. Multivariate regression was used to examine associations of structural support with individual CVD risk factors with demographics, acculturation, physical health, and psychological distress included as covariates. **Results:** There were no significant cross-sectional associations of structural support indices with abdominal obesity, hypertension, hypercholesterolemia, or smoking status. There was a marginally significant (OR: 1.05; 95% CI 1.00-1.12) trend
toward higher odds of obesity in participants reporting a larger family unit (including children, parents, and in-laws) (Table 1).

**Conclusions:** Structural social support was marginally associated with higher odds of obesity in Hispanic/Latino adults with diabetes. Alternate forms of social support should be further explored as potential markers of cardiac risk in Hispanics/Latinos with diabetes.


Funding: No

**Funding Component:**

P341

**Community Environment Associated with Cardiovascular Disease Hospitalization Rates in Denver, Colorado**

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Introduction: Hospitalization rates for acute myocardial infarction (AMI), coronary heart disease (CHD), and stroke have decreased over time, although trends are debatable for heart failure (HF). These trends are unequally distributed. There is a growing literature documenting the relationship between social and economic characteristics of people’s communities and cardiovascular disease (CVD). Based on a social ecological model of health through the life course, we descriptively examined associations between CVD hospitalization rates and patient characteristics and census tract (CT)-level community environment. Hypothesis: CVD hospitalization rates will be higher in community environments with higher percentages of individuals living below the federal poverty level, racial/ethnic minority groups, and non-residential (i.e., commercial/office, industrial, open space, public/civic, vacant, and miscellaneous space) vs. residential land use. Methods: Colorado Hospital Association (2009-2013) data were used to measure ICD-9 coded hospitalization rates (per 1,000) for Denver, Colorado residents ≥20 years. Data were merged with American Community Survey (2009-2013) and Denver County land use (2010) data. Using chi-square analysis, we examined associations between age-adjusted CVD hospitalization rates (N=15,521) and CT-level community environment (in quartiles) (N=144). Results: Denver’s annual CVD hospitalization rate was 6.6. Patient-level AMI (1.7), CHD (2.8), and HF (2.2) rates were higher among men. Women had higher stroke-related rates (2.4). Across CVD types, rates for those ≥65 years (6.5-13.5) were higher than middle-aged groups (2.1-3.4). Average annual age-adjusted AMI hospitalization rates were higher in CTs with the highest quartile of Hispanic Americans (2.0), Native Americans (1.9), and individuals below poverty (1.9). CHD rates were higher in CTs with higher percentages of Hispanic Americans (3.1), individuals below poverty (3.1), and Native Americans (3.1). HF rates were higher in CTs with higher percentages of industrial/office land use (3.5), individuals below poverty (3.3), and Hispanic Americans (3.2). Stroke rates were higher in CTs with higher percentages of Native Americans (3.0), industrial/office land use (3.0), and African Americans (3.0). The largest disparities for rate ratios comparing the highest to the lowest quartiles for each exposure by CVD outcome were the percentage of individuals below poverty (AMI 2.2; CHD 2.1; HF...
2.4; Stroke 1.7), non-Hispanic Whites (AMI 0.7; CHD 0.7; HF 0.7; Stroke 0.7), Hispanic Americans (AMI 1.5; CHD 1.5; HF 1.5), and Native Americans (Stroke 1.30). Conclusions: In conclusion, associations exist between community environment and CVD hospitalization rates, suggesting opportunities for health policy development in Denver’s city government, council districts, and neighborhoods.


Funding: No

Funding Component:

P342

Disparities in Awareness of Stroke Symptoms Among Different Socioeconomic, Ethnic/Race, and At-risk-of-stroke Groups

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Findings from a few small studies suggested that disparities in awareness of stroke symptoms lead to disparities in delays of receiving treatment and outcomes of patients with stroke. Hence it is important to conduct a study with a large sample size to understand the associations between awareness of symptoms of stroke with various socioeconomic factors as well as with modifiable stroke risk factors. We assessed the hypotheses that there are disparities in awareness of different stroke symptoms among different groups with respect to various SES factors (e.g., self-reported race, ethnicity, education, age, and income) in the presence/absence of modifiable stroke risk factors (e.g., smoking status, exercise, body mass index, and blood pressure). We combined four Behavioral Risk Factor Surveillance Surveys (BRFSS) from 2003, 2005, 2007, and 2009 to create a sample of 1,051,834 participants. We ran six logistic regression models, one for each of the measures of awareness of six common stroke symptoms (e.g., sudden confusion, numbness on one side of the body, sudden vision loss, sudden chest pain, sudden dizziness, and severe unexplained headache). The unweighted sample size in each of the six models was greater than 120,000. In addition, we calculated marginal probabilities which give the probability of an outcome (e.g., being aware of a specific stroke symptom) with respect to a specific factor (e.g., in the presence/absence of a stroke risk factor) in the context of averaging over all other factors/covariates. While there was low awareness of stroke symptoms among the US population except for recognition of chest pain or discomfort, we did find an association between the awareness of stroke symptoms with gender, educational levels, and income levels. Additionally, among all the ethnic groups, Native Americans had the lowest awareness of five out of six stroke symptoms. On the other hand, White only-non Hispanic, while being relatively better aware of several stroke symptoms, had the lowest awareness of the most common stroke symptom of sudden chest pain compared with other race/ethnicity groups. In conclusion, the findings from this study can serve as a useful guide to facilitating targeted educational efforts aimed at improving awareness of stroke symptoms that may ultimately reduce disparities in the outcomes of patients at risk for stroke.

Disclosures: P. Tran: None.

Funding: No

Funding Component:

P343

E-Epidemiology to study the Associations of Socioeconomic Status with Risk of Cardiovascular Disease Hospitalization Among Patients with Chronic Kidney Disease

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**Introduction**
There has been a paradigm shift in epidemiology to integrate large, disparate sources of information, including electronic health record (EHR) data, to identify, prevent and treat individuals at risk for cardiovascular disease (CVD). This developing field, termed “e-epidemiology,” has the potential to enhance our ability to utilize these resources more efficiently, however limited data exists on how results from EHR based studies compare to traditional cohort studies.

**Objective**
Quantify the association between socioeconomic status (SES) and CVD hospitalization among patients with chronic kidney disease (CKD) using EHR clinical and public SES data.

**Methods**
We quantified the odds of incident or recurrent CVD hospitalization for a fatal/nonfatal heart disease or stroke event (defined by ICD-9 codes) among patients with lower vs. higher SES. We included patients ≥40 years old with prevalent CKD receiving care in 2 Durham NC health systems from 2007-13. Annual cross sectional cohorts of patients (new and returning) were created to calculate the probability of a CVD hospitalization in the following year. We measured SES using the AHRQ SES score (based on income, education, occupation, wealth and housing data). In logistic regression models, we estimated the odds of CVD hospitalization in the next year per quartile of SES score, adjusting for demographic and clinical covariates.

**Results**
Of 60463 patients, 61% were female, 45% were Black, 89% had hypertension, and 41% had diabetes. Examined continuously, the probability of a CVD hospitalization was inversely associated with SES score (Figure 1). Patients in the lowest quartile of SES had a 32% greater odds of CVD hospitalization in the next year as compared to patients in the highest quartile of SES (OR = 1.32, 95% CI=1.08-1.61).

**Conclusions**
Our results support published data from traditional cohort studies that lower SES is associated with CVD hospitalizations. The EHR is a feasible, efficient and robust data source that may have great potential to advance CVD research.

Disclosures: N.A. Bhavsar: None. B.A. Goldstein: None. M. Phelan: None. L.E. Boulware: None.

Funding: No

Funding Component: P344

**Tipped-wage Work is Associated With Greater Perceived Stress in US Women**


**Background:** Low income and income volatility are risk factors for stress and stress-induced illnesses such as hypertension. Subminimum wage, ranging from $2.13 to $7.82 in 43 states, applies to certain service occupations such as wait staff. The implicit assumption behind this law is that, combined with tips, subminimum wage ensures earnings equal to or greater than the minimum wage. However, tips are unpredictable and vary based on shift, day of week, season, and fluctuations in the economy. Women make up 67% of the tipped-wage workforce. We tested the hypothesis that women in tipped-wage occupations experience greater perceived stress and hypertension relative to women in non-tipped service occupations and non-tipped non-service occupations. **Methods:** We used data from the
National Longitudinal Study of Adolescent to Adult Health (Wave IV, 2007-2008; age 24-33 years; n=3,562). In multivariable ordinal logistic regression, perceived stress tertiles (Cohen’s Perceived Stress Scale score: 0-3, 4-6, and 7-16) and hypertension (Normotensive, Stage 1, and Stage 2 relative to 7th Report of the Joint National Committee standards) were modeled as a function of self-reported occupation type (US Bureau of Labor Statistics categories, classified as tipped-wage, non-tipped service, and non-tipped non-service). Models were adjusted for early life and adolescent confounders, such as parental socioeconomic status (SES) and experiences of maltreatment.

**Results:** On average, women in non-service non-tipped occupations were from higher SES families and were themselves more educated than tipped and non-tipped service workers. Women in tipped and non-tipped service occupations were similar, with non-tipped workers coming from slightly lower SES families. For women in tipped-wage occupations, the odds of being in a higher perceived stress score tertile were 54% greater than women in non-tipped service occupations (OR: 1.54; 95%CI: 1.08,2.19) and 65% greater when compared to women in non-tipped non-service occupations (OR: 1.65; 1.21,2.26). The odds of having a higher hypertensive stage among tipped-wage workers were 45% lower than women in non-tipped service occupations (OR: 0.55; 95%CI: 0.32,0.94) but were similar to women in non-tipped non-service occupations (OR: 0.72; 95%CI: 0.43,1.21). **Conclusions:** In a nationally representative sample of women, working in a tipped-wage service occupation was associated with greater perceived stress, even when compared to other service occupations that similarly offer low wages with limited job control and employ women from relatively similar backgrounds. The negative association between tipped-wage occupations and hypertension may reflect selectivity related to the physical demands of tipped-wage work. Our findings suggest that reliance on tips to supplement wages may exacerbate stress relative to similar work afforded a reliable minimum wage.

**Disclosures:** S.B. Andrea: None. J. Boone-Heinonen: None. L.C. Messer: None.

**Funding:** No

**Funding Component:**

P345

**A Cross Sectional Analysis of High Depressive Symptoms and Antidepressants on Heart Rate Parameters in the Community. The Paris Prospective Study III**


**Background:** Dysautonomy has been suggested to be a mechanism contributing to the well-established association between high depressive symptoms (HDS) and cardiovascular disease (CVD). So far however, at the population level, this question has been addressed using parameters of complex interpretation that are rarely used in the clinical setting. The aim of this study was to quantify the respective association of HDS and antidepressants (ATD) on different heart rate parameters of simple investigation.

**Methods:** The Paris Prospective Study III included subjects recruited in a large health preventive centre in Paris (France) between 2008 and 2012. Four heart rate parameters were measured including resting heart rate (RHR), heart rate immediately after moderate
effort (EHR), differences between EHR and RHR, and RR interval. A total score ≥ 7 on a 13-item standardized questionnaire defined the presence of HDS. Information on classes of ATD was obtained on a face-to-face interview with a medical doctor. The association between HDS or ATD and each of the 4 heart rate parameters were quantified in separate linear regression analysis adjusted for age, sex, body mass index, physical activity, personal history of CVD, smoking, diabetes, high blood pressure and beta blockers. To minimize indication bias, the analysis on ATD was adjusted for the propensity score of receiving ATD.

Results: The mean age of the 8430 participants was 59.6 years and 39% were women. HDS were noted in 473 subjects and 383 participants were on ATD: 58 on Tricyclics, 232 on Serotonin Specific Reuptake Inhibitor (SSRI) and 80 on Serotonin Norepinephrine Reuptake Inhibitors (NSRI) respectively. Beta-blockers were used by 4.2% of the participants and only 2.1% had a personal history of cardiovascular disease. HDS were associated with slightly higher RHR (+0.9 beats per minute (bpm), p<0.05) and lower RR interval (-21.1 ms, p<0.05). ATD of any class were related to lower RR interval (-22.3 ms, p=0.007), higher EHR (+1.7 bpm, p=0.02) and higher difference between EHR and RHR (+1.5 bpm, p=0.009). While tricyclics and NSRI were both associated with significantly higher RHR (+7.0 and +2.64 bpm respectively, p<0.05), higher EHR (+6.79 and +6.94 bpm respectively, p<0.001), higher difference between EHR and RHR (+2.74, p=0.06 and +5.70, p<0.001 respectively) and lower RR interval (-98.50 ms and -50.63 ms respectively, p<0.001), SSRI was related to lower RHR (-1.81 bpm, p<0.05) and almost significantly higher RR interval (+18.61 ms, p=0.08). Neither sex nor beta-blockers modified these associations. Consistent findings were observed when other propensity score methods were used.

Conclusions: Our study suggests that ATD more than HDS are associated with dysautonomy as evaluated by simple and routinely used heart rate parameters.
Results: We identified 7 and 5 novel loci for Blacks and Whites, respectively. Intergenic variants rs9396438 (ARIC&CRIC $P=3.38\times10^{-9}$, WHI $P=4.32\times10^{-2}$, and meta $P=9.09\times10^{-9}$), rs56687683 (ARIC&CRIC $P=8.64\times10^{-11}$, WHI $P=3.58\times10^{-2}$, and meta $P=7.97\times10^{-10}$), and rs6071452 (ARIC&CRIC $P=3.02\times10^{-11}$, WHI $P=4.50\times10^{-2}$, and meta $P=2.10\times10^{-10}$), SNX9 variant rs10945790 (ARIC&CRIC $P=3.67\times10^{-10}$, WHI $P=2.05\times10^{-2}$, and meta $P=2.00\times10^{-10}$), and NXN variant rs10153287 (ARIC&CRIC $P=1.61\times10^{-8}$, WHI $P=2.05\times10^{-2}$, and meta $P=1.01\times10^{-8}$) were robustly associated with CKD among Blacks. Intergenic variants rs509616 (ARIC&CRIC $P=2.86\times10^{-19}$, WHI $P=3.44\times10^{-2}$, and meta $P=5.97\times10^{-19}$), rs35849486 (ARIC&CRIC $P=6.66\times10^{-7}$, WHI $P=1.79\times10^{-2}$, and meta $P=3.95\times10^{-8}$), rs12508057 (ARIC&CRIC $P=2.57\times10^{-9}$, WHI $P=2.45\times10^{-2}$, and meta $P=4.82\times10^{-10}$), and rs2180911 (ARIC&CRIC $P=3.75\times10^{-7}$, WHI $P=1.53\times10^{-2}$, and meta $P=2.11\times10^{-8}$), MEGF6 variant rs34852522 (ARIC&CRIC $P=6.01\times10^{-7}$, WHI $P=2.30\times10^{-2}$, and meta $P=4.20\times10^{-9}$), CAPN8 variant rs34485635 (ARIC&CRIC $P=9.58\times10^{-10}$, WHI $P=2.27\times10^{-2}$, and meta $P=1.01\times10^{-10}$), and PTPRS variant rs80125132 (ARIC&CRIC $P=4.38\times10^{-7}$, WHI $P=1.74\times10^{-2}$, and meta $P=3.05\times10^{-8}$) were identified for Whites. Furthermore, conditional analyses at the above loci additionally identified CAPN8 missense variant rs4072247 ($P=6.30\times10^{-8}$) at the rs34485635 locus and NXN-3 UTR 3-primer variant rs3822226 ($P=4.08\times10^{-14}$) at the rs12508057 locus for CKD among Whites. Finally, we replicated 9 and 39 loci reported in previous CKD GWAS among Whites and Blacks, respectively.

Conclusion: We robustly identified 12 novel loci in our large-scale case-control GWAS of CKD. In addition, conditional analyses identified additional functional signals at 2 novel loci among Whites.


Funding: No

Funding Component:

P347

The Relationship Between Renal Artery Calcium and Kidney Function: the Multi-Ethnic Study of Atherosclerosis

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Background: Renal Artery Calcium (RAC) has been shown to be associated with a higher odds of hypertension (HTN). The purpose of this study was to determine if the presence and extent of RAC is associated with significant differences in several measures of kidney function.

Methods: We analyzed cross-sectional data from the Multi-Ethnic Study of Atherosclerosis (MESA). During MESA follow-up visits 2 and 3, a random subsample of 1226 participants underwent computed tomography (CT) of the abdomen and also had venous blood samples assayed for kidney function. RAC was the primary predictor variable and the following measures of kidney function were the outcome variables: eGFR, cystatin-C, micro and macroalbuminuria and CKD stage. CKD stage was divided into the following groups: stage 1 GFR < 90mL/min, stage 2 GFR 60-89 mL/min, stage 3A GFR 45-59 mL/min, and stage 3B GFR 30-44 mL/min. There were no study participants in the stage 4 category of GFR < 30mL/min. The analyses were adjusted for age, gender, race, height, visceral fat, dyslipidemia, diabetes, cigarette smoking, hypertension, interleukin-6 (IL-6), coronary artery calcium (CAC), abdominal aortic calcium (AAC), renin and aldosterone.

Findings: The average age of this cohort was 66.1 years (SD 9.7) and 44.8% (549 of 1226) were male, 36.3% (445 of 1226) Caucasian,
14.1% (173 of 1226) Chinese-American, 21.6% (265 of 1226) African-American and 28.0% (343 of 1226) Hispanic-American. Compared with those with no RAC, those with RAC > 0 were significantly older but not different by gender or race. After adjustment for age, sex and race, those with RAC > 0 had significantly higher visceral fat, were more likely to have dyslipidemia, diabetes and hypertension, had a higher IL6, and a higher prevalence of CAC and AAC > 0.

In fully adjusted multivariable linear regression models, the presence of RAC was associated with higher creatinine (β = 0.052, p = 0.01) and Cystatin-C (β = 0.052, p < 0.01), as well as a lower eGFR (β = -2.209, p = 0.06). In logistic regression, the presence of RAC was also associated with albuminuria but after adjustment for cardiovascular risk factors including dyslipidemia, diabetes, smoking and hypertension, this association was no longer significant. In fully adjusted ordinal logistic regression, RAC as a continuous variable was associated with increased odds of being in a higher CKD category (β = 1.14, p = 0.05).

Discussion: Our results suggest a modest relationship between RAC and kidney function, when measured by creatinine, Cystatin-C, eGFR and CKD stage. As such, the identification of RAC on abdominal CT scans obtained as part of clinical practice may be considered in the prevention of chronic kidney disease.


Funding: No

Funding Component:

P348

Incidence of Chronic Kidney Disease (CKD) and Association of Major Cardiovascular Risk Factors With CKD in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)

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Background: The prevalence of major cardiovascular risk factors and chronic kidney disease (CKD) is high in U.S. Hispanics/Latinos.

Hypotheses: We assessed the hypotheses that the incidence of CKD will vary by Hispanic/Latino heritage, and that cardiovascular risk factors will be associated with incident CKD among Hispanic/Latino adults.

Methods: We used data from HCHS/SOL, the largest community-based cohort of 16,415 self-identified Hispanic/Latino adults from diverse backgrounds in the U.S., aged 18-74 years at visit 1 (baseline, 2008-2011), and ongoing second clinic examination (2014-2017). This preliminary analysis describes results from 7,144 adults who attended visit 1 and 2 by September 2016, and did not have CKD at baseline. Incident CKD was defined as estimated glomerular filtration rate (eGFR) <60 ml/min/1.73m² and eGFR decline ≥1 ml/min/year, or urine albumin-to-creatinine ratio (UACR) ≥30 mg/g. Incidence rates for CKD and incidence rate ratios (RR) for the association between cardiovascular risk factors at baseline and incident CKD were estimated using Poisson regression with robust variance while accounting for the complex sampling design of HCHS/SOL.

Results: In 5.7 years mean follow-up, 430 individuals developed CKD (61.2% women). The age- and gender-adjusted incidence rate of CKD ranged from 6.0% (South Americans) to 14.9% (Puerto Ricans) per 1000 person-years (Table).
Higher systolic blood pressure (RR, 95% CI, 1.02, 1.01-1.02, per one mm Hg increment), glycated hemoglobin (1.17, 1.07-1.27, per one percentage point increment), and log-UACR (3.29, 2.60-4.16, per one unit increment) were significantly associated with incident CKD. LDL and HDL cholesterol were not significantly associated with incident CKD.

**Conclusions:** The incidence of CKD varies markedly by Hispanic/Latino heritage. Systolic blood pressure, glycated hemoglobin and albuminuria are important in the development of CKD in this population. Future work will focus on further evaluation of these differences/associations.

Disclosures: **A.C. Ricardo:** None. **M. Loop:** None. **E. Cedillo-Couvert:** None. **J. Chen:** None. **F. Gonzalez:** None. **H.J. Mattix-Kramer:** None. **A.E. Moncrief:** None. **G.A. Talavera:** None. **M.L. Daviglus:** None. **J.P. Lash:** None.

Funding: No

Funding Component:

**P349**

**Kidney Function Modifies the Positive Association of Troponin With 30 Day Mortality After Myocardial Infarction**

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**Introduction:** Increased levels of cardiac troponin at the time of myocardial infarction (MI) have been shown to predict mortality. However, troponin is renally cleared and kidney function itself impacts mortality. We tested the hypothesis that baseline kidney function modifies the relationship between peak cardiac troponin I ratio (cTnI-R) and 30 day mortality after MI.

**Methods:** Data from the Veterans Health Administration was used to create a national sample of hospitalized Veterans with a discharge diagnosis of MI between 2002 and 2015. The peak cTnI-R, calculated as the highest cTnI during the hospitalization compared to the upper limit of normal for each assay, was used as a proxy for the date of the MI event. Veterans with a history of cancer or blood vessel surgery 5 days before peak cTnI were excluded. The closest estimated glomerular filtration rate (eGFR) measured within 2 years prior to hospital admission was used as a marker of baseline kidney function. We created quartiles of peak cTnI-R and clinically relevant levels of eGFR (<30, 30-44, 45-59, and 60+ ml/min/1.73 m²) and fitted Cox regression adjusting for calendar year, age, length of hospital stay, region, diabetes, major mental health conditions and baseline use of diuretics, anti-hypertensives and anti-lipemics. We used subjects in the first quartile of troponin with eGFR of 60+ as common reference.

**Results:** Among 56,073 Veterans hospitalized for MI, mean age was 67 and 98% were men. During 28 days mean follow up, 4,533 deaths occurred. 30 day mortality steadily increased across quartiles of peak cTnI-R; however, the increase in mortality was higher in eGFR below 30, suggesting effect modification of troponin-mortality relation by eGFR (p for interaction between eGFR and troponin 0.03) (Figure).

**Conclusions:** Our data show that the positive relation of troponin with 30 day mortality post MI is modified by kidney function. Veterans with impaired kidney function carry a higher risk of 30 day mortality after MI compared to those with normal eGFR for a given troponin quartile.
Introduction: Both lower urinary tract symptoms (LUTS) and cardiovascular disease (CVD) share multiple risk factors. Whether LUTS predict the development of CVD, independent of these factors, remains unclear. Objectives: To examine the cross-sectional and longitudinal relationship between LUTS (total, storage, and voiding LUTS) and first-event CVD. Methods: Participants were drawn from a cohort of randomly-selected, community-dwelling men aged 35-80 years at recruitment (2002-5; n = 1195; sample response rate: 67.8%). LUTS were assessed using the International Prostate Symptom Scale (IPSS). Men with an overall IPSS score >7 were classified as having total LUTS, while men with IPSS scores of >3 for items 2, 4, & 7 and >4 for items 1, 3, 5 & 6 were classified with storage and voiding LUTS, respectively. CVD status was obtained by either self-reported physician diagnosis and/or data linkage with a state-wide registry of in-hospital events. The cross-sectional sample (n=1108) consisted of men who had uncomplicated LUTS and complete LUTS measures at baseline. Binomial logistic regression models were used to fit exposure (LUTS) against outcome (CVD) along with qualifying lifestyle, and health-related factors. The longitudinal sample consisted of all CVD-free men at T1 who attended follow-up visits (2007-10; n=701). Cox proportional models were used to determine to hazard ratios (HR) for first-event CVD or date of data-linkage (June 2015). Results: For the cross-sectional sample, 9.4% (n=104) of men examined were found to have CVD. Higher levels of CVD were observed in men with total (35.6% (n=37) vs. 18.2% (n=198) without CVD, p=0.009), storage (40.4% (n=42) vs. 28.3% (n=308), p=0.009) and voiding (31.7% (n=33) vs. 20.0% (n=218), p=0.005) LUTS. In unadjusted binomial models, CVD was associated with total LUTS (OR: 2.38; 95%CI: 1.23-4.31), storage LUTS (1.55; 1.08-2.52), and voiding LUTS (1.55; 1.08-3.33). In the multi-adjusted model, voiding (1.65; 1.06-3.89) and total (2.18; 1.17-4.11) LUTS was independently associated with CVD, with no significant associations observed for storage LUTS. In the longitudinal analysis (median follow-up duration: 67 months), n=103 CVD cases were detected (14.7% of sample; 20 MI, 38 IHD, 18 sudden cardiac arrests, and 27 heart failure cases). In unadjusted Cox proportional models, a significant association was detected for voiding (1.28; 0.87-1.55) and total (HR: 1.22; 95%CI 1.05-1.83) LUTS, but not storage LUTS (1.18; 0.78-2.01). In multi-adjusted models, total LUTS only (2.89; 1.37-6.23) were associated with incident CVD. Conclusions: We demonstrate in a group of broadly-representative, middle aged men an independent association between total LUTS at baseline and the development of CVD, suggesting its utility as a prognostic marker for CVD.
Remnant cholesterol (RC) is the cholesterol content of circulating triglyceride-rich lipoproteins. Studies employing a simple calculation of RC from routine lipid/lipoprotein measures have demonstrated associations between RC levels and cardiovascular disease (CVD) outcomes in both observational study, and lipid lowering clinical trial cohorts. There are no published data evaluating the potential relationship between remnant cholesterol and CVD in chronic kidney transplant recipients (KTRs), a population with excess risk for fatal and non-fatal CVD. RC was calculated, using non-fasting plasma samples, as total cholesterol - [HDL cholesterol + LDL cholesterol] in n=3002 FAVORIT trial [NCT00064753] participants at randomization (mean 37.6, standard deviation ± 21.3, range 4-230 mg/dl). During a median follow-up of 4.0-years, the cohort experienced n=419 CVD outcomes [myocardial infarction, stroke, resuscitated sudden death, CVD death, and CVD procedural events, pooled]. Multivariable logistic regression modeling revealed that each 10 mg/dl increase of RC conferred a 16.4% increase [95% CI, 3.6-30.8%] in CVD risk adjusted for age, baseline CVD, LDL, HDL, natural log triglycerides, estimated glomerular filtration rate, natural log urinary albumin/creatinine, type of kidney graft, graft vintage, and the use of calcineurin inhibitors, steroids, or lipid lowering drugs. Given the residual risk for CVD after recommended LDL levels are achieved, these data suggest that interventions [i.e., such as eicosapentaenoic acid ethyl ester, which can lower RC by ~25-30%; Atherosclerosis 2016; 253: 81-87] targeting elevated RC concentrations in KTRs, merit consideration.

excess and chronic kidney disease (CKD), however, has been relatively unexplored.

**Methods:** HCHS/SOL is a community-based cohort study of 16,415 self-identified Hispanic/Latino adults from diverse backgrounds in the US, including 3,801 women age 18-44 years at visit 1 (2008-2011). This preliminary cross-sectional analysis describes results from 994 reproductive-aged women who attended the ongoing visit 2 (2014-2017) by Sept. 2016. Signs and symptoms of androgen excess included menstrual cycle length (>35 days or too irregular), self-reported PCOS, and oral contraceptive use to regulate menstrual cycles or acne. We also evaluated each component separately. CKD was defined as either a low estimated glomerular filtration rate (eGFR; <60 ml/min/1.73 m²) or albuminuria based on a urine albumin/creatinine ratio ≥30 mg/g. Estimates are adjusted for sampling design, site, age, Hispanic/Latina background, education, smoking status, and body mass index.

**Results:** Among women reporting any sign or symptom of androgen excess (unweighted N=278), 9% reported cycles >35 days, 51% reported cycles too irregular, 49% reported oral contraceptive use to regulate cycles or acne, and 19% self-reported PCOS. Compared to women without any sign or symptom of androgen excess, women reporting a sign or symptom of androgen excess had a higher mean body mass index, waist circumference, albumin/creatinine ratio, and prevalence of hypertension and the metabolic syndrome. The prevalence of CKD (7%, 95% confidence interval (CI): 4-13%) was the same with or without signs and symptoms of androgen excess, and the association was not significant after adjusting for covariates (odds ratio (OR): 1.0; 95% CI: 0.4-2.1). When individual components were analyzed, women reporting cycles too irregular had higher odds of CKD (OR: 1.5; 95% CI: 0.6-3.7) compared to women reporting cycles of 24-35 days, although not statistically significant. **Conclusion:** Over a fourth of Hispanic/Latina women reported signs and symptoms of androgen excess. Overall, there were no statistically significant associations with CKD among women reporting signs and symptoms of androgen excess. Completion of visit 2 would allow us to draw a more robust conclusion and to further characterize these relationships.

Disclosures: **M.L. Meyer:** None. **D. Sotres-Alvarez:** None. **A. Steiner:** None. **L. Cousins:** None. **G.A. Talavera:** None. **J. Cal:** None. **M. Daviglus:** None. **L.R. Loehr:** None.

Funding: No

Funding Component:

**P353**

**New Evidence on the Association of Physical Activity and Chronic Kidney Disease: ORISCAV-LUX Study**

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**Background:** Evidence on stages of renal impairment and related risk factors in Luxembourg adults is lacking. This study aimed to assess the prevalence of chronic kidney disease (CKD) and identify potential correlates among general population in Luxembourg, using the recent definition suggested by the Kidney Disease Improving Global Outcomes (KDIGO) guidelines. **Methods:** Analyses were based on data from 1361 adult participants aged 18-69 years, enrolled in the Observation of Cardiovascular Risk Factors in Luxembourg (ORISCAV-LUX) study, 2007-2008. Descriptive and multivariable logistic regression analyses were performed to identify demographic, socio-economic, clinical and behavioral factors associated with CKD, defined as single estimated glomerular filtration rate (eGFR) measure <60 ml/min/1.73m² and/or urinary albumin creatinine ratio (ACR)>30mg/g. **Results:** Overall, 6.3% had CKD, including 4.4% and 0.7% presented with moderate and severe
macroalbuminuria respectively, and 0.1% had kidney failure (eGFR<15 mL/min/1.73 m²). CKD risk increased significantly with age; the odds ratio increased more than two folds among subjects aged 50-69 years, with no sex-specific difference. CKD was higher among subjects with primary education. Hypertension and diabetes were associated with more than 3-fold and 4-fold higher risk of CKD [adjusted odd ratio (95%CI): 3.11 (1.76, 5.52); P<0.001] and [adjusted odd ratio (95%CI): 4.69 (2.35, 9.36), P<0.001] respectively. Increased physical activity measured as total MET-hour/week was independently associated with a lower odd of CKD (P=0.035). Conclusion: The prevalence estimate of CKD in Luxembourg may represent a neglected public health issue, stressing the benefit of early detection of CKD, particularly in subjects with hypertension, diabetes, lipid disorders and obesity. Promoting physical activity among these high-risk subjects should be considered to prevent CKD. These measures altogether could defray costs related to eventual complications and decrease risk of associated cardiovascular events.

Disclosures: A. Alkerwi: None. N. Sauvageot: None. S. Stranges: None. C. Delagardelle: None. J. Beissel: None.

Funding: No

Funding Component: P354

Objective Short Sleep Duration Increases the Risk of Mortality Associated with the Metabolic Syndrome

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Background: The metabolic syndrome (MetS), the clustering of cardiometabolic risk factors, has been associated with short sleep duration and mortality. Most studies have been limited by using self-report measures and treating sleep duration as a sole, independent predictor, thus, its role in predicting mortality is still not well-established. Hypothesis: We hypothesized that objective sleep duration is an effect modifier of the impact of the MetS on mortality. Methods: We addressed this question in the Penn State Adult Cohort, a random, general population sample of 1,741 men and women (48.7 ± 13.5 years) who were studied in the sleep laboratory and followed-up for 16.7 ± 4.6 years. MetS was defined by the presence of three or more of obesity (≥30 m²/kg), elevated total cholesterol (≥200 mg/dL), triglycerides (≥150 mg/dL), fasting glucose (≥100 mg/dL), and blood pressure (≥85/130 mmHg). Polysomnographic (PSG) sleep duration was classified into clinically meaningful categories. Among the 1,741 participants, 23.5% (n=478) of them died during the follow-up. Results: We tested the interaction between MetS and PSG sleep duration on mortality using Cox proportional hazard models controlling for multiple potential confounders (p-value < .05). The hazard ratios (95%CI) of all-cause and cardiovascular / cerebrovascular mortality associated with MetS were 1.28 (0.88-1.86) and 1.49 (0.75-2.97) for individuals who slept ≥ 6 hours and 1.99 (1.53-2.59) and 2.10 (1.39-3.16) for individuals who slept < 6 hours. Interestingly, this effect modification was primarily driven by the elevated blood pressure and glucose dysregulation components of the MetS. Conclusions: The risk of mortality associated with the MetS increases as a function of short sleep duration. Short sleep in individuals with MetS may be linked to greater central autonomic and metabolic dysfunction. Future clinical trials should examine whether lengthening sleep improves the prognosis of individuals with MetS.


Funding: Yes

Funding Component: National Center
Sleep Duration is Associated With the Metabolic Syndrome Independent of Depression Symptoms The Polish Norwegian Study

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Introduction: Short- and long sleep durations have emerged as potential cardiovascular risk factors. Yet, the relation with metabolic syndrome (MetSyn) remains uncertain due to potential residual confounding by depression and comorbidities. Purpose: To test whether compared to adequate-sleepers, short and/or long-sleepers have higher prevalence of MetSyn, independent of current depression or past psychiatric illnesses. Methods: Cross-sectional data of 12754 participants, age 45 to 64 years, in an ongoing cohort study, with structured questionnaires and fasting blood samples. We categorized self-reported sleep duration as short (le 5 h), adequate (6-8 h) or long (ge9 h). Metabolic syndrome was defined based on AHA/NHLBI’s criteria. Depression symptoms were ascertained with a culturally-adapted, 7-item Patient Health Questionnaire. We estimated multivariable-adjusted prevalence ratios using Poisson regression models with robust standard error estimates. Results: Compared to adequate sleepers, both short- and long-sleepers were less likely to be men, to drink alcohol, and be current smokers but more likely to have history of cardiovascular diseases and hypertension. Among short-, adequate and long-sleepers the prevalence of self-reported past psychiatric diseases was 2.28%, 1.59% and 8.50% respectively (p =0.0001) and the prevalence of current antidepressant use was 5.09%, 2.52% and 10.26% respectively (p<0.0001). Similarly, the prevalence of 5 or more depressive symptoms was 39.36%, 22.09% and 26.98% respectively (p =0.0001). The prevalence of MetSyn among short-, adequate and long-sleepers was 45.38%, 38.12% and 49.56% respectively (p =0.0001). Compared to adequate sleepers, the prevalence of MetSyn remained higher among short-sleepers (PR 1.10, 95% CI 1.01-1.19) and among long-sleepers (PR 1.15, 95%CI 1.02-1.30), after adjusting for age, sex, smoking, alcohol, coffee intake, physical activity, education, non-cardiovascular chronic diseases, past psychiatric diseases, current depression symptoms and current antidepressant drugs use. Difficulties with sleep initiation were not associated with MetSyn. In a subgroup analysis restricted to those with BMI 25-29.9 kg/m², compared to adequate sleepers, the prevalence of MetSyn remained higher among short-sleepers (PR 1.16, 95% CI 1.02-1.32) and among long-sleepers (PR 1.29, 95%CI 1.04-1.60) after multivariable adjustment. Conclusion: Both short and long sleep duration are associated with the presence of MetSyn, independent of past psychiatric conditions or current depression symptoms or treatment.

Disclosures: G. Vaidean: None. M. Manczuk: None.

Funding: No

Funding Component:

Association Between Sleep Disturbances and Dyslipidaemia: Systematic Review and Meta-analysis of Prospective Studies

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Objectives. To assess the longitudinal evidence of the relationship between sleep disturbances (of quantity and quality) and dyslipidaemia in the general population and to quantify such relationships. Methods. We performed a
systematic search of PubMed and EMBASE (up to July 2016), complemented with manual searches. Studies were included if they were prospective, had sleep quantity and/or quality at baseline and either incident cases of dyslipidaemia or changes in any of the lipid fractions assessed prospectively. Relative risks (95% CIs) were extracted and pooled using a random effect model. Sub-group analyses by lipid type and cumulative meta-analysis by publication date were also performed. Heterogeneity and publication bias were assessed. Results. 13 studies were identified (4 on quality, 11 on duration). There was heterogeneity in the sleep quality aspects and types of lipids assessed. Classification of sleep duration (per hour/groups) and outcome reporting (changes, risks, differences) also varied widely. In the pooled analysis of sleep duration (6 studies, 16 cohort samples; 30,021 participants; follow-up 2.6-10 years), short sleep was associated with a risk of 1.01 (95% CI: 0.93-1.10) of developing dyslipidaemia, with moderate heterogeneity ($I^2=56\%$, $p=0.003$) and publication bias ($p=0.035$). Long sleep was associated with a risk of 0.98 (95% CI: 0.87-1.10) for dyslipidaemia, with heterogeneity ($I^2=63\%$, $p<0.001$) and no publication bias ($p=0.248$). However, subgroup analyses suggested a trend for higher TChol in short sleepers (1.10; 0.99-1.22; $p=0.07$) and lower TChol in long sleepers (0.91; 0.81-1.01; $p=0.087$). Cumulative meta-analysis shows a general trend towards no effect for both short and long sleep duration with dyslipidaemia. Conclusion. The results do not support a significant relationship between sleep duration and the development of dyslipidaemia. However, heterogeneity in the reporting of both exposure and outcomes and some publication bias limit the interpretation.


Funding: No

Funding Component:

P357

The Association between Sleep and Waist Circumference Varies among Women as a Function of Race and Ethnicity

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BACKGROUND: Waist circumference (WC) is an established predictor of global 10-y risk for cardiovascular disease (CVD). Sleep duration and quality have also been associated with CVD risk. The association between sleep and WC and how it may vary among racially/ethnically diverse women has not been fully established.

HYPOTHESIS: We assessed the hypothesis that sufficient sleep duration ($\geq 6$ h), good sleep quality, and lower insomnia severity would be associated with reduced WC and that associations would vary by race/ethnicity.

METHODS: Participants were English or Spanish speaking females ($n=50$), aged 20-79y, recruited as visitors of patients or members of the community surrounding an urban medical center, as part of the American Heart Association Go Red for Women Strategically Focused Research Network. Sleep duration and quality were assessed using the Pittsburgh Sleep Quality Index, and insomnia was assessed using the Insomnia Severity Index (ISI). Anthropometric measures were obtained by trained personnel. A standardized health questionnaire was used to obtain medical and demographic data. Linear regression models were used to evaluate cross-sectional associations between sleep patterns and WC in the overall sample and stratified by race/ethnicity.

RESULTS: The mean age of the sample was $41\pm18$y and 56% (28 of 50) were racial/ethnic minorities. The mean body mass index (BMI) was $26.0\pm4.5$ kg/m$^2$ and half of women had a BMI $\geq 25$ kg/m$^2$. One third were current/former smokers, 36% (18 of 50) were postmenopausal and 60% (30 of 50) reported a history of chronic
disease. In the overall sample, a sleep duration of <6 versus ≥6 h was associated with higher WC in univariate (beta(SE)=4.90(1.44), p=.001) and multivariable models adjusted for age, race/ethnicity, education, marital status, menopausal status and history of chronic disease (beta(SE)=4.38(1.76), p=.02). In analyses stratified by race/ethnicity, null associations between sleep duration and WC were observed for non-Hispanic whites in univariate (beta(SE)=3.30(2.19), p=.15) and multivariable-adjusted models (beta(SE)=0.97(2.68), p=.72). However, among racial/ethnic minorities, a sleep duration <6 versus ≥6 h was associated with higher WC in both univariate (beta(SE)=5.65(1.07), p=.01) and multivariable-adjusted models (beta(SE)=6.68(2.12), p=.01). In general, the mean WC among minority women who slept <6 versus ≥6 h was 41.1 versus 35.5 inches (p=.03). Sleep quality and ISI were not significantly associated with WC.

CONCLUSIONS: In this diverse sample of women, sleeping for ≥6 h/night had a protective impact on WC, particularly among minority women. These preliminary findings suggest that minority women with insufficient sleep may be particularly prone to central adiposity, thereby predisposing them to increased CVD risk. Analyses are ongoing to confirm these results in a larger sample.

Disclosures: **N. Makarem:** None. **M. Liao:** None. **B. Aggarwal:** None.

Funding: Yes

Funding Component: National Center

P358

Sleepiness and Subclinical Measures of Atherosclerosis in a Bi-racial Cohort: The Bogalusa Heart Study

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INTRODUCTION: That adverse health outcomes, including atherosclerosis, are associated with sleep disturbance is well-documented; however, evidence from diverse populations on the magnitude of this association, or investigating sleepiness as an outcome, is scarce.

METHODS: We examined data from the Bogalusa Heart Study, a long-term community-based observational study of a biracial cohort, with first measurements in childhood in 1973. Men and women (n=546) who underwent a measure of carotid intima-media thickness (IMT), calculated as the composite IMT (cIMT), mean of six segments (common and internal carotid, and carotid bifurcation, each left and right), and completed the Epworth Sleepiness Scale (ESS), were included. Multivariable logistic regression was employed to model the association between ordinal self-rated sleepiness and cIMT per standard deviation, adjusted for age, sex, smoking status (at time of IMT measurement), hours of sleep, symptoms of sleep disturbance, and previous heart attack. Based on previous race-specific findings, data were analyzed separately by race.

RESULTS: Of whites (n=356), 59.6% were female and 22.5% were current smokers. Mean (SD) age was 43.1 (4.4) years, and cIMT was 0.6 (0.1) mm. Of African-Americans (n=190), 66.8% were female, 34.7% were current smokers. Mean (SD) age was 42.8 (4.6) years, and cIMT was 0.7 (0.2) mm. Multivariate modeling found a significant race-cIMT interaction term (p=0.04). In stratified analyses, the adjusted odds of abnormal sleepiness (vs. normal sleepiness) were 1.40 times greater (95% CI: 1.04-1.90) per 1-SD increase in cIMT in whites, while among black participants, the odds ratio (95% CI) was 1.01 (0.68-1.50).

CONCLUSIONS: There was a significant association between unfavorable subclinical measures of atherosclerosis and excessive daytime sleepiness among white participants.

Funding: No

Funding Component:

P359

Difficulty Falling Asleep is Predictive of Metabolic Syndrome

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Introduction: Insomnia symptoms are associated with cardiovascular disease and multiple metabolic syndrome components, yet few studies have investigated their association with metabolic syndrome.

Hypothesis: Insomnia symptoms will be significantly associated with prevalent metabolic syndrome.

Methods: Middle-aged, community-dwelling adults, ages 40-65 yrs, were recruited to participate in a study on healthy aging. All participants completed questionnaires on demographics, medical history, and sleep patterns in the past month including estimated sleep-onset latency, frequency of difficulty falling asleep, and severity of difficulty falling asleep, difficulty maintaining sleep, and early morning awakenings. Measurements for metabolic syndrome were collected at a home health visit. All metabolic syndrome criteria consisting of waist circumference, triglyceride level, HDL cholesterol level, blood pressure, and fasting glucose were identified using the American Heart Association definitions. Participants with three or more positive criteria were considered to have metabolic syndrome. Of a total sample of 770 individuals, 557 participants who did not have a history of cardiovascular events (n = 62), and had complete sleep and metabolic syndrome data were included in the analysis. We conducted logistic regression models predicting presence of metabolic syndrome from the sleep measures adjusting for age, sex, race, education level, smoking status, alcohol consumption, moderate physical activity minutes per week, and current major depression diagnosis.

Results: Metabolic syndrome was prevalent in 24.2% of the sample (n = 135). Sleep onset latency of greater than 30 minutes and difficulty falling asleep three or more nights per week were significantly related to metabolic syndrome, but no other insomnia symptoms were related (see Table).

Conclusions: Difficulty falling asleep, a marker of physiological and emotional hyperarousal, may be a modifiable risk factor for metabolic syndrome.

Disclosures: M.E. Petrov: None. A.J. Zautra: None. N. Hoffmann: None. M.C. Davis: None.

Funding: No

Funding Component:

P360

24-hour Blood Pressure Profiles Associated With Sleep Duration

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INTRODUCTION: Insufficient sleep is associated with incident hypertension. Because blood pressure (BP) varies across 24h, shorter sleep may be associated with increased BP across all 24h. Additionally, we evaluated whether BP variability was also associated with shorter sleep. METHODS: Participants were adults with untreated prehypertension or stage-1 hypertension assessed at baseline as part of a clinical trial. Recordings took place during overnight visits in a Clinical Research Center. Sleep was reported by nurses continuously monitoring patients. Those with <7h sleep were classified “shorter” (N=13) and the rest “longer” (N=30). BP was assessed with a Spacelabs ambulatory monitor. Linear regression models evaluated effect of group on day, night, and 24h systolic and diastolic BP and heart rate (HR).

RESULTS: The “shorter” group slept for M=370 (SD=87) minutes and the “longer” group slept for M=521 (SD=51) mins. Results for day, night, and 24h systolic and diastolic blood pressure and heart rate are reported in the Table. Also, higher 24h variability in systolic BP (B=1.2, p=0.03), diastolic BP (B=1.4, p=0.002), and HR (B=1.3, p=0.03) were demonstrated. This was reflected in higher variability during daytime for systolic BP (B=1.1, p=0.04), diastolic BP (B=1.5, p=0.001), and HR (B=1.2, p=0.05); no differences in variability were seen during the night. CONCLUSIONS: Shorter sleep duration is associated with higher systolic BP and HR across 24h (day and night), as well as increased variability in systolic and diastolic BP and HR across 24h (during the day in particular). This could provide additional insight into how sleep duration is associated with hypertension incidence.


Funding: No

P361

Significant Inverse Association of Blood Levels of Marine Omega-3 Fatty Acids With Aortic Calcification in an International Multi-ethnic Cohort of 1335 Men Aged 40-49 Years: The ERA JUMP Study

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Introduction Aortic calcification (AC) is an independent predictor of future cardiovascular (CV) events. Marine omega-3 fatty acids (OM3) are reported to have anti-atherogenic properties. Hypothesis We hypothesized that blood levels of OM3 have a significant inverse association with AC. Methods ERA JUMP is a population-based study of subclinical atherosclerosis in 1335 men aged 40-49 without CVD (310 European American, 107 African American, 303 Japanese American, 313 Japanese in Japan and 308 Korean in South Korea). Participants were examined for AC, blood levels of OM3, CV risk and other factors in 2002-07 with rigorous standardization. AC was
assessed by electron-beam CT and quantified using the Agatston method. OM3 were measured using gas chromatography, expressed as the percentage of total fatty acids and defined as the sum of eicosapentaenoic, docosapentaenoic and docosahexaenoic acids. After excluding missing data for AC (n=36), OM3 (n=8) and heavy drinkers (ethanol >69 g/day) (n=73), our final analytic sample was 1218. The association of the presence of AC with OM3 was analyzed using logistic regression adjusting for age, race, CV risk and other factors. We also performed Tobit regression and ordinal logistic regression to assess the relation between AC score (ACS) and OM3.

**Results**

Mean [standard deviation (SD)] of age, LDL-C, and pack-years of smoking were 45.2 (2.8) years, 127 (35) mg/dl and 9.5 (13.6), respectively. Prevalence (%) of hypertension and diabetes was 22.4 and 8.0, respectively. Mean (SD) of OM3 was 6.1 (3.1) (%) and 58.1% had ACS>0. In a fully adjusted model with stepwise backward elimination, odds of ACS>0 was reduced by 10% with one SD increase in OM3 level (p <0.001). Results of Tobit regression and ordinal logistic regression suggest a statistically significant lower ACS for every SD increase in OM3 level. There was no significant interaction on AC between race and OM3.

**Conclusions**

This cross-sectional study showed a significant inverse association of OM3 with AC in an international multi-ethnic cohort.


Funding: No

Funding Component: P362

**Significant Positive Association Between Alcohol Consumption and Advanced Aortic Calcification in an International Multiethnic Cohort of 1335 Men Aged 40-49 Years: The ERA JUMP Study**

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**Introduction:** Aortic calcification (AC) is a less widely used measure of atherosclerosis, has been linked to cardiovascular (CV) morbidity and mortality. A J-shaped association of alcohol consumption with CHD has been consistently reported in epidemiological studies. However, scanty literature is available describing the
association of alcohol consumption and AC.

**Hypothesis:** We hypothesized that alcohol consumption has a J-shaped association with advanced AC.

**Method:** ERA JUMP is a population-based study of subclinical atherosclerosis in 1335 men aged 40-49 years without CVD (310 European American, 107 African American, 303 Japanese American, 313 Japanese in Japan and 308 Korean in South Korea). Participants were examined for AC, alcohol consumption, CV risk and other factors in 2002-07 with rigorous standardization. AC was assessed by electron-beam CT and quantified using the Agatston method. Advanced AC was defined as Agatston calcium score >300. Alcohol consumption was categorized into four groups: 0 (non-drinkers), <1 (light drinkers), > 1 to < 3 (moderate drinkers) and >3 drinks per day (heavy drinkers) (1 drink=12.5 grams of ethanol). Multivariable logistic regression was used to assess the relationship between AC with alcohol consumption adjusting for age, race, CV risk and other factors.

**Results:** Among 1299 studied participants, after excluding participants with missing values for AC (n=36), 70.3% (913 of 1299) were current drinkers and 10.9% (142 of 1299) had advanced AC. Prevalence of advanced AC among non, light, moderate, and heavy drinkers was 7.25% (28 of 386), 10.89% (43 of 395), 9.06% (28 of 309), and 20.57% (43 of 209) respectively. Alcohol consumption had a positive association with advanced AC with a significant cubic trend (p<0.01). There was no significant interaction on advanced AC between race and alcohol consumption.

**Conclusion:** A significant positive association between alcohol consumption and advanced AC was observed in this cross-sectional study of an international multi-ethnic cohort.


**Funding:** No

**Funding Component:**

**P363**

**Ectopic Adiposity is Associated With Abdominal Aorto-Iliac but Not Coronary Artery Calcification Independent of Total Body Adiposity in African Ancestry Men**

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**Objective** While ectopic adiposity is considered a risk factor for many chronic diseases, including cardiovascular disease, the extent to which this association is independent of total adiposity is yet to be established. Vascular calcification, which is associated with greater adiposity, is a subclinical marker of cardiovascular disease that may have varying etiology and clinical implications in different vascular beds. Therefore, our objective was to assess the potential independent associations of total, regional and ectopic adiposity measures with abdominal aorto-iliac calcification (AAC) and coronary artery calcification (CAC).

**Methods** Detailed health history, clinical exam, dual x-ray absorptiometry and computed tomography (CT) scans were obtained in 798 African ancestry men aged ≥40 years (mean(SD): 62.0(8.6)years) recruited
without regard to health status from the Tobago Heart Health Study. Vascular calcification was measured by CT in the abdomen (AAC) and chest (CAC). Calcification was scored using the Agatston method and a score ≥10 was considered to be a prevalent calcification. Severity of calcification was modeled using continuous Agatston score in those with any calcification. Multivariable logistic and linear regression models were used to assess the cross-sectional association of adiposity measures with vascular calcification prevalence and severity. All models were adjusted for age, hypertension, diabetes, dyslipidemia, smoking, alcohol intake and sedentary lifestyle. In addition, models of ectopic adiposity (abdominal visceral adipose tissue, liver attenuation and calf skeletal muscle fat) were adjusted for total body fat. Results AAC was present in 63% and CAC was present in 29% of men. After adjustment for traditional cardiovascular risk factors, 1SD greater total, trunk, or abdominal subcutaneous adiposity was associated with 1.3-1.5-fold increased odds of AAC (all p<0.05). After additional adjustment for total body fat, 1SD lower liver attenuation (indicative of greater liver adiposity) or 1SD greater skeletal muscle fat were each associated with a 1.2-1.3-fold increased odds of AAC. In fully adjusted models, only greater BMI or waist circumference was associated with increased odds of CAC (OR 1.2, p<0.05 for both). In fully adjusted linear models of calcification severity, no significant association was observed between any adiposity measure and AAC or CAC. Conclusions Independent of total adiposity, measures of ectopic adiposity were associated with greater AAC, but not CAC, prevalence in African ancestry men. These results highlight potential differences in the adiposity-vascular disease relationship that may vary by ectopic fat depot and vascular bed location. Future vascular disease research should explore potential underlying biologic mechanisms for these findings.


Funding: No

Funding Component:

P364

Coronary Artery Calcium Incidence and Progression Among South Asians: Results From the MASALA Study

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Background: South Asians have a high burden of cardiovascular disease. We have reported that South Asians have similarly high prevalence of coronary artery calcium (CAC) compared to non-Hispanic Whites, and higher CAC than other U.S. ethnic minority groups. No studies have determined the incidence or progression of CAC among South Asians. Methods: We used data from a community-based cohort of South Asians (MASALA) and calculated change in CAC Agatston score between Exam 1 (2010-2013) and Exam 2 (2015-2016) among 379 South Asians. We compared these findings to the previously reported CAC incidence and progression in the Multi-Ethnic Study of Atherosclerosis (MESA). We also determined factors associated with a ≥100 change in CAC score. Results: We used data from 240 men and 139 women with repeat CAC measured after 4.5±0.7 years of follow-up. Among those with no detectable CAC at baseline, 6.8% developed incident CAC annually (9.2% of men and 4.4% of women), which was similar to MESA race/ethnic groups. Among those with known CAC at
baseline, the median annual CAC progression was 23 (interquartile range, 8-56). The table shows the distribution of annual CAC progression. South Asians overall, but particularly South Asian men, had significantly higher annual CAC progression compared to the reported average in MESA (overall median 18, 4-53). Established risk factors (age, male sex, diabetes and hypertension), pericardial fat volume and visceral fat area were associated with greater CAC progression. Conclusions: These preliminary results suggest that South Asian men have significantly greater CAC progression compared to other race/ethnic groups. Longer follow-up of MASALA will determine whether CAC score or CAC progression are important predictors of cardiovascular disease events.


Funding: No

Funding Component:
P365

Effects of a Health Partner Intervention on Arterial Health

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Introduction: Lifestyle modification is effective for cardiovascular disease prevention. Whether lifestyle intervention also preserves vascular health is less clear. Our study examined the role of a Health Partner-administered lifestyle intervention on vascular function.

Hypothesis: Lifestyle intervention improves and preserves vascular function.

Methods: A total of 711 university employees (48±11 years, 66% women, 22.5% Black) enrolled in a program that promoted healthier lifestyles at Emory University. Participants collaborated with a Health Partner to generate a personalized plan focused on achieving ideal health metrics. Anthropometric, laboratory and vascular function measurements were performed at baseline and at 1-year and 2-years of follow-up. Arterial stiffness was assessed by carotid-femoral pulse wave velocity and radial tonometry-derived central augmentation index. Microvascular function was assessed as digital reactive hyperemia index. Flow-mediated dilation was measured using ultrasound. The sample was divided into individuals within the lowest tertile and those in the upper two tertiles for vascular function at baseline. Paired t-test was used to assess the changes in vascular functions at 1 and 2 years of follow-up compared to baseline.

Results: At each of the 1-year and 2-year follow-up visits, vascular function improved in the group within the abnormal tertile at baseline. Flow-mediated dilation increased by 1.6% and 2.0% (P<0.001) respectively, pulse wave velocity decreased by 0.85 m/s and 0.93 m/s (P<0.001), central augmentation index was lower by 3.4 and 3.2 (P<0.001), and microvascular function assessed by reactive hyperemia index improved by 0.48 and 0.52 (P<0.001). In those within the upper two tertiles, pulse wave velocity did not significantly change, but flow-mediated dilation and reactive hyperemia index showed significant decline at 2 years of follow up.

Conclusion: A personalized, goal directed
Health Partner intervention was associated with better vascular stiffness, endothelial and microvascular function in those with baseline abnormal values. These effects were evident at 1 year following enrollment and were sustained for 2 years. Whether the impact of Health Partner intervention on vascular function improves long-term morbidity and mortality needs further investigation in a controlled design.


Funding: No

Funding Component:

P366

Introduction: Whether multiple unique trajectories in fasting glucose (FG) and insulin resistance (HOMA-IR) are present during young adulthood and if such trajectories are associated with cognitive function in middle adulthood is unclear.

Hypothesis: We hypothesized that a high-increasing trajectory of FG and HOMA-IR in the absence of diabetes during young adulthood would be associated with lower level of cognitive function in midlife compared to a low trajectory.

Methods: We studied 2,650 CARDIA participants, age 18 to 30 years (1985-1986) to determine FG and HOMA-IR at baseline and 7, 10, 15, and 20 year follow-up exams (≥ 8 hours fasting and not pregnant). Using latent class analysis (SAS Proc Traj), we determined trajectory groups for FG and HOMA-IR through year 20. Cognitive function was assessed at year 25 (2010-2011) with three cognitive tests including the Digit Symbol Substitution Test (DSST; a test of sustained attention, psychomotor speed, working memory, and executive function), Rey-Auditory Verbal Learning Test (RAVLT; verbal memory), and Stroop Test (executive function). We used multivariable linear regression to estimate adjusted means for each cognitive test according to trajectory group for both FG and HOMA-IR for individuals free from diabetes during follow-up, after adjustment for potential confounding factors.

Results: We identified three trajectory groups for FG and HOMA-IR for individuals free from diabetes in middle adulthood, qualitatively low-stable to increasing, moderate-increasing, and high-increasing. Compared to the low FG trajectory group, the high FG trajectory group had significantly lower mean score for the RAVLT, shown in the Table. Otherwise, cognitive test scores generally did not differ according to FG or HOMA-IR trajectory group.

Conclusion: In this community-based sample of individuals free from diabetes, a high-increasing FG trajectory through young adulthood was associated with worse memory in midlife.

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Fasting Glucose and Insulin Resistance Trajectories in Young Adulthood and Cognitive Function in Middle Adulthood: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Funding: No

Funding Component:
P367

Association of Risk Factor Exposure Patterns Through Young Adulthood With Left Ventricular Structure/Function in Middle Age: The Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Background: Data are sparse regarding associations of risk factors (RF) across young adulthood with development of adverse left ventricular (LV) structure and function by middle age, and it is unclear whether baseline, cumulative, or longitudinal RF exposure patterns best represent that risk.

Methods: We included up to 2335 CARDIA participants (ppts) who had echocardiographic data from exam year (Y)5, Y25, and Y30, and RF data from at least 3 exams including Y0 and Y25. Echo outcomes included Y30 indexed LV end-systolic (ESD/ht) and -diastolic (EDD/ht) dimensions, and LV mass (M/ht²⁻⁷), septal and posterior wall thickness, ejection fraction (EF), and incident adverse geometry (defined as LV concentric remodeling [CR], concentric hypertrophy [cLVH], or eccentric hypertrophy [eLVH]). We used multivariable linear, logistic or polytomous regression (as appropriate to endpoint) to examine associations of RF exposures measured as: 1) baseline (Y0); 2) change from Y0 to Y25; 3) cumulative exposure from Y0 to Y25 (e.g., pack-yrs, mmHg-yrs); or 4) latent class trajectories (using PROC TRAJ) from Y0 to Y25, with adjustment for demographics and relevant Y5 echo measures.

Results: At Y30, ppts were 55±4 yrs, 56% women and 44% black; 12% smoked, mean BMI was 30.4±7, 37% had hypertension, and 17% diabetes; 20.5% had incident LVH; 4.5% EF<50%; and 37.2% adverse LV geometry. Models representing cumulative RF exposures tended to have the highest adjusted R² and lowest AIC for continuous and categorical Y30 LV outcomes. The table shows associations of cumulative RFs from Y0 to Y25 with incident LVH, EF<50%, and adverse LV geometry at Y30. Few RFs were consistently associated with Y25-Y30 change in echo measures, but they included education and SBP.

Conclusions: Among initially healthy young adults, cumulative risk factor exposures (often within clinically normative ranges) over 25 years are significantly associated with continuous LV echo measures and adverse LV outcomes by middle age, suggesting the importance of primordial prevention.
Background: Carotid intima-medial thickness (IMT) is an indicator of subclinical atherosclerosis and medial hypertrophy, and is easily quantified by ultrasonography. Although carotid IMT has been associated with systemic cardiovascular disease, its relation to silent brain infarctions (SBI) is not well established. The etiology of SBI is multifactorial; likely causes include atherosclerotic and thrombotic obstructions, microthrombi, and lipohyalinosis. Because arterial IMT reflects both atherogenesis and hypertensive remodeling, we hypothesized that elevated carotid IMT would be associated with SBI. Methods: The Atherosclerosis Risk in Communities (ARIC) study is an observational cohort of 15,792 black and white participants from 4 US communities. At visit 3 (1993-1995) a subset of stroke-free study participants (N=1,346) was screened by brain MRI and carotid ultrasound. IMT was averaged bilaterally, from 12 posterior wall measurements along a 1 cm segment of the distal common carotid artery up to the bifurcation. Consistent with European Society of Cardiology recommendations, IMT > 0.9 mm was considered elevated. Asymptomatic brain lesions ≥3 mm in diameter were considered SBI. Prevalence ratios (PRs) for number of SBI lesions associated with elevated IMT were analyzed using Poisson regression, adjusted for age, race-center, sex, current smoking, hypertension, diabetes, and hyperlipidemia. Model fit was ascertained by the deviance to degree of freedom ratio. Results: Of 1,346 individuals, 170 (13%) were classified with elevated IMT. Mean IMT was 1.0 ± 0.2 mm vs. 0.7 ± 0.1 mm for those with and without elevated IMT. Study participants with elevated IMT were more often male (49% vs. 38%; p=0.006), black (60% vs. 46%; p=0.0007), and older (64 vs. 62 years; p=0.0001); with a greater prevalence of both hypertension (65% vs. 42%; p<0.0001) and diabetes (27% vs. 13%; p<0.0001). SBI were detected in 157 individuals with a collective total of 247 lesions. A total of 30 (18%) participants with elevated IMT had at least one SBI lesion, compared to 127 (11%) with normal IMT (p=0.009). Elevated IMT was associated with 70% greater number of SBI lesions (PR=1.7; 95% CI: 1.3 - 2.3; p=0.0008). After adjustment for cardiovascular risk factors, elevated IMT remained associated with a 40% greater SBI count (PR= 1.4; 95% CI: 1.0 - 1.9; p=0.05). Conclusions: Although elevated IMT is often classified by a conservative 0.9 mm cut-point, it is a continuum, with advanced wall thickening (>1.5 mm) recognized as plaque. In this analysis from the ARIC Study, asymptomatic individuals classified with elevated IMT had mild wall thickening (mean IMT = 1.0 mm), which nonetheless was associated with greater number of SBI lesions. This association remains robust after adjustment for cardiovascular risk factors.


Funding: No

Funding Component:
Hepatocyte Growth Factor is Positively Associated With Progression of Atherosclerosis: the Multi-Ethnic Study of Atherosclerosis

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Introduction - Hepatocyte growth factor (HGF) is released in response to endothelial injury, and higher levels of circulating HGF are associated with atherosclerosis. However, the association of HGF with atherosclerosis progression is unknown.

Hypothesis - Circulating HGF is positively associated with atherosclerosis progression, measured as progression of 1) carotid artery plaque and 2) coronary artery calcium (CAC).

Methods - The Multi-Ethnic Study of Atherosclerosis is a large, population-based cohort study of adults aged 45-84 and free of clinical cardiovascular disease. Participants had HGF measured in serum at baseline (2000-02), and were followed for progression of carotid plaque and CAC through 2012. We defined CAC and carotid plaque progression as dichotomous variables (progression, no progression). Carotid plaque progression is an increase in the number of carotid plaques. We used the Hokanson method to define CAC progression as an increase of $\geq 2.5 \text{ mm}^3$ in the square root-transformed calcium volume score. Relative risk regression quantified the association between HGF and carotid plaque progression. Cox regression models using inverse-probability-of-attrition weights estimated the association of HGF with progression of CAC. All effect estimates are adjusted for potential confounding variables.

Results - The cohort included 6714 Americans with HGF measurements: 2593 non-Hispanic white, 797 Chinese, 1848 black, and 1476 Hispanic Americans. In 3363 participants with measurements for both carotid plaque and HGF, each standard deviation (259 pg/ml) increase in HGF was associated with a 4% greater risk (95% CI: 1.01-1.07) of carotid plaque progression (n=1875), which did not differ by race/ethnicity (interaction p = 0.3). Out of 6714 participants with measurements for both CAC and HGF, 2994 had CAC progression during follow-up. The association of HGF with CAC progression differed by race/ethnicity (interaction p = 0.01). Each standard deviation increase of HGF was associated with a 10% greater risk of CAC progression in non-Hispanic white (95% CI: 1.05-1.16) and black Americans (95% CI: 1.03-1.17), while HGF was not associated with CAC progression in Chinese (p = 0.5) nor Hispanic (p = 0.7) American participants.

Conclusions - Circulating HGF was associated with a modestly increased risk of atherosclerosis progression in this large and diverse population, with the strongest associations between HGF and CAC progression in non-Hispanic white and black Americans. Our results suggest that HGF may have utility as a marker of atherosclerosis progression in some populations.


Funding: No

Funding Component:

P370
Risk Factors for Progression of Coronary Artery Calcification in Patients with Chronic Kidney Disease


Introduction: Coronary artery calcification (CAC) is prevalent among patients with chronic kidney disease (CKD) and predicts the risk of cardiovascular disease (CVD). Risk factors for the progression of CAC in patients with CKD have not been well studied.

Hypothesis: We assessed the hypothesis that several established and novel CVD risk factors are associated with progression of CAC among patients with CKD.

Methods: In a random subsample of 1,123 participants from the Chronic Renal Insufficiency Cohort (CRIC) Study, CAC was measured at baseline and the follow-up visit using electron beam computed tomography (CT) or multidetector CT. CAC progression was defined as an increase of Agatston score ≥100 units during follow-up. Multiple logistic regression and mixed-effects regression models were used to assess risk factors for progression of CAC.

Results: Over an average of 3-year follow-up, 332 (29.6%) participants developed CAC progression. After adjusting for age, sex, race, clinical site, total cholesterol, HDL-cholesterol, systolic blood pressure, antihypertensive treatment, diabetes, and current smoking in the multivariable models, history of CVD (odds ratio [OR] 1.53, 95% CI 1.09-2.15, p=0.02), lipid-lowering treatment (OR 1.81, 95% CI 1.28-2.55, p<0.001), higher serum phosphate (OR 1.37, 95% CI 1.17-1.61, p<0.001), hemoglobin A1c (OR 1.32, 95% CI 1.10-1.58, p=0.002), and cystatin C (OR 1.24, 95% CI 1.06-1.45, p=0.007), and lower estimated-glomerular filtration rate (eGFR) (OR 1.32, 95% CI 1.10-1.56, p=0.002) were associated with CAC progression. In addition, lower physical activity, lipid-lowering treatment, body-mass index, LDL-cholesterol, lower serum calcium, phosphate, total parathyroid hormone, fibrinogen, interleukin-6, tumor necrosis factor-α, fibroblast growth factor-23, lower eGFR, cystatin C, and 24-hour urine albumin were associated with square root transformed change in CAC score from baseline in multiple-adjusted models. These findings persisted after additional adjustment for baseline CAC score.

Conclusions: In conclusion, these data suggest that reduced kidney function, calcium and phosphate metabolic disorders and inflammation, in addition to established CVD risk factors, might play a role in CAC progression among patients with CKD.


Funding: No

Funding Component: P371
Race Disparities in the Contribution of Lipid Profiles to Ankle-Brachial Index: Lifecourse Evidence from the Bogalusa Heart Study

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**Background:** Ankle-brachial index (ABI) is a practical non-invasive estimation of the burden of atherosclerosis on the vascular system. Although cholesterol is known to affect ABI as part of the disease process, information is limited on the contribution of longitudinal measures of cholesterol on the decline of ABI over time. **Hypothesis:** Race (black-white)—specific differences exist in cumulative burden effects of cholesterol, measured from childhood to adulthood, on ABI decline in young adults.

**Methods:** We examined 497 adult participants of the Bogalusa Heart Study (72.8% white, 43.1% men, age 32-51 years), who had at least 3 measurements of cardiovascular (CV) risk factors since childhood (average follow-up 33.5 years). ABI was obtained in two separate instances: baseline (2001-2002) and follow-up (2007-2010), and its change was computed as the mean difference, divided by the time (years), between the two instances. The long-term cumulative burden of each risk factor was calculated as the total area under the curve (AUCt). Measurements of cholesterol and other CV risk factors in childhood, adulthood and AUCt were standardized to z-scores prior to regression analyses. **Results:** ABI significantly decreased (1.09±0.09 vs 1.03±0.09, p<0.01) after a mean follow-up of 6.8 years. There were no significant differences in annual ABI decline between male and female (p=0.56) / black and white (p=0.18) participants. In multivariable linear regression analyses, after adjustment for sex, lipid-lowering medications, smoking status, body mass index, systolic blood pressure and baseline ABI, significant predictors of annual ABI decline in white participants were: childhood total cholesterol (TC) (β = -0.11, p<0.01), low-density lipoprotein cholesterol (LDL-C; β = -0.10; p<0.01), and non-high-density lipoprotein cholesterol (non-HDL-C; β = -0.10, p<0.01), as well as the AUCt of TC (β = -0.09; p=0.02) and non-HDL-C (β = -0.08, p=0.04). The AUCt of HDL-C was the only significant predictor in black participants (β = 0.16, p=0.04).

**Conclusions:** These findings suggest that the impact of cholesterol levels on future adult ABI decline starts in childhood, and follows a cumulative detrimental pattern throughout the lifespan in a race-dependent fashion. Further, this information may aid in the development of strategies to improve prevention, diagnosis and treatment of vascular disease by race group.


Funding: Yes

Funding Component: Greater Southeast Affiliate (Alabama, Florida, Georgia, Louisiana, Mississippi, Puerto Rico & Tennessee)

**P372**

Trajectories in Fasting Glucose and Insulin Resistance During Young Adulthood and Measures of Cardiac Function and Structure in Middle Adulthood: the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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**Introduction:** Whether trajectories in fasting glucose (FG) and insulin resistance (HOMA-IR)
during young adulthood, before the onset of diabetes, are associated with cardiac function and structure in middle adulthood is unclear. **Hypothesis:** We tested the hypothesis that as compared to low-stable trajectory of FG and HOMA-IR, an increasing trajectory for each would be associated with worse cardiac structure and function in middle adulthood.

**Methods:** We determined FG and HOMA-IR for 2,198 CARDIA participants, age 18-30 years, at baseline (1985-1986) and 7, 10, 15, 20, and 25 year follow-up exams who fasted for >8 hours and were not pregnant and were free from diabetes at all exams. At year 30 (2016), Doppler echocardiography and 2D-guided M-mode echocardiography was performed, measuring left atrial dimension, relative wall thickness, left ventricular (LV) mass, LV mass indexed to height, LV ejection fraction percentage, LV end-diastolic and systolic volume, and LV mass to volume ratio. Trajectories were determined using latent class analysis (SAS Proc Traj). We used multivariable linear regression to estimate adjusted means for echo measures according to FG and HOMA-IR trajectory group after adjustment for potential confounding factors.

**Results:** For individuals free from diabetes in midlife, we identified three trajectory groups for both FG and HOMA-IR, low-stable to increasing, moderate-increasing, and high-increasing. Compared to low-stable trajectory for FG, increasing trajectory was associated with greater LV end-diastolic volume, whereas for HOMA-IR increasing trajectory was associated with lower LV end-diastolic volume (Table). Increasing FG trajectory was also associated with greater left atrial dimension, while HOMA-IR was not.

**Conclusion:** Trajectory of both FG and HOMA-IR during young adulthood, in the absence of diabetes, was most prominently and differentially associated with LV end-diastolic volume. Future research should elaborate on differential associations of FG and HOMA-IR trajectory.


**Funding:** No

**Funding Component:**

**P373**

**Higher Plaque Volume but Not Density of Coronary Artery Calcium is Associated With Left Ventricular Mass**

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Coronary artery calcium (CAC) predicts future cardiovascular disease (CVD) events, including heart failure (HF), improves risk stratification beyond traditional CVD risk factors, and is associated with a higher left ventricular mass (LVM), a HF risk factor. Recent findings from the MESA have shown that for a given CAC volume, higher CAC density was inversely associated with incident CVD. It remains uncertain whether CAC volume and density associate differently with LVM. In a multi-ethnic cohort of community dwelling individuals free from clinical CVD at recruitment, we determined the independent cross-sectional associations of baseline CAC volume and density, measured by non-contrast cardiac CT, with LVM, measured by MRI.

In 2432 participants with prevalent CAC (density can only be assessed in those with CAC > 0), the mean age was 66 ± 10 years, 59% were men, 50% were European-, 22% were African-, 20%
were Hispanic, and 13% were Chinese-Americans. Median (25-75th) CAC volume was 78 (23-259) mm$^3$, mean CAC density was 2.7 ± 0.7, and mean LVM was 151 ± 41 grams. CAC density and natural log ($ln$) CAC volume were correlated (correlation coefficient=0.60, P-value < 0.01). Multivariable linear regression models investigated associations of $ln$(CAC volume) and CAC density with LVM. Model 1 adjusted for demographics (age, sex, and ethnicity) and body surface area. Model 2 included Model 1 plus CVD risk factors (smoking status, fasting glucose, total and HDL cholesterol, systolic blood pressure, and use of medications for hypertension, diabetes, and abnormal lipids). In fully adjusted models one log unit increase in CAC volume as associated with 1.7 gram increase in LVM (Beta = 1.7, 95% CI: 0.7 to 2.6, P < 0.01). In contrast, a unit increase in CAC density was associated with 1.9 gram decrease in LVM (Beta = -1.9, 95% CI: -3.9 to 0.1, P = 0.07).

Higher CAC volume, but not CAC density, was cross-sectionally associated with higher LVM; a risk factor for HF. Higher calcium density of coronary artery plaques may not be a hazard for ischemic heart disease mediated increase in LVM. Future studies should determine independent associations of CAC volume and density with incident HF.


Funding: No

Funding Component:

P374

Thyroid-stimulating Hormone Levels and Coronary Artery Calcium Score. The Brazilian Longitudinal Study of Adult Health (ELSA-Brasil)

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Introduction: There is scarce information about the association between thyroid stimulating hormone (TSH) levels with subclinical atherosclerosis as the coronary artery calcium score (CAC). Hypothesis: we assessed the hypothesis that the extremes quintiles of TSH were associated with high values of CAC.

Methods: We analyzed cross-sectionally baseline data of the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil), a cohort of civil servants aged 35-74 years-old, in 4549 participants with CAC information. We excluded individuals using medications that affect thyroid function, with overt thyroid disorders and who self-reported cardiovascular disease. We included in the analysis TSH levels of subjects with euthyroidism and with subclinical thyroid disorders (subclinical hypothyroidism and hyperthyroidism). Logistic regression models evaluated increasing quintiles of TSH as the independent variables and CAC greater than 100 Agatston units as the dependent variable. Multivariate models were adjusted for age (continuous), sex, race (white, mixed, black, Asian, indigenous), body-mass index (continuous), hypertension (yes/no), diabetes (yes/no), dyslipidemia(yes/no), smoking (never/former/current), glomerular filtration rate (continuous, CKD-Epi formula) and C-Reactive Protein (log transformed). Results: From 3,836 subjects included (median age = 49 years;52.1%, women), 3,551 (92.6%) had euthyroidism, 239 (6.2%) subclinical hypothyroidism, and 46 (1.2%) subclinical hyperthyroidism. Frequencies of women, whites, never smokers, overweight/obesity and of reduced glomerular filtration rate increased according to TSH quintiles, but the frequency of diabetes decreased. Quintiles of TSH were from 1st to 5th respectively: TSH:0-0.99; 1.00-1.38;
1.39-1.85 (reference); 1.86-2.67; and 2.68-35.5 mIU/L. Using the 3rd quintile as reference, the odds ratio OR (95% Confidence Interval) for CAC greater than 100 Agatston units were 1.57 (1.05-2.35) for the 1st; 0.95 (0.62-1.46) for the 2nd; 1.25 (0.81-1.87) for the 4th; and 1.18 (0.77-1.80) for the 5th quintiles. Restricting analysis to the 3,551 euthyroid participants, quintiles of TSH in normal range were from 1st to 5th respectively: 0.40-0.99; 1.00-1.35; 1.36-1.75 (reference); 1.76-2.43 and 2.44-4.0. Using 3rd quintile as reference, we also observed a significant association of the 1st quintile with CAC: 1.70 (1.11-2.59) but not with 2nd 0.95 (0.60-1.50), 4th 1.46 (0.95-1.70) or 5th 1.08 (0.69-1.70) quintiles. Conclusion: contrasting with previous studies that did not find any association between subclinical hypothyroidism and prevalent CAC, our results point to an association of low and low-normal TSH levels with prevalent CAC. Although one previous study showed an association between low-normal TSH levels and CAC, our results also extended this association to low TSH levels.


Funding: No

Funding Component:

P375

Coronary Artery Structural Remodeling by Computed Tomography and Cardiovascular Disease; the Coronary Artery Risk Development in Young Adults (CARDIA) Study

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Background: Glagov identified cross-sectional enlargement and maintenance of the lumen of the coronary artery (CA) in post-mortem studies as an early feature of atherosclerotic coronary heart disease (CHD) that precedes the development of stenosis, coronary artery calcium (CAC) and plaque rupture. This structural change in the CA wall has been termed positive remodeling. We hypothesized that larger CA cross-sectional areas, consistent with positively remodeled CA, is associated with prevalent or soon-to-be incident coronary heart disease (CHD) and cardiovascular disease (CVD) events. Methods: In 2946 black and white male and female CARDIA participants aged 42-56 years, who had thin-slice (<1 mm), ECG gated, non-contrast coronary CT in 2010-2011, we measured CA cross-sectional area (CSA) in the proximal epicardial CA at 24 pre-specified locations. The mean of all measurements was calculated to provide a summary of all CA (CA_CSA_all). We performed logistic regression with medical-record adjudicated CVD prevalence (n=96) or incidence in the following 3 years (n=27) as the outcome, predicted from this estimate of positive remodeling adjusting for age, race, sex, presence of coronary artery calcium (CAC), and amount of pericardial fat as covariates. Results: CA_CSA_all had a mean ± SD 21.2 ± 6.7 mm². The adjusted odds ratio (OR) for having any CVD was 1.06 (95% CI 1.03-1.09, p<0.0001) per mm²(Table). ORs for CVD increased across quartiles of CA_CSA_all. Corresponding OR for any coronary heart disease (n=66) was not significant, but was significant for stroke (n=42) and for heart failure (n=27). Further adjustment for traditional risk factors assessed in 2010-2011 did not alter these estimates substantially. Conclusion: Individuals with larger CA cross-sectional areas had increased odds of CVD, stroke, and heart
failure, but not CHD, independent of CAC and pericardial fat. $C_{\text{CSA,all}}$ may be an imaging biomarker of coronary positive remodeling and provide new insight into progression from subclinical to premature clinical CVD.


Funding: No

Funding Component:

P376

Risk Factors for the Progression and Incidence of Aortic Calcification in an International Multi-ethnic Cohort of Men Aged 40-49 Years: ERA JUMP Study

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Background Aortic calcification (AC) is independently related to cardiovascular (CV) disease mortality. No previous study has examined associations of risk factors with the progression of calcification in the entire aorta.

Methods 1033 men aged 40-49 years without overt CV diseases from the ERA-JUMP cohort were examined for AC, CV risk and other factors in 2002-07 with rigid standardization with a median follow-up of 5.9 years. AC was assessed by electron-beam CT and was quantified using the Agatston’s method. We defined annual AC progression as the absolute difference of Agatston score divided by follow-up time in years, which was further dichotomized at the 80th percentile: $\geq 100$/year vs. $< 100$/year. In participants free of detectable AC at baseline, AC incidence was calculated. Logistic regressions were performed to analyze the association of risk factors with both annual AC progression and AC incidence. AC progression was adjusted for baseline AC and AC incidence was adjusted for follow-up time. Results After excluding missing data (n=287) and extreme outliers (n=10), our sample included: 234 Caucasian, 53 African American, 207 Japanese American and 242 Japanese in Japan. AC was present in 55.3% (407 out of 736) at baseline. Baseline mean (SD) of age, pack-years of smoking, systolic blood pressure (SBP), BMI, LDL-C and AC Agatston score were 45.3 (2.9) years, 9.1 (14.0) pack-year, 124.5 (13.4) mmHg, 26.6 (4.6) Kg/m2, 129.7 (33.9) mg/dl and 103.0 (336.8), respectively. Overall analysis showed that baseline BMI, smoking, SBP and diabetes were significant or marginally significant determinants of AC progression (table 1). Incidence analysis showed that baseline smoking, SBP and LDL-C were significant or marginally significant determinants of AC incidence. Japanese in Japan displayed significantly lower incidence as well as progression. Conclusion Both AC progression and incidence were closely related to multiple traditional CV risk factors, most significant for pack-years of smoking and blood pressure.
Insulin Resistance is Associated With Carotid Intima-media Thickness in Non-diabetic Subjects: the ELSA-Brasil Cohort Baseline

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Background: Epidemiological studies have analyzed the association between carotid intima-media thickness (CIMT) and insulin resistance, glucose levels or glycated hemoglobin with mixed results. Objective: To evaluate the association between CIMT and homeostasis model assessment - insulin resistance (HOMA-IR), fasting and post-load plasma glucose and glycated hemoglobin in the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil) baseline. Methods: We included 8,028 participants (aged 35-74 years) without diabetes or overt cardiovascular disease who had complete CIMT data at baseline. We built crude and adjusted linear and binary logistic models to evaluate the association between CIMT and (a) HOMA-IR; (b) fasting plasma glucose; (c) post-load plasma glucose; and (d) glycated hemoglobin. We also built post-hoc models, stratified by sex. Results: In the fully-adjusted linear models, only the association between CIMT (in mm) and HOMA-IR remained significant (table). Consistent with these results, only the association between the highest age-sex- and race-specific CIMT quartile and HOMA-IR was significant in the adjusted model (odds ratio [OR]: 1.10; 95% CI: 1.04 - 1.17). The association between HOMA-IR and the highest CIMT quartile remained significant in sex-specific analyses (OR: 1.10; 95% CI: 1.02 - 1.20 for men and OR: 1.10; 95% CI: 1.02 - 1.20 for women). We did not find an independent association between CIMT and glucose or glycated hemoglobin levels. Conclusion: We found a direct, independent association between HOMA-IR and CIMT in a large sample of non-diabetic men and women. Mechanisms unrelated to glucose homeostasis, as a direct effect of insulin on atherosclerosis or medial hypertrophy, may be involved in this association.
presence and severity of subclinical atherosclerosis measured in the form of coronary artery calcium (CAC) at the El Camino Hospital South Asian Heart Center. We included 515 participants of South Asian origin with no prior history of cardiovascular disease aged 36 to 88 years who underwent CAC measurement. The 2010 Task Force of the American Heart Association (AHA) cutoffs were used to define ideal level of smoking, physical activity, diet, blood pressure, glucose, cholesterol levels, and body mass index (BMI). Participants were categorized according their number of IRFs: 0 to 1 (n = 45, 8.7%), 2 (n = 103, 20%), 3 (n = 144, 28%), 4 (n = 128, 24.9%), 5 (n = 70, 13.6%), and 6 to 7 (n = 25, 4.8%). Compared to individuals with 0 to 1 IRFs, the odds ratio of participants with 6 to 7 IRFs presenting with a CAC >0 was 0.16 (95% CI 0.04-0.69). Moving forward, participants were also categorized according to their number of ideal lifestyle factors (BMI, physical activity, smoking status, and healthy diet) and clinical factors (blood pressure, total cholesterol, and blood sugar). Compared to individuals with 0 ideal lifestyle factors, the odds ratio of participants with all 4 ideal lifestyle factors presenting with a CAC >0 was .12 (95% CI 0.03-.50). Amongst the individual ideal lifestyle factors though, only non-smoking status, 0.47 (95% CI 0.30-.75), and a BMI <23 kg/m^2, 0.60 (95% CI 0.38-.95), conferred a statistically significant protective effect from having a non-zero CAC score. In contrast, compared to those with 0 ideal clinical factors, the odds ratio of participants with all 3 ideal clinical factors presenting with a CAC >0 was .16 (95% CI .06-.44). That said, amongst the individual ideal clinical factors, normal BP produced the strongest protective effect from having a non-zero CAC score, 0.37 (95% CI 0.25-.57), followed by total cholesterol <200 mg/dL, 0.69 (95% CI 0.44-.90), and blood glucose <100 mg/dL, 0.69 (95% CI 0.47-.90). Disclosures: A. Mehta: None. Funding: No

Introduction Intrauterine and early life factors such as low birth weight, not being breastfed, smoking parents, and other socioeconomic conditions have been associated with later predisposition to chronic diseases. Although there still exists controversy in which is the best marker for environmental exposition during early lifetime, leg length has been one of the most accepted. Hypothesis There is an inverse relationship between leg length and subclinical cardiovascular disease (sCVD). Methods We conducted a cross-sectional analysis of a sub sample of 2,038 women from the Mexican Teacher’s Cohort. Participants underwent anthropometry during clinical assessments. Trunk length was calculated as the height measured in seated position minus the height of the stool participants were sitting on. Leg length was defined as height minus trunk length. Carotid intima media thickness(CIMT) was measured by trained neurologists through standardized ultrasound and log-transformed. We defined sCVD as CIMT ≥0.8 mm or the presence of plaque. We used multivariable linear and logistic regression models to estimate the association between leg length quartiles with CIMT and sCVD respectively. Results Mean height was 153.8 cm and mean
leg length was 72 cm. The prevalence of sCVD was 23% (469 of 2038). Participants with shorter legs were likely to report low birthweight, indigenous origin, rural residence, and low socioeconomic environment. We observed an inverse relationship between leg length and mean IMT when we compared the lowest (median 67 cm) to the highest quartile (median 77.1 cm) (multivariable-adjusted mean % difference = -2.93; 95% CI -5.53, -0.32). In contrast to the lowest quartile, the multiple-adjusted odds ratio for sCVD in the highest quartile was 0.58 (95% CI 0.34, 0.98).

Additional analysis controlling for mediators such as weight, diabetes, hypertension and hypercholesterolemia weakened the association but remained significant.

**Conclusion** We found a significant association between leg length, CIMT and sCVD in a population of middle-aged Mexican women.


Funding: No

Funding Component:

**P381**

**Vascular Inflammation as a Subclinical Marker of Atherosclerosis Demonstrates High Cardiometabolic Risk in a Resource-limited, Community-based Population**


**Background:** Vascular inflammation (VI) is associated with increased cardiovascular (CV) events among populations with inflammatory disease. Less is known about VI among populations in communities characterized by lower neighborhood-level socioeconomic status and limited resources for physical activity and dietary intake, particularly those identified as having CV risk factors through community-based (CB) efforts. Specifically, no comparisons exist of VI between CB cohorts and populations with known inflammatory disease associated with CV risk, such as psoriasis (PSO).

**Hypothesis:** We hypothesized that VI by 18-FDG PET/CT would be similar in a resource limited CB cohort compared to a matched mild/moderate PSO cohort.

**Methods:** In the Washington, DC CV Health and Needs Assessment, we evaluated CV risk factors among participants of a day-long, CB event in resource-limited Washington, DC areas (NCT01927783). Those having at least one CV risk factor (obesity, hypertension, hyperlipidemia, or diabetes) underwent 18-FDG PET/CT to measure VI for cardiometabolic phenotyping. Cardiometabolic markers were compared between the CB cohort and PSO cohort; VI between the cohorts was also compared using linear regression modeling.

**Results:** The CB cohort was African-American, middle-aged, and predominantly female, and the PSO cohort was half female and mostly Caucasian. Both cohorts were obese and prehypertensive with elevated lipid levels. There was no significant difference in VI between the CB cohort and the PSO cohort in both unadjusted (beta 0.25, p 0.15) and adjusted models including age, BMI, and race (beta 0.21, p 0.14). **Conclusion:** Populations with CV risk factors in resource-limited communities have comparable VI to those with known inflammatory PSO. These findings highlight a need for 1) CB efforts to identify individuals at high CV risk who might not otherwise be seen in a clinical setting and 2) targeted CB interventions to reduce CV risk for these populations. However, larger studies are needed to confirm our findings.
Introduction: Both acute and agent specific chronic infections have been associated with increased cardiovascular risk, however data on the burden of common recurrent infections and cardiovascular disease (CVD) is limited.

Hypothesis: Women with greater exposure to uncomplicated common infectious events have an increased risk of subclinical CVD (sCVD) compared to women with no events.

Methods: In a cross-sectional study we assessed the relationship of recurrent infections and carotid artery intima-media thickness (IMT) in 1,945 disease-free women from the Mexican Teachers’ Cohort. Through 2012-2016, participants answered questions on respiratory, urinary tract and vaginal infections during the previous year and IMT was measured using ultrasound by standardized neurologists and log-transformed. Total infectious episodes were categorized as “0”, “1 or 2” and “3 or more”. We defined sCVD as mean right and left IMT≥0.8mm or plaque. Multivariable linear and logistic regression analyses were used to evaluate the association of infectious events with IMT and sCVD adjusting for age, sociodemographic, and cardiovascular risk factors.

Results: Among participants (50 ±5 years of age) 14% (278 of 1945) reported no infections, 41% (800 of 1945) 1 or 2 infections, and 45% (867 of 1945) 3 or more. Overall prevalence of sCVD was 12% (242 of 1945). Adjusted models for logistic regression showed that women with 3 or more infections had 80% higher odds of subclinical CVD (95% CI 1.1, 2.9) compared to women without infections (p-trend: 0.019). Sub-analyses by type of infection were not significantly associated with sCVD (Image 1). Linear regression analysis did not show a significant association between mean IMT and recurrent infections.

Conclusion: Recurrent infectious events in women are associated with greater sCVD, which supports the hypothesis of low grade chronic inflammation in CVD.

Funding: No

Funding Component: