Effects of Intensive Blood Pressure Control in Adults With and Without Albuminuria: Results From the SPRINT Trial

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Background: Albuminuria is strongly associated with elevated risk of cardiovascular disease (CVD). While the Systolic Blood Pressure Intervention Trial (SPRINT) showed that intensive blood pressure (BP) lowering reduces CVD in high-risk non-diabetic adults, it is unclear whether this effect varies by albuminuria status.

Methods: SPRINT randomized non-diabetic adults with elevated blood pressure and increased CVD risk to a systolic BP (SBP) goal of <120 or <140 mmHg. Albuminuria (>=30 mg/g) was measured by albumin/creatinine ratio (ACR) at baseline. Outcomes examined included the primary composite CVD outcome (myocardial infarction, other acute coronary syndromes, stroke, heart failure, or death from CVD) and all-cause death.

Results: A total of 8913/9361 (95.2%) participants had baseline ACR data; 51.9%, 28.7%, and 19.4% had baseline ACR < 10, 10-29.9, and >=30 mg/g, respectively. The primary composite outcome occurred in 4.0%, 6.7%, and 11.2% of individuals with baseline ACR <10, 10-29.9, and >=30 mg/g, respectively. The primary composite outcomes occurred in 4.0%, 6.7%, and 11.2% of individuals with baseline ACR <10, 10-29.9, and >=30 mg/g, respectively. The effect of intensive BP lowering on the primary outcome was similar in patients with albuminuria (HR 0.74, 95% CI: 0.55-0.99) and without albuminuria (HR 0.73, 95% CI: 0.59-0.91; p for interaction = 0.77). Intensive BP lowering reduced risk of stroke in patients with albuminuria (HR 0.45, 95% CI: 0.24-0.85) but not patients without albuminuria (1.13, 95% CI: 0.73-1.74; p for interaction = 0.03). Absolute risk reduction was particularly high in those with albuminuria, with a number needed to treat (NNT) of 32 to prevent 1 primary outcome and a NNT of 37 to prevent 1 death from any cause at 3 years of follow-up. By comparison, the NNT to prevent 1 primary outcome was 72 for ACR < 30 mg/g at 3 years of follow-up.

Conclusions: The effect of Intensive BP lowering reduces CVD risk similarly in non-diabetic adults with and without albuminuria. Given the high CVD risk in patients with albuminuria, this high-risk population may particularly benefit from efforts to intensify BP control.

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Circulating Levels of Natural Killer Cells and Monocyte Subsets Are Associated With Higher Systolic Blood Pressure: The Multi-Ethnic Study of Atherosclerosis

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Introduction: Hypertension is a multifactorial process. Activation of the innate immune...
system and subsequent upregulation of adaptive immunity have been shown to promote hypertension in various mouse models. Large scale human population studies examining the composition of the innate and adaptive immune system as it pertains to hypertension are lacking.

Hypothesis: The composition of innate and adaptive immune cells are risk factors for increased systolic blood pressure (SBP).

Methods: Using cells cryopreserved from the baseline exam, we measured 34 immune cell subsets from participants of the Multi-Ethnic Study of Atherosclerosis (MESA) (mean age 64 years, 53% male), sampled from a case-cohort study of myocardial infarction (n=1,200). SBP was assessed at baseline and at four follow-up exams over the succeeding ten years. Our approach to anti-hypertensive medication use was to add 10mmHG to SBP for treated participants. Associations between immune cell subpopulations and SBP were conducted using linear mixed models, with sampling weights to account for the sampling strategy and robust confidence intervals; immune cells were modeled per standard (SD) deviation higher value. We adjusted for age, sex, race/ethnicity, smoking, exercise, body mass index, education, diabetes, and log-transformed cytomegalovirus levels.

Results: After adjustment for potential confounders, 5 of 34 immune cells subsets were significantly associated with mean levels of SBP. For each standard deviation increment higher immune cell proportion, natural killer (NK) cells, defined as CD3-CD56+CD16+, (1.9 mmHG; 95% CI: 0.8-2.9), classic monocytes, defined as CD14++CD16-, (-1.3 mmHG; 95% CI: -2.5 to -0.1) and non-classic monocytes, defined as CD14+CD16++, (1.4 mmHG; 95% CI: 0.3 to 2.6) had the strongest associations with SBP changes over 10-years of follow-up. Sensitivity analyses with principal components analysis were supportive of these findings. After using a Bonferroni corrected threshold to account for multiple testing only NK remained significant.

Conclusions: NK cells, classic monocytes and non-classic monocytes, all components of the innate immune system, were associated with higher levels of SBP over follow-up. The strongest association was with natural killer cells; in agreement with previous studies that showed circulating levels of interferon gamma and tumor necrosis factor alpha, the two main cytokines produced by NK cells, correlate with systolic blood pressure.

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Funding Component:

003

**Growth Trajectories of Body Mass Index During Childhood and Adult Hypertension**

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**Background** Childhood body mass index (BMI) predicts adult hypertension. However, information is lacking regarding the relationship between BMI growth trajectories during childhood and adult hypertension risk. We aimed to test the hypothesis that BMI growth rates at different childhood ages have differential influences on adult hypertension risk, independent of BMI levels. **Methods** The study included 1,772 Whites and 960 Blacks with repeated BMI and blood pressure measurements from childhood (4-19 years) to
adulthood (20-51 years). A random-effects mixed model was used to construct BMI growth curves by race and sex. Model-estimated linear growth rates of BMI at different childhood ages were linked to adult hypertension (defined by measured blood pressure or antihypertensive medication) in multivariable logistic regression models. **Results** Hypertensive adults had higher BMI across childhood than normotensive adults. Overall, linear slope and cubic parameters of BMI were higher in hypertensive adults than in normotensive adults in all four race-sex groups (p ≤ 0.023). Odds ratio of adult hypertension for each kg/m²/year increase in BMI linear slope was 1.22 (95% CI =1.11-1.34) at age 4, was non-significant between ages 5-9, and gradually increased thereafter and plateaued beginning at age 15 (odds ratio = 1.41 and 95% CI = 1.28-1.56) (Figure). **Conclusions** Rapid increase in BMI during and after puberty is associated with elevated risk of hypertension in adult life, which has implications for early prevention.

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004

**The Cost-Effectiveness of Blood Pressure Control in Young Adulthood to Prevent Later Life Coronary Heart Disease: A Computer Simulation Study**


**Introduction**

Prehypertension defined as blood pressure (BP) 120-139/80-89 mmHg, has a prevalence of 23% in U.S. young adults (age 20-39 years). Young adult high diastolic blood pressure (DBP) has been associated with later life coronary heart disease (CHD), but it is unclear if lifelong benefits of early blood pressure control outweigh costs and side-effect risks.

**Objective**

We estimated CHD events and life-long cost-effectiveness of U.S. Preventive Service Task Force recommended lifestyle modification (LM) or pharmacotherapy in young adults with DBP ≥80mmHg, incremental to later life hypertension treatment.

**Methods**

A microsimulation model simulated CHD events from age 20 until death for 20-year olds selected from 1999-2014 NHANES. Individual risk factor trajectories were assigned, and risk functions predicted CHD based on Framingham Offspring Study data, accounting for both age 20-39 time-weighted average DBP and later life systolic blood pressure (SBP). Simulated interventions lowered DBP ≥80mmHg for age 20-39 years, and SBP ≥140mmHg for age ≥40 years. Cost-effectiveness was measured as incremental cost-effectiveness ratios (ICERs) and net health benefit (NHB) at willingness to pay (WTP) threshold $50,000/quality adjusted life year (QALY).

**Results**

In 40,000 young adults with DBP ≥80 mmHg (50% women), pharmacologic BP control in young adulthood and later life prevented the most CHD events (Table). The strategy that yielded highest NHB in women was pharmacologic control after age 40 (ICER $26,536/QALY). In men, lifestyle modification to control DBP in young adulthood plus
pharmacotherapy for later life hypertension (ICER $42,481/QALY) yielded highest NHB.

**Conclusion**

Early DBP control in young adults could achieve substantial health benefits over the life course but standard interventions to achieve this goal are costly. Innovative strategies to reduce pharmacotherapy costs and improve sustainability of lifestyle modification could make early BP control a higher-value prevention strategy in young adults.


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005

**Cumulative Stress Exposure is Associated With Incident Hypertension in African Americans: Findings From the Jackson Heart Study**

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**Introduction and Hypothesis:** Chronic stress has been associated with incident hypertension but evidence is mixed, particularly in African Americans. We tested the hypothesis that higher cumulative exposure to stress would be associated with increased risk of developing hypertension in the Jackson Heart Study (JHS), a prospective study of cardiovascular disease in African Americans.  **Methods:** Analyses included 1,442 JHS participants free of hypertension at baseline (2000-2004) who completed at least 3 annual follow-up telephone interviews. Incident hypertension was defined as systolic blood pressure (SBP) ≥140 mm Hg or diastolic BP (DBP) ≥90 mm Hg or use of antihypertensive medications at Exam 2 (2005-2008) or Exam 3 (2009-2013). A single-item measure of stress (“How much stress have you experienced over the past year?”) was completed during annual interviews, and the percentage of assessments in each measurement interval (i.e., between Exams 1 and 2, between Exams 2 and 3) in which high stress was reported was categorized as No Chronic Stress (0%), Low Chronic Stress (1-33.3%) or High Chronic Stress (>33.3%). Chronic stress exposure in each interval was used to predict incident hypertension at the following exam among participants free of hypertension at the start of the interval using repeated measures Poisson regression models with progressive adjustment for age, sex, years between exams and other relevant risk factors (education, marital status, parental history of hypertension, baseline SBP and DBP, body mass index, diabetes, chronic kidney disease).

**Results:** The 1,442 participants in this analysis contributed data to 1,987 measurement intervals. The mean age was 49±0.26 years and 41% were male. During follow-up (median, 8 years), 44.0% of participants developed hypertension. The percentage of intervals with No, Low and High chronic stress was 62.3%, 9.2% and 28.6%, respectively. Multivariable-adjusted risk ratios (95% confidence interval) for incident hypertension associated with Low (vs. No) and High (vs. No) chronic stress were 1.11 (0.90-1.37) and 1.21 (1.06-1.38), respectively ($P_{\text{trend}}=0.005$). This association remained statistically significant after further adjustment for baseline stress ($P_{\text{trend}}=0.014$) and potential behavioral mediators (smoking,
alcohol use, physical activity, diet; \( P \) trend=0.03). In stratified analyses, the association was present in women (\( P \) trend=0.002), younger participants (<50 years old; \( P \) trend=0.007) and those with normal BP at baseline (\( P \) trend=0.001). **Conclusion:** We found that African Americans reporting higher chronic stress over time are at increased risk of developing hypertension, independent of baseline stress levels and cardiovascular and behavioral risk factors. Future studies should evaluate the use of stress management interventions to support primary prevention of hypertension in this high risk population.


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**006**

**Role of Providers in Implementation of Blood Pressure Control Strategies in Patients with Hypertension**

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**Introduction:** Globally, only 13.8% of hypertensive patients have their blood pressure (BP) controlled. Trials testing implementation strategies to overcome barriers to BP control have produced mixed results. Providers who deliver the intervention may play an important role in implementation strategy success. This meta-analysis aimed to determine which provider-led interventions are most effective for BP reduction. **Methods:** We searched Medline and Embase (through September 2017) for randomized controlled trials of various provider-led implementation strategies targeting barriers to hypertension control in hypertensive patients. Seventy-four trials with 22,180 hypertensive participants met our eligibility criteria and were included in this analysis. These trials were grouped by intervention provider, and the effects of the intervention on BP change were combined using random effects models. **Results:** Pharmacist-led health coaching and team-based care had the greatest reduction in systolic and diastolic BP. Nurse- and community health worker-led interventions also resulted in significant reductions in BP. Interventions led by multiple providers were less effective for BP reduction. Research staff-led interventions were also effective at reducing BP but questions of sustainability persist. **Conclusions:** Pharmacists are most effective for the delivery of implementation strategies for BP control among patients with hypertension. Nurse- and community health worker-led interventions were also effective for BP reduction. Pharmacist-, nurse- and community health worker-led interventions should be prioritized in future BP control efforts.


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**007**

**Comparative Effectiveness of Blood Pressure Lowering Drugs in Reducing Cardiovascular Events: Results From a Network Meta-Analysis**

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Introduction: Blood pressure lowering drugs help prevent cardiovascular events though less is known about the comparative effectiveness of different drug classes. We aimed to compare the effect of different blood pressure lowering drugs classes on cardiovascular risk. Hypothesis: We hypothesized that the cardiovascular preventive effects of blood pressure lowering drugs would vary among different types of drug classes. Methods: PubMed, EMBASE, and Cochrane Library databases were searched for articles published between January 1, 1990 and June 30, 2014. Study eligibility criteria included randomized controlled trials testing blood pressure-lowering drugs, including angiotensin-converting-enzyme inhibitors, angiotensin receptor blockers, calcium-channel blockers, beta-blockers, and thiazide diuretics that reported cardiovascular outcomes (cardiovascular death, myocardial infarction, stroke, coronary revascularization and composite cardiovascular events) with at least 6 months of follow-up. Data from studies that met inclusion criteria were independently extracted by two reviewers using a standardized extraction form. For each outcome, a Frequentist, random effects network meta-analysis model was used to compare risk reductions between drug classes. The relative ranking probability of each blood pressure lowering drug class being the most effective was estimated using rankogram curves, surface under the cumulative ranking curves, and mean ranks. Results: A total of 102 trials that included 415,047 participants (mean age 65.1 years, 60.0% male) met inclusion criteria. Compared to placebo, blood pressure lowering drugs reduced the risk of composite cardiovascular events by 11-18% in aggregate. Calcium channel blockers were the most effective in reducing composite cardiovascular events risk (RR=0.82, 95% CI: 0.77, 0.88), stroke (RR=0.68, 95% CI: 0.61, 0.75) and revascularization (RR=0.84, 95% CI: 0.77, 0.92); angiotensin-converting-enzyme inhibitors were the most effective in reducing cardiovascular death (RR=0.85, 95% CI: 0.80, 0.91) and myocardial infarction (RR=0.83, 95% CI: 0.77, 0.91). Effects of drugs were influenced by blood pressure, where each 10mmHg reduction in systolic and diastolic blood pressure, regardless of drug class, was associated with a 2.5% (95% CI: -3.8, -1.2) and 5.4% (95% CI: -8.0, -2.4) lower risk of composite cardiovascular events, respectively. Conclusion: Angiotensin-converting-enzyme inhibitors had an advantage over other blood pressure lowering drugs in preventing myocardial infarction and cardiovascular death, while calcium channel blockers were more effective in preventing overall cardiovascular events, stroke and revascularization. Future studies should compare the effectiveness of combination of drug classes in reducing cardiovascular events.


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008

Casual and 24-hour Urinary Sodium-to-potassium Ratio and Intakes of Sodium and Potassium Among Men and Women From Multi-ethnic General Populations: The Intersalt Study

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Background Urinary sodium-to-potassium ratio may be more strongly related to blood pressure and cardiovascular disease than either urinary sodium or potassium alone. The casual urine sodium-to-potassium ratio is readily obtained,
can provide prompt on-site feedback, and with repeated measurements may provide useful individual estimates of 24-hour urinary sodium-to-potassium ratio. The World Health Organization (WHO) has recently published guidelines for sodium and potassium intakes, but no generally accepted guideline prevails for favorable sodium-to-potassium ratio. **Objective** Our primary aim was to compare the level of urinary Na/K ratio with the current recommended levels of Na and K intakes suggested in WHO guidelines. **Methods** INTERSALT is an international study on associations of multiple urinary variables, with blood pressure (BP), based on standardized data on 24-hour and casual urinary electrolyte excretion in 10,065 individuals from 52 population samples in 32 countries. The associations between casual urinary sodium-to-potassium ratio and 24-hour urinary sodium and potassium excretion of individuals were assessed by correlation and stratification analysis. **Results** Mean 24-hour sodium and potassium excretions were 156.0 mmol/24h and 55.2 mmol/24h; mean 24-hour urinary sodium-to-potassium ratio was 3.24. Pearson-r correlation coefficients of casual urinary sodium-to-potassium ratio with 24-hour sodium and potassium excretions were 0.42 and -0.34, respectively, and these were 0.57 and -0.48 for 24-hour urinary sodium-to-potassium ratio. The proportion of participants with estimated sodium chloride intake below the WHO recommended guideline of 85 mmol/day was 61.1% for those with casual urinary sodium-to-potassium ratio less than 1, and 96.3% where the 24-hour ratio was less than 1. For potassium, the proportion of people with potassium intake more than the WHO recommended guideline of 90 mmol/day was 21.3% where the casual urinary sodium-to-potassium ratio was less than 1 and 28.6% for the 24-hour urinary sodium-to-potassium ratio. **Conclusions** Casual urinary sodium-to-potassium ratio less than 1 may be a useful indicator of adherence to the World Health Organization recommended levels of sodium intake, and to a lesser extent potassium intake in diverse different populations.


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009

**Incidence of Hypertension among Diverse US Hispanics/Latinos: Findings from the Hispanic Community Health Study/Study of Latinos**

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Introduction: Hypertension (HTN) is a major contributor to cardiovascular disease, the leading cause of death in the US. Yet, among diverse US Hispanics/Latinos, one of the fastest growing ethnic minority populations in the US, incident rates of HTN are currently unknown. **Objectives** To determine rates of incident HTN over six years among diverse US Hispanics/Latinos and evaluate whether rates differed by Hispanic/Latino background. **Methods** The Hispanic Community Health Study/Study of Latinos is an ongoing prospective population-based study of 16,415 diverse Hispanics/Latinos, ages 18-74 years, from four US communities sampled through a stratified multi-stage area probability design.
Baseline examination was conducted in 2008-2011. Systolic and diastolic blood pressure (BP), as the average of three seated measurements, was measured at baseline and at an ongoing second visit (2014-2017). At each visit, HTN was defined as systolic BP ≥ 140 mmHg, diastolic BP ≥ 90 mmHg, or use of anti HTN medication. This analysis includes 7,258 adults who were free of HTN at baseline and attended the second study visit by August, 2nd, 2017. Age adjusted, sex stratified, HTN incidence rates (IR) were calculated in person-years (PY) by Hispanic/Latino background. All analyses were weighted by nonresponse adjusted, trimmed, and calibrated sampling weights and took into account the complex survey design.

Results: At baseline, age distributions were similar for men and women with: 40% age 18-34, 38% age 35-49, and 22% age 50 - 74; mean follow-up time was 5.7 years. Among 2,694 men, a total of 539 developed HTN for an overall age-adjusted IR of 25.7/1,000PY (95% CI: 22.8, 28.9). Among men, compared with Mexican background (IR: 20.5, 95% CI: 16.6, 25.2), the age adjusted IR of HTN per 1,000 PY was higher among Hispanics/Latinos of Dominican (IR: 39.2, 95% CI: 28.4, 54.0; p<0.01) and Cuban (IR: 30.6, 95% CI: 25.2, 37.2; p<0.01) background, but comparable among Central American (IR: 19.7, 95% CI: 14.1, 27.6; p=0.86), Puerto Rican (IR: 28.3, 95% CI: 20.5, 39.0; p=0.09), and South American (IR: 18.8, 95% CI: 11.5, 30.7; p=0.75) background. Among 4,564 women, a total of 855 developed HTN for an overall age-adjusted IR of 25.6/1,000PY (95% CI: 23.1, 28.3). Among women, compared with Mexican background (IR: 20.1, 95% CI: 17.0, 23.8), the age adjusted IR of HTN per 1,000 PY was higher among Hispanic/Latinos of Dominican (IR: 32.7, 95% CI: 24.3, 44.1; p<0.01), Cuban (IR: 26.8, 95% CI: 21.3, 33.6; p<0.05), and Puerto Rican (IR: 35.1, 95% CI: 27.4, 45.1; p<0.01) background, and comparable among Central American (IR: 23.2, 95% CI: 18.4, 29.3; p=0.31) and South American (IR: 24.3, 95% CI: 18.5, 31.8; p=0.24) background.

Conclusions: Among a large sample of US Hispanics/Latinos free of HTN, age adjusted IRs of hypertension differed substantially by Hispanic/Latino background, being highest among those of Caribbean background.


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010

Prevention of Chronic Kidney Disease: Impact of Addressing the Blood Pressure Distribution, Not Just the Tail

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Background: While much of the chronic kidney disease (CKD) literature focuses on the role of blood pressure reduction in delaying CKD progression, little is known about the benefits of modest population-wide decrements in blood pressure on incident CKD.

Methods: We used multivariable linear regression to estimate incidence rate differences comparing the impact of 2 pragmatic hypothetical interventions to reduce the incidence of CKD: (1) a population-wide intervention that reduced systolic blood pressure by 1 mmHg and (2) targeted interventions that reduced the prevalence of unaware, untreated, or uncontrolled blood pressure above goal (as defined by Joint National Committee (JNC) 7 and JNC 8 thresholds) by 10%. The population comprised 15,390 participants of the Atherosclerosis Risk in Communities Study (45-64 years of age at baseline, 1987-1989). Incident CKD was...
ascertained from laboratory assays and abstraction of medical records.

**Results:** Over a mean of 20 years of follow up, 3,852 incident CKD events were ascertained. After adjustment for antihypertensive use, gender, diabetes, and age a 1 mmHg decrement in SBP across the total population was associated with an estimated 11.7 and 13.4 fewer incident CKD events per 100,000 person-years (PY) in African Americans and white Americans, respectively. Among participants with blood pressure above JNC 7 goal, a 10% decrease in unaware, untreated, or uncontrolled blood pressure was associated with 3.2, 2.8 and 5.8 fewer incident CKD events per 100,000 PY in African Americans and 3.1, 0.7, and 1.0 fewer incident CKD per 100,000 PY in white Americans. Interventions targeted to the population with blood pressure above JNC 7 goal produced greater reductions in incident CKD than interventions targeted at reductions in blood pressure above JNC 8 treatment goal. Extrapolation to the US African American and white American populations age greater than 45 years (NHANES 2010) suggests that a 1 mmHg decrement in SBP could result in approximately 9,996 fewer incident CKD events annually compared to approximately 2,098, 636, and 1,598 fewer incident CKD events potentially preventable from 10% decreases in unaware, untreated, and uncontrolled blood pressure above goal.

**Conclusions:** Modest blood pressure interventions population-wide provide an opportunity to substantially reduce the burden of incident CKD. Among the high-risk population, lowering the threshold for blood pressure treatment to JNC 7’s treatment goal could increase the impact of high-risk strategies on CKD prevention when compared to JNC 8’s treatment goal.

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with dementia risk and with etiologic subtype, respectively.

**Results:** During a mean 16 years of follow-up, 1259 (10%) participants developed dementia. Moderate or severe (vs. no) retinopathy (hazard ratio [HR], 1.86; 95% CI: 1.36, 2.55) and generalized arteriolar narrowing, measured as the central retinal arteriolar equivalent (CRAE, narrowest quartile vs. widest three quartiles), (HR, 1.26; 95% CI: 1.09, 1.45) were associated with all-cause dementia. Results did not differ by diabetes, race or APOE ε4 genotype. Retinopathy was associated with cerebrovascular-related dementia and MCI (odds ratio, 2.66; 95% CI: 1.30, 5.42).

**Conclusions:** Retinal photography captures small vascular signs in the eye that are related to increased dementia risk. Emerging techniques, such as optical coherence tomography angiography, may have the sensitivity to provide surrogate indices of microvascular lesions relevant to dementia in older adults.


**Funding:** No

**Funding Component:**

012

**Capture-Recapture Using Multiple Data Sources: Estimating the Prevalence of Congenital Heart Disease**

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**Introduction:** Improvements in the treatment of congenital heart disease (CHD) have resulted in the majority of infants born with CHD surviving into adulthood; completely modifying the epidemiologic profile of patients with CHD. Although the prevalence of CHD at birth has been robustly estimated, the prevalence of CHD in adolescents and adults in the U.S. is uncertain due to a lack of systematically collected population-based data. The unique disjointed healthcare system in the U.S. makes population-based surveillance of conditions like CHD difficult. **Hypothesis:** Use of capture-recapture methodology in a state-wide CHD surveillance system will result in a higher estimated prevalence of CHD in adolescents and adults by adjusting for incomplete case ascertainment. **Methods:** Adolescents and adults age 11 to 64 years with a CHD lesion listed as a diagnostic code on an encounter occurring between January 1, 2011 to December 31, 2013 were captured by the Colorado CHD surveillance system. Five primary data sources, representing electronic medical records (EMR) from participating healthcare systems and claims data from the All Payer Claims database, were used for case ascertainment. These sources provide inpatient, outpatient and emergency care across the state of Colorado. Once CHD cases were identified in one of the above data sources, a probabilistic record linkage algorithm was used for de-duplication of cases within and across data sources. Crude prevalence estimates were generated and then capture-recapture methods were employed to estimate the number of adolescents and adults with CHD in Colorado that were not captured in the surveillance system. Data were analyzed using a log-linear model incorporating severity of CHD as a variable of potential heterogeneous catchability. **Results:** The five primary data sources identified 24,907 CHD cases that met our case definition corresponding to 19,849 unique individuals during our 3-year
surveillance period. The observed overall crude prevalence rate of CHD in adolescents and adults was 5.19 per 1000 population (95% CI 5.07 - 5.31 per 1000 population). Using capture-recapture methodology, the estimated prevalence of CHD in adolescents and adults corrected for incomplete case ascertainment was 5.68 per 1000 population (95% CI 5.59 - 5.77 per 1000 population), so an estimated 3,641 CHD cases were not identified in the five primary case finding data sources. **Conclusion:**

Our study provides novel insight into strategies for EMR-based surveillance at the population-level by demonstrating the utility of capture-recapture methodology to estimate, and then correct for, cases missed in standard surveillance techniques.

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013

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**A Model for Stroke Prediction Using Claims Data in a Contemporary Cohort of Patients With Atrial Fibrillation Receiving Oral Anticoagulation**

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**Background:** Oral anticoagulants (OACs) are recommended for AF patients for the prevention of thromboembolic events, including stroke. Stroke risk stratification scores (e.g., CHA2DS2-VASc) are used to tailor therapeutic recommendations for patients in different risk groups. However, these were derived before the advent of direct OACs. At present, there is no tool that estimates a patient’s stroke risk, given their individual characteristics, by type of OAC.

**Methods:** We used healthcare utilization data from two independent US databases (MarketScan and Optum) to construct and validate a predictive model of ischemic stroke in patients with AF initiating OACs. Patients with non-valvular AF initiating OACs were identified from the MarketScan data for years 2007-2015. Using bootstrapping methods and backward selection of 44 candidate variables, we developed a model which selected variables predicting stroke. The final model was validated in patients with non-valvular AF in the Optum Clinformatics database in the period 2009-2015.

**Results:** Among 135,523 patients with AF initiating OAC in the MarketScan dataset, 2,028 experienced an ischemic stroke after anticoagulant initiation. The stepwise model identified 15 variables (including type of OAC) associated with ischemic stroke (Table). The discrimination (c-statistic) of the model was adequate [0.68, 95% confidence interval (CI) 0.66-0.70], showing excellent calibration ($\chi^2= 7.7$ p=0.57). The model was then applied to the 84,549 AF patients in the Optum data set (1408 stroke events). The model showed similar discrimination (c-statistic 0.67, 95%CI 0.65-0.70) and calibration ($\chi^2= 12.8$ p=0.17). However, previously-developed predicted models had similar discriminative ability (CHA2DS2-VASc 0.67, 95%CI 0.65-0.68; ATRIA 0.67, 95%CI 0.65-0.68)

**Conclusion:** A novel model using extensive administrative healthcare data for the identification of patients at higher risk of ischemic stroke by type of anticoagulant did not perform better than established simple models.
Comparative Cost-Effectiveness of 10-Year Atherosclerotic Cardiovascular Disease Risk Equations Over 10 Years of Follow-up: The Multi-Ethnic Study of Atherosclerosis

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Introduction: Uncertainty remains regarding the most efficient and cost-effective 10-year atherosclerotic cardiovascular disease (ASCVD) risk prediction tool for identifying moderate to high-risk patients for primary prevention statin treatment. Methods: We utilized the CVD Policy Model, a computer microsimulation model of ASCVD incidence, prevalence, mortality, and costs, to compare cost-effectiveness of statin treatment at varying 10-year predicted ASCVD risk thresholds for Framingham CVD (FRS-CVD), Reynolds Risk Score (RRS), and Pooled Cohorts Risk Equations over a 10-year time horizon in the Multi-Ethnic Study of Atherosclerosis (MESA) cohort. Cost effectiveness was assessed at predicted 10-year risk ≥ 20.0%, 15.0%, 10.0%, 7.5%, 5.0%, and 2.5%. We restricted the simulation cohort to participants aged 50 to 74 years who were not taking statins at baseline (n = 2,871). Moderate intensity statin treatment effectiveness was parameterized in the model as a 29% low-density lipoprotein cholesterol reduction. Total cost comprised statins ($100/year), side effect costs, and ASCVD event costs. Disability from treatment side effects and ASCVD events were included. Results: Average FRS-CVD, RRS, and Pooled Cohorts 10-year predicted ASCVD risks were 18.8%, 11.3%, 12.2%, for men and 8.9%, 4.3%, 6.6%, for women, respectively. At the same predicted risk, FRS-CVD consistently selected the most patients for treatment, and RRS the fewest (Figure). Compared with no treatment, treating patients with RRS ≥ 20% was cost saving in men. Subsequent risk threshold strategies with incremental cost effectiveness <$75,000/quality-adjusted life-year (QALY) for men were: FRS-CVD ≥ 20% ($13,046), RRS ≥ 7.5% ($17,774), and RRS ≥ 5.0% ($19,891). For women, the non-dominated thresholds were: Pooled Cohorts ≥ 15% ($27,908) and Pooled Cohorts ≥ 7.5% ($72,377). Conclusions: At cost-effectiveness thresholds less than $75,000/QALY, RRS was the highest value tool for men while the Pooled Cohorts Risk Equations performed best for women.
Critical Periods in Cardiovascular Health Across the Life Course: A Pooled Cohort Analysis

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Background: The prevalence of Ideal Cardiovascular Health (CVH) decreases with age, beginning in childhood. However, more precise estimates of trajectories of CVH across the lifespan are needed to guide intervention. The aims of this analysis are to describe trajectories in CVH from childhood through middle age and examine whether there are critical inflection points in the decline in CVH.

Methods: We pooled data from five prospective childhood/early adulthood cohorts including Bogalusa, Young Finns, HBI, CARDIA, and STRIP. Clinical CVH factors—blood pressure, BMI, cholesterol, glucose—were categorized as poor, intermediate and ideal then summed to create a clinical CVH score, ranging from 0 to 8 (higher score = more ideal CVH). The association between clinical CVH score and age in years was modeled using a segmented linear mixed model, with a random participant intercept, fixed slopes, and fixed change points. Change points were estimated using an extension of the R package 'segmented' which utilizes a likelihood based approach to iteratively determine one or more change points. All models were adjusted for race, gender and cohort.

Results: This study included 18,290 participants (51% female, 67% White, 46% between the ages of 8-11 at baseline). CVH scores decline with age from 8 through 55 years. We found two ages at which the slope of the CVH trajectories change significantly. CVH scores are generally stable from age 8 until the first change point at age 17 (95% CI 16.3-17.4), when they begin to decline more rapidly with a 0.08 CVH unit loss per year from age 17 to 30. The second change point occurs at age 30 (26.7-33.6) when the rate of decline increases by an additional 0.01 units per year.

Conclusion: The clinical CVH score declines from favorable levels from childhood through adulthood, with a rapid decline starting at age 17 that becomes slightly steeper from age 30 to 55 years. These inflection points signal that there are critical periods in an individual’s clinical CVH trajectory during which prevention efforts may be targeted.

Muscular Strength Predicts All-Cause Mortality Independent of MVPA in Women Ages 63-99 Years

Background: While some studies report muscle strength is associated with mortality, independent of aerobic physical activity (PA), in older people, there are less data in women and lack of studies adjusting the association for objective measures of PA and physical performance. We prospectively examined this association in 5,061 multiethnic (White, 48.2%; Black, 34.0%; Hispanic, 17.9%) women ages 63-99 (mean 78.3) with complete information for analysis in the Objective Physical Activity and Cardiovascular Health Study. Methods: Quartile categories of dominant hand grip strength (<14, 14-18, 18.1-22.5, >22.5 kg) and EPESE categories of time to complete five consecutive unassisted chair stands (>16.6, 16.6-13.7, 13.6-11.2, <11.2 sec) were the muscle strength exposure measures. Primary covariables included age, race-ethnicity, current smoking, BMI, and number of comorbidities. Accelerometer measured moderate-to-vigorous PA (MVPA) and total sedentary time, and gait speed during a self-paced 8 meter walk test were further assessed as confounding factors. Cox regression was used to estimate hazard ratios (HR) and 95% confidence intervals (CI).

Results: There were 306 (5.5%) all-cause deaths during a mean 3.3 year follow-up. Adjusting for primary covariables, significant inverse trends in mortality were observed across categories of grip strength, HR (95% CI) = 1.00 (ref), 0.70 (0.53, 0.93), 0.77 (0.56, 1.05), 0.59 (0.41, 0.87), trend p = .007, and chair stands, 1.00, 0.82 (0.62, 1.09), 0.76 (0.55, 1.04), 0.53 (0.36, 0.77), trend p <.001. Further adjustment for MVPA attenuated these associations which remained statistically significant, 1.00, 0.72, 0.81, 0.66, trend p = .032, and 1.00, 0.91, 0.88, 0.65, trend p = .033, respectively. Similarly, adding sedentary time or gait speed to the primary covariables did not eliminate significance of the inverse mortality trends with either muscle strength measure. Adjusting for primary covariables, each 1-standard deviation (6.2 sec) faster chair stand time was associated with 12% lower mortality risk (p = .004), which was attenuated to 8% risk reduction (p = .04) when further controlling for MVPA. Adjusting for primary covariables and MVPA, each 1-standard deviation (6.8 kg) increment in grip strength was associated with 13% lower mortality risk (p = .04), and this inverse association was generally consistent across subgroups defined by age (interaction p = .78), race-ethnicity (p = .19), and BMI (p = .88). Controlling for gait speed opposed to MVPA resulted in consistent findings. Conclusions: Higher muscular strength is associated with lower mortality in older women, independent of device-measured MVPA and sedentary time, and measured gait speed, an indicator of aerobic fitness. If results are confirmed, in addition to guideline recommendations regarding aerobic PA, promoting skeletal muscle strength is an important component of aging well.
Friends Make Children Less Sedentary but Neighborhoods Make Them More Active

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Background and Purpose: Sedentary behavior (SB) and physical inactivity are distinct constructs for which separate research and intervention paradigms may be warranted. To this end, we compared individual- and neighborhood-level risk factors of each among youth at risk of obesity. Methods: Data are from QUALITY, a cohort study of the natural history of obesity in Quebec, Canada. Baseline data were obtained in 2005-2008 when children were aged 8-10y (n=512 families). Activity level was measured using accelerometers at age 8-10y and again 2 years later at age 10-12y. At each time point, children were categorized as inactive if they did <60 min/day of moderate to vigorous physical activity (PA) and as excessively sedentary if they recorded <100 counts/min for >50% of the day. Children were required to have worn the device for at least 4 days and for at least 10 hours/day. Child-level factors included sex, sleep duration, and weekly frequency seeing friends; neighborhood-level factors included density of fast food outlets, convenience stores, and parks; school proximity, street connectivity, land use mix, disorder, social and material deprivation, and parental perceived safety. Separate logistic regression models were estimated for each of inactivity and excessive SB. We tested models using the identical set of baseline risk factors at both time points. Analyses were restricted to 413 children with complete data at age 8-10y, and to 283 children with complete data at age 10-12y. Models controlled for child’s obesity status, father and mother’s obesity status, and parental education. Results: At both time points, girls were 75% to 85% more likely to be inactive than boys, but were equally likely to be excessively sedentary as were boys. Also at both time points, each additional weekly outing with friends reduced the likelihood of being sedentary by 20%, but did not reduce the likelihood of being inactive. Only area-level disorder was associated with being excessively sedentary, and only in 10-12y olds; in contrast, several factors increased the likelihood of being inactive, including area deprivation at age 8-10y (OR: 1.7; 1.0-3.0) and perceived lack of safety at age 10-12y (OR: 2.8: 1.1-6.3). Moreover, the likelihood of being inactive decreased by 24% for each quintile increase in land use mix. Although obesity status in children was strongly associated with outcomes in all models, other determinants were unaffected by its inclusion in the models. Conclusions: Our findings suggest that physical inactivity and sedentary behavior are driven by largely distinct paradigms. Each of these may be impacted through increases in light PA. Although interventions need to target all spheres of influence, reducing physical inactivity may be more effectively mediated by features of the built environment, while leveraging social and peer groups may be more effective to reduce sedentary behaviors.

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018

Association of the Change in Physical Activity and Cardiovascular Disease Outcomes in the Look AHEAD Trial
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Introduction: The Look AHEAD trial examined cardiovascular disease incidence in adults with type 2 diabetes randomly assigned to an intensive lifestyle intervention compared to those randomly assigned to diabetes support and education (control). In a substudy, physical activity was assessed using accelerometry, which provides an opportunity to examine whether the incidence of cardiovascular disease varied by the measured change in physical activity.

Hypothesis: There is a beneficial association between the 1- and 4-year change in physical activity and the pre-specified primary and secondary outcomes in participants in the Look AHEAD trial.

Methods: Adults (N=1,978; 59.1±6.8 kg; 102.8±19.0 kg) with type 2 diabetes at 8 study sites, who completed physical activity was assessment using accelerometry for 1 week at 0, 1, and 4 years. MET-minutes per week of moderate-to-vigorous physical activity (MVPA) performed in bouts of at least 10 minutes was identified from the accelerometry data. The 1- and 4-year change in MVPA was computed as the difference from baseline. The primary outcome was pre-defined as non-fatal myocardial infarction, stroke, hospitalized angina, and cardiovascular disease death. The first secondary outcome was pre-defined as non-fatal myocardial infarction, stroke, hospitalized angina, CABG/PTCA, hospitalized congestive heart failure, carotid endarterectomy, peripheral vascular disease, and total mortality. The relationships between 1- and 4-year change in physical activity and the primary and secondary outcomes were examined using Cox proportional hazards models with data collapses across the two treatment groups. Hazard ratios (HR) were adjusted for age, sex, history of cardiovascular disease, duration of diabetes, diabetes medication use, baseline weight, change in weight, and baseline physical activity.

Results: MVPA [Median (25th, 75th percentile)] was 167.6 (0,545.5), 205.4 (0, 700.2), and 91.3 (0, 418.9) MET-minutes per week at 0, 1 and 4 years, respectively. Change in MVPA at 1-year was not significantly associated with the primary outcome [HR per 100 MET-minutes per week = 1.001 (95% CI: 0.985, 1.017)] or secondary outcome [HR per 100 MET-minutes per week = 0.989 (95% CI: 0.966, 1.013)] assessed across 8.8±2.4 years of follow-up. Change in MVPA at 4-years was significantly associated with a reduction in the primary [HR per 100 MET-minutes per week = 0.949 (95% CI: 0.912, 0.987)] and the secondary outcome [HR per 100 MET-minutes per week = 0.897 (95% CI: 0.843, 0.954)] assessed across 9.2±1.8 years of follow-up.

Conclusions: Change in physical activity at 4-years is associated with a reduction in incidence of cardiovascular disease in adults with type 2 diabetes. These findings suggest improvements in physical activity may need to be sustained for a relatively long period (4 years) to elicit a beneficial effect on incidence of cardiovascular disease.


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019

Cost-effectiveness of the FDA Sodium Reduction Targets for the Processed Food Industry: Are There Internal Incentives to Reformulate?

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Introduction In 2016, the US Food & Drug Administration (FDA) proposed voluntary industry reductions in sodium, a major modifiable risk factor for CVD, for processed foods. Yet, reformulation could cost the food industry up to $16bn over 10 years, perhaps partly explaining why in 2017 Congress blocked the FDA from implementing these long-term voluntary targets. Aim To estimate the potential health gains and health-related cost savings for food industry employees from the FDA sodium targets. We defined the industry perspective as including all costs to the food industry and all health-related costs and health benefits to people working in the industry. Methods Utilizing the validated US IMPACT Food Policy dynamic microsimulation model, we estimated QALYs gained, costs, and incremental cost effectiveness ratios (incremental cumulative cost per QALY gained, with costs and QALYs discounted at 3%) from 2017-2036 in individuals working in the wider food system (food services and drinking places; food and beverage stores; food manufacturing) and the subset of food manufacturing. Data sources included NHANES, matched to demographic data for workers from the American Community Survey, and meta-analyses of sodium effects on blood pressure and blood pressure on CVD. Costs included industry reformulation costs, government costs, and health-related costs (healthcare, productivity, informal care) for individuals working in the industry. We modelled the FDA sodium targets under 2 scenarios: a) Short-term, 100% compliance of 2-year reformulation targets with no further progress. b) Long-term, 100% compliance of 10-year reformulation targets. We tested our assumptions with probabilistic sensitivity analysis. Results Achieving the short-term, 2-year reformulation targets would generate net discounted industry costs of ~$7bn, health-related cost savings of ~$1.7bn (95% UI: $1.0bn, $2.9bn) and health gains of ~60,000 QALYs (50,000, 77,000) over 20 years, with an ICER of ~$85,000 ($12,000, $243,000) per QALY gained. Achieving the long-term sodium reduction targets could result in industry costs of ~$16bn, health-related cost savings of approximately $5.1bn ($3.4bn, $8.3bn), and industry health gain of ~180,000 (149,000, 209,000) QALYs, with an ICER of ~$60,000 ($2,000, $168,000). For the subset of food manufacturing, the long-term sodium reduction targets would lead to health-related savings of ~$1bn ($0.6bn, $1.6bn) and ~32,000 (27,000, 37,000) QALYs gained with an ICER of $489,000 ($160,000, $1,052,000). Conclusions Sustained sodium reduction is estimated to benefit the overall food industry with a healthier workforce and partly offset the reformulation costs for the subset of the processed food industry.

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Heartbreaking Careers in Old Age: Retirement Sequences as a Non-Traditional Risk Factor for Cardiovascular Diseases

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Background: Traditional factors leave substantial risk for incident cardiovascular disease (CVD) unexplained. Recent literature addressing this limitation identifies non-traditional risk factors, such as depression and clinical biomarkers. This study explored retirement sequences as a new non-traditional risk factor for CVD among older Americans.

Methods: Heart disease and stroke incidence were measured for 7,880 Health and Retirement Study participants age 70 and over. Non-parametric survival curves and time-discrete survival models were used to compare the succeeding incidence of CVD across the retirement sequences that individuals followed between ages 60-61 and 70-71. We employed six holistic types of retirement sequences: (i) **early** for individuals who completely retired at or before age 62; (ii) **complete** for the conventional normative model of retirement by which people who are working in full-time jobs completely retire at the legally established age; (iii) **ambiguous** for people out of the labor force who shifted into retirement; (iv) **partial** for subjects with full-time jobs that claimed partial pension benefits in their early 60s; (v) **compact** for individuals moving from part-time positions into partial retirement; and (vi) **late** for individuals with full-time employments until their late 60s. These sequences were measured as longitudinal pathways of labor-force statuses and transitions measured in two-year intervals between the ages 60-61 to 70-71 years. Models were fitted for the whole sample, as well as males and females separately, adjusting for the probability of dying before CVD onset, sociodemographics, traditional risk factors, and clinical characteristics.

Results: Out of all participants, 78.1% (6154/7880) reported at least one adverse cardiovascular event after age 70. Individuals following retirement sequences characterized by a progression from full-time jobs to either early retirement (heart disease, HR 3.07 CI95% 2.89-3.26 p<.001; stroke, HR:2.75 CI95% 2.53-2.96 p<.001) or retirement at the state pension age (heart disease, HR:3.73 CI95% 3.52-3.93 p<.001; stroke, HR:2.30 CI95% 2.07-2.54 p<.001), as well as people out of the labor force who move into retirement (heart disease, HR:2.36 CI95% 2.12-2.60 p<.001; stroke, HR:2.72 CI95% 2.44-3.01 p<.001) experienced a higher risk for heart disease and stroke relative to individuals who kept on working past the retirement age. However, the effects are stronger for heart disease among women and stroke among men. Conclusions: Retirement sequences may indeed be regarded as a non-traditional risk factor for CVD in aging populations. Keywords: Retirement-Heart disease-Stroke-Work

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Fasting Glucose: The Reasons for Geographic and Racial Differences in Stroke Study

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Aims/hypothesis:
Ideal cardiovascular health (ICH) is associated with lower risk of incident diabetes, but whether this association varies by baseline glycemia (normal [<100 mg/dL] vs. impaired fasting glucose [100-125 mg/dL]) remains to be clarified. We assessed the incidence of diabetes based on American Heart Association (AHA) ICH components stratified by glycemic status to determine whether ICH is more effective for primordial or primary prevention of diabetes among middle-aged and older adults.

Methods:
This study included 7,662 non-Hispanic whites and African Americans from the REasons for Geographic and Racial Differences in Stroke (REGARDS) Study without prevalent diabetes at baseline (2003-2006), who completed the follow-up exam (2013-2016). Participants were categorized as having ideal, intermediate or poor cardiovascular health, as defined by the AHA 2020 Impact Goals, based on baseline ICH components (total cholesterol, blood pressure, dietary intake, tobacco use, physical activity and body-mass index (BMI)). We categorized participants based on their total number of components that were ideal (0-1 “poor”, 2-3 “intermediate”, and 4+ “ideal”). Incident rate ratios (IRR) were calculated using modified poisson regression adjusting for age, sex, education, income, race, alcohol use, estimated glomerular filtration rate, urine albumin:creatinine ratio and high-sensitivity C-reactive protein. After confirming significant interactions with multiplicative interaction terms and application of likelihood ratio test, we stratified by glycemic status (normal vs. impaired fasting glucose).

Results:
Among REGARDS participants (mean age 63.0 [SD 8.4] years, 56% female, 26% African American), there were 560 incident diabetes cases (median follow-up 9.5 years). Overall, those with 2-3 and 4+ ICH components vs. 0-1 components had 31% (IRR 0.69; 95% CI 0.61, 0.79) and 71% lower (IRR 0.29; 95% CI 0.20, 0.42) risk of diabetes, respectively. Among 5,930 participants with normal fasting glucose, these risks were 36% (IRR 0.64; 95% CI 0.52, 0.79) and 80% lower (IRR 0.20; 95% CI 0.10, 0.37), while among 1,732 participants with baseline impaired fasting glucose these risks were 8% (IRR 0.92; 95% CI 0.80,1.07) and 13% lower (IRR 0.87; 95% CI 0.58,1.30) (p for interaction by baseline glucose status <0.0001).

Conclusions/interpretation:
Meeting an increasing number of ideal levels of dietary intake, physical activity, smoking, blood pressure, cholesterol and BMI was associated with a dose-dependent lower risk of diabetes for individuals with normal fasting glucose but not impaired fasting glucose. This suggests the AHA 2020 guidelines may be more effective for primordial versus primary prevention of diabetes among middle-aged and older adults.
Disclosures:  

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**022**

**Cost-Effectiveness of Financial Incentives and Disincentives for Improving Diet and Health Through the Supplemental Nutrition Assistance Program**


**Introduction:** The 2018 Farm Bill represents a major opportunity to reduce disparities in diet and health. The largest component is the Supplemental Nutrition Assistance Program (SNAP), feeding 1 in 6 Americans. Potential options include subsidizing fruits & vegetables (F&V), restricting sugar-sweetened beverages (SSBs), or implementing a broader food incentive/disincentive framework that preserves choice. Their comparative health impacts and cost-effectiveness are not established.

**Methods:** Using a validated microsimulation model (CVD PREDICT), we estimated changes in CVD events, quality-adjusted life-years (QALYs), costs, and cost-effectiveness of 3 policy scenarios in SNAP adults: 1) 30% subsidy on F&V; 2) 30% F&V subsidy + SSB restriction; and 3) 30% subsidy on F&V, whole grains, nuts/seeds, seafood, plant-based oils, and 30% disincentive on SSBs, junk food, and processed meats. Model inputs included national data from NHANES (2009-2014), policy effects from SNAP pilots and food pricing meta-analyses, diet-disease effects from meta-analyses, and policy, food subsidy, and healthcare costs.

**Results:** From a societal perspective, all 3 scenarios were cost-savings at 5, 10, 20 y and lifetime (Table). At 5 y, a F&V subsidy would prevent 32,218 CVD events, gain 18,072 QALYs, and save $1.04B ($6.05B lifetime). Corresponding values for a F&V subsidy + SSB restriction were 63,898, 45,772, and $4.47B ($38.83B); and for a broader incentive/disincentive framework that preserved choice, 65,078, 26,663, and $3.98B ($29.90B). Government affordability varied by program duration and by whether subsidy costs for SNAP adults or all SNAP participants were included. Scenario 3 was generally most cost-effective or -saving, followed by scenario 2 and then scenario 1; all were cost-effective over a lifetime from a government affordability perspective.

**Conclusions:** Financial incentives/disincentives through SNAP could generate substantial health benefits and be cost-effective or cost savings.

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J. Liu: None. D. Mozaffarian: B. Research Grant; Significant; NIH research, Gates
Introduction: African Americans (AA) have a disproportionate greater burden of risk factors and higher risk of HF than Whites. However, the factors underlying the transition from at-risk to clinical HF in AA is not well understood. We aimed to examine the independent and joint effects of subclinical myocardial injury, as measured by highly sensitive assays for cardiac troponin (hs-TnI) and left ventricular hypertrophy (LVH), on risk of HF in AA.

Methods: Participants from the Jackson Heart Study, a prospective study of AA adults, without prevalent HF at baseline (2000-2004) were stratified into categories based on elevation in hs-cTnl (>6 ng/L) and presence of LVH (LV mass > 96 g/m² in women and > 116 g/m² in men). The risk of incident HF across different LVH and hs-cTnl groups was assessed using adjusted Cox models. Results: We included 3,796 participants (54 y, 64% women, 17.2% with elevated hs-TnI & 6.1% with LVH) with median follow up of 9.8 y and 285 incident HF events. In adjusted analyses, LVH and higher hs-TnI at baseline were independently associated with risk of HF [HR (95% CI): LVH (vs. no LVH) = 2.2(1.6 - 2.9); Log hs-cTnI (per unit higher)=1.6(1.5 - 1.8)]. A significant interaction was observed between LVH and hs-TnI for the risk of HF (p-int < 0.0001) with the highest risk among individuals with both LVH and elevated hs-TnI [43% incidence, HR (95% CI): 5.7(3.9 - 8.2)]. In contrast, LVH in absence of hs-TnI elevation was not associated with HF risk [Figure]. Among 2,367 participants with repeat assessment of hs-TnI at 5 year follow-up, increase in hs-TnI levels on follow-up was also associated with significantly higher risk of HF [HR (95% CI) per 1 unit increase = 1.03 (1.02 - 1.06)].

Conclusions: The combination of LVH and elevated hs-TnI levels identifies a malignant preclinical HF phenotype in AAs with a remarkably high absolute risk of HF over a 10-year f/u period. Longitudinal increase in hs-TnI levels is also associated with significant risk of HF. Targeting these high-risk subsets may be an important strategy to mitigate HF risk in blacks.
Plasma Free Fatty Acids and Risk of Dementia: The Cardiovascular Health Study

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Background: Plasma free fatty acids (FFAs) are a byproduct of lipolysis largely derived from adipose tissue. High plasma FFA levels have toxic effects on a variety of organs central to cardiometabolic disease. Whether FFAs associates with cognitive decline or dementia remains unknown. Objective: To assess the association of plasma FFAs with risk of cognitive decline and dementia. Methods: Plasma FFAs were measured in participant samples from the 1992-1993 study visit of the Cardiovascular Health Study (CHS) (mean age 74 yrs; 59% female; 14% African American [AA]; 24% APOE4 carriers). A total of 3,242 non-demented participants were followed with adjudication for dementia through 1998-1999 (n=456 cases). In addition, cognitive decline was assessed annually among all CHS participants using the 100-point modified Mini-Mental State examination (3MSE; n=4,417) and the Digital Symbol Substitution Test (DSST; n=4,254).

Results: Higher plasma FFAs levels were positively associated with risk of dementia (Figure: Log-rank p-value=0.04). In Cox regression analysis adjusted for demographics, FFAs remained associated with risk of dementia (HR per SD [0.20 mEq/L] =1.10; 95% CI, 1.00-1.22). In fully adjusted models that included lifestyle factors, medical history, C-reactive protein, LDL-C, HDL-C, and 3MSE at baseline, the hazard ratio per SD was 1.13 (1.01-1.26), with a particularly strong association observed among AA participants (HR=1.49 [1.10-2.01], p interaction=0.08). FFA levels did not differ by APOE genotype, and adjustment for genotype did not influence results. FFA levels from the baseline visit were also associated with a decline in both cognitive assessments over 6 years of follow-up, with significant time x FFA interactions (p=0.04 for 3MSE and p=0.002 for DSST). We observed no interactions with APOE genotype or race for cognitive outcomes.

Conclusions: In non-demented older men and women, higher plasma FFA levels are associated with faster cognitive decline and higher risk of dementia over the subsequent years.
Cross-sectional Relations of Serum Cortisol and Cognitive and Structural Brain Measures in Young Adults: The Framingham Heart Study

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Introduction: Chronic stress and related changes in serum cortisol have adverse effects on brain structure and cognition in animal models. However, evidence from population-based studies is scant. We assessed the association of early morning serum cortisol with cognition and brain structural integrity in middle-aged adults without dementia.

Hypotheses: High or low levels of serum cortisol are associated with lower cognitive performance and brain volumes.

Methods: We evaluated dementia-free Framingham Study (Generation 3) participants (mean age 48.5 years; 46.8% men), who underwent cognitive testing of memory, abstract reasoning, visual perception, attention, and executive function (n=2231), and brain MRI (n=2018) to assess total white matter, lobar gray matter, and white matter hyperintensity volumes and fractional anisotropy (FA) measures. We used linear or logistic (cortisol categorized in tertiles, middle tertile as the reference) regression to assess the relations of cortisol with cognition, MRI volumes and voxel-based microstructural white matter integrity and gray matter density, adjusting for age, sex, APOE and vascular risk factors.

Results: Higher cortisol (highest tertile vs. middle tertile) was associated with worse memory and visual perception, as well as lower total cerebral brain, occipital and frontal lobar gray matter volumes (Table). Higher cortisol was associated with multiple areas of microstructural changes on voxel-based analyses (gray matter density and FA). The association of cortisol with total cerebral brain volume varied by sex ($P_{interaction}=0.048$, highest cortisol tertile inversely associated with cerebral brain volume in women [$P=0.001$] but not in men [$P=0.717$]). There was no effect modification by the apoE4 genotype of the relations of cortisol and cognition or imaging traits.

Conclusions: Higher serum cortisol was associated with lower brain volumes and impaired memory in asymptomatic young adults in their forties; women may be particularly susceptible to this influence.


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026

Eicosapentaenoic Acid is a Strong Predictor of Risk for Heart Failure in the Multi-ethnic Study of Atherosclerosis

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Introduction: In animal models of afterload stress, eicosapentaenoic acid (EPA) prevents interstitial myocardial fibrosis and preserves diastolic dysfunction.

Hypothesis: We hypothesized that EPA is similarly protective in humans.

Methods: In the Multi-Ethnic Study of
Atherosclerosis, we tested for an effect of plasma phospholipid EPA percent of total fatty acids on primary heart failure incidence across heart failure types including, heart failure with reduced ejection fraction (HFrEF; <45% EF), and with preserved ejection fraction (HFpEF) using Cox proportional hazards modeling in 6566 subjects. Results are mean [95% CI].

**Results:** A total of 6566 subjects had measured baseline EPA, including 1797 black, 794 Chinese, 1444 Hispanic, and 2531 white participants; 52% were female. Over a median follow-up of 13.0 years, 293 heart failure events occurred in subjects with measured EPA: 129 had HFrEF, 110 had HFpEF, and the remaining 54 had unknown ejection fraction status. Mean EPA in HF-free subjects was 0.77% (0.76 - 0.79), and was lower in heart failure subjects 0.70% (0.65 - 0.74), p=0.002. EPA was associated with lower incidence of HF, having a hazard ratio of 0.73 (0.60 - 0.89) per unit change in percentage of total fatty acids, p=0.001. Adjusting for age, sex, race, BMI, smoking, diabetes mellitus, blood pressure, lipids and lipid-lowering drugs, and albuminuria did not change this relationship. Sensitivity analysis showed no dependence on heart failure type. Adjusting for other fatty acids with clustering did not change hazards. In animals, >2.5% EPA is required for prevention of HF, between 2.5% and 1% is marginal, and <1% EPA is insufficient. Most subjects had insufficient EPA levels (n=4794), fewer had marginal levels (n=1471), and fewer still had sufficient levels (n=301). Subjects with sufficient EPA levels were at 0.40 (0.15 - 0.81) fold risk compared to insufficient EPA (p=0.008).

**Conclusion:** High abundance of EPA is robustly associated with reduced risk for heart failure, independent of established risk factors and regardless of ejection fraction status.


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Finns Study (YFS), and the Muscatine Study. During childhood (age 5-18 yr), participants were percentile-ranked by their CV risk factor burden using an age- and sex-adjusted sum of z-scores from total cholesterol, systolic blood pressure, BMI, and triglycerides. During adult follow-up (age 40-55 yr), participants were percentile-ranked using the Framingham score. The rank-rank slope (β) from the regression of adult/child percentile rankings forms the measure of CRM.

**Results:** Patterns of CRM were similar to BHS in both YFS [β=.15 (95% CI: .12, .18) at age 10] and Muscatine [β=.14 (95% CI: .09, .19) at age 10]. Pooled results of age/rank interaction were significant (p=0.005), indicating a pattern of lower CRM (more tracking) earlier in childhood. The pooled β=.15 (95% CI: .14, .16)], meaning that a child ranked 10 percentiles better was only 1.5 percentiles better as an adult.

**Conclusions:** Populations in the developed world track, yet exhibit large mobility in CV risk. Children are readily able to move from both high to low and low to high CV risk strata over the life course. The earlier children develop a high CV risk factor burden relative to their peers, the lower their mobility, or opportunity to “catch up,” into adulthood.


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**028**

**Infant Growth Trajectories and Lipid Levels in Adolescence: Evidence From a Chilean Infancy Cohort**

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**Introduction:** Growth in early infancy is hypothesized to affect chronic disease risk factors later in life. To date, most reports draw on European ancestry cohorts with few observations of early growth. To determine if previous findings generalize to diverse study populations and to accommodate more detailed growth estimates, we investigated the association between monthly infant growth from birth to 5 months and dyslipidemia in adolescents in a Hispanic/Latino cohort.

**Methods:** We characterized infant growth in males (n=345) and females (n=308) from the Santiago Longitudinal Study (SLS) using three metrics: weight (kg), length (cm) and weight-for-length (g/cm). Nonlinear mixed effects (SITAR) and latent growth mixture models (LGMM) were two approaches to estimate infant growth characteristics. Growth functioned as an exposure and lipid levels at 17 years were the outcome, including HDL-C, LDL-C, and TG. We used a false discovery rate of 0.05 to report findings.

**Results:** Height trajectories presented the strongest evidence for an effect on dyslipidemia in adolescence in both the SITAR and LGMM models. SITAR analyses demonstrated an inverse relationship between height velocity before six months of age and HDL-C levels in adolescence. LGMM models offered more nuanced findings. A two-class height trajectory
model offered the best fit: one group (n~268) had shorter length at birth accompanied by lower velocity/higher acceleration; the other group (n~406) had higher length at birth and higher velocity/lower acceleration. The lower velocity/lower acceleration group had lower mean HDL-C (mg/dL) (35.4, se=0.9) than the higher velocity/lower acceleration group (43.8, se=0.7), \( \chi^2(1)=36.4, p\text{-value}<0.001 \). Similarly, the best-fitting 3-class weight trajectory model indicated the lower velocity/medium acceleration group had a higher mean LDL-C (mg/dL) (97.7, se=1.6, n~441) than the highest velocity/lowest acceleration group (88.8, se=2.0, n~202), \( \chi^2(1)=15.2, p\text{-value}<0.001 \). A similar pattern for LDL-C emerged for the weight-for-length trajectories, \( \chi^2(1)=8.6, p\text{-value}=0.003 \).

Summary:
This study provides evidence of associations between infant growth from 0 and 5 months and blood lipid profiles during adolescence. Based on two different analytic approaches, characteristics of infant length trajectories were associated with HDL-C at mean age 17 years. These findings align with the well-established relationship between height and CVD in adulthood. Furthermore, groups with higher acceleration in all three trajectory types were more likely to have adverse lipid outcomes. Future research can inform the role of infant body size change in the context of downstream effects and CVD risk.


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Age-Related Blood Pressure Changes at the Incipient Stages of Westernization in Yanomami and Yekwana Tribes

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Introduction: Studies of isolated hunter-gatherers have found little evidence of the age-related rise in blood pressure (BP) that is common to Western societies, but none of these studies have included children or, for comparison, neighboring tribes exposed to Western culture. We tested the hypothesis that BP does not rise with age in isolated, hunter-gatherer Yanomami, and the age-BP slope is greater in neighboring Yekwana tribes that have some Western exposure. Methods: In the Upper Caura basin, a remote area of the Venezuelan Amazon, we sampled 438 participants from 5 isolated Yanomami-Sanema villages, accessible only by foot or canoe, and 3 Yekwana villages, 1 of which had a grass landing strip for small-engine planes, allowing for delivery of medicine and aspects of Western lifestyle, including salt. Trained researchers measured auscultatory sitting BP in triplicate per standard protocols, and height and weight to determine BMI (kg/m²). We used ANCOVA to compare the age-BP slope between the Yanomami and Yekwana. Results: 154 participants (83 Yekwana; 71 Yanomami) ages 2-60 y (53% female) had data on age and sitting systolic BP (SBP). Age-SBP slopes were significantly different (p=0.02): in Yekwana, a 1-y age increment was associated with a 0.25±0.08 mmHg (p=0.003) increase in SBP (Figure), whereas in Yanomami age was not associated with SBP (1-y increment: 0.00±0.07mmHg; p=0.98). These results indicate that at age 10 y, mean sitting SBP was, on
average, 5.8 mmHg lower for Yanomami compared to Yekwana, and that the average difference increased to 15.9 mmHg by age 50 y. BP differences between Yanomami and Yekwana remained after control for BMI.

**Conclusion:** In isolated Yanomami with hunter-gatherer-grower lifestyles, BP does not increase with age over ages 2 to 60 y. Yet, among the Yekwana—the closest geographic neighbors of the Yanomami in whom Westernization is at the incipient stages—age is positively associated with BP, suggesting that the rise in BP with age may result in part from cumulative exposure to Western lifestyle.

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**030**

**Natural History of Obesity Subphenotypes: Dynamic Changes Over Two Decades and Prognosis in the Framingham Heart Study**

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**Introduction:** The natural history of obesity (body mass index [BMI]≥30 kg/m²) sub-phenotypes is not fully understood. We investigated longitudinal changes in obesity sub-phenotypes, and their associations with health outcomes.

**Hypothesis:** We hypothesized that metabolically healthy obesity (MHO) is associated with elevated risk of cardiovascular disease [CVD], metabolic disease and cancer, compared to healthy non-obesity.

**Methods:** We evaluated 4,291 Framingham Offspring Study participants attending at least two examinations between cycles 2 [1979-1983] through 7 [1998-2001] (26,508 participant-observations). Obesity subphenotypes were defined using metabolic health (<2 of Adult Treatment Panel-III criteria) and BMI (metabolically healthy non-obese [MHNO], MHO, metabolically unhealthy non-obese [MUNO], metabolically unhealthy obese [MUO]). We assessed changes in subphenotypes over time, and their relations to coronary artery calcification (CAC), subclinical CVD (presence of one or more of the following: left ventricular [LV] systolic dysfunction, LV hypertrophy, increased carotid intima-media thickness, reduced ankle-brachial index or microalbuminuria) and incident diabetes, hypertension, chronic kidney disease, CVD and mortality.

**Results:** At baseline, 4% and 31% of participants exhibited the MHO and MUNO subphenotypes, respectively. Between two consecutive exams, >40% of MHO participants became MUO. Transition probabilities were highest for MHO to MUO changes (43-46%). Compared to MHNO, MHO participants had 1.28-fold and 1.9-fold higher odds of subclinical CVD and CAC, respectively; corresponding values for MUNO were 1.95 and 1.92 (P<0.05). Compared to MHNO, MHO increased the risks of diabetes and hypertension (Table); while MUNO increased the risks of diabetes, hypertension, CVD and death.

**Conclusion:** Over two decades, most MHO participants developed metabolic abnormalities, subclinical and clinical disease, suggesting that this subphenotype is a harbinger of future disease risk.
Socioeconomic Trajectories Across the Life Course and Risk of All-cause and Cardiovascular Mortality: Prospective Findings From the Moli-sani Study

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Introduction: A life course approach has been suggested as the most appropriated to establish the actual impact of socioeconomic status (SES) on health outcomes. Hypothesis: We assessed the hypothesis that SES trajectories from childhood to adulthood are useful to better evaluate the role of SES towards mortality risk in a large general population-based cohort. Methods: Longitudinal analysis on 22,194 subjects recruited in the general population of the Moli-sani study, Italy (2005-2010). Educational attainment (low/high) and SES in adulthood (measured by a score including occupational social class, housing and overcrowding, and dichotomized as low/high) were used to define four possible trajectories both in low and high SES in childhood (age of 8). Hazard ratios (HR) with 95% confidence intervals (95%CI) were calculated by multivariable Cox regression and competing risk models. Results: Over a median follow-up of 8.3 years (182,924 person-years), 1155 all-cause, of which 414 cardiovascular (CVD), deaths were ascertained. In the group with low SES in childhood, as opposed to those stably low (low education and low SES in adulthood), an upward in both educational attainment and material factors in adulthood was associated with lower risk of both all-cause (HR=0.64; 95%CI 0.52-0.79; Table) and CVD mortality (HR=0.62; 0.43-0.88), respectively. Subjects with high childhood SES experienced an increased risk of total and CVD death in absence of higher educational attainment despite a higher SES in adulthood (HR=1.47; 1.04-2.07 and HR=1.75;1.00-3.05, respectively) as compared to the group with both high education and high SES in adulthood. Conclusions: In conclusion, for individuals with low SES in childhood, an upward of both educational attainment and material factors over the life course is associated with lower risk of total and CVD death. In advantaged groups in childhood, lack of a higher educational attainment, rather than material factors, over the life course appears to be unfavourably associated with survival.

Funding Component:

**032**

**Life-Course Socioeconomic Position Relates to Higher Arterial Stiffness in Adults From the ELSA-Brasil Cohort Study**

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**BACKGROUND:** Although the association between socioeconomic adversity and risk for cardiovascular disease (CVD) is established, little is known about the effect of socioeconomic disadvantages across the life-course on arterial stiffness, an important marker of subclinical cardiovascular disease (CVD). **OBJECTIVE:** To investigate whether exposure to adverse socioeconomic position (SEP) throughout the life course and especially in early life, is associated with increased arterial stiffness in adults. In addition, we assessed whether increasing number of unfavorable SEP events during the life course is associated with higher arterial stiffness. **METHODS:** A total of 14,497 adults from the ELSA-Brasil cohort study baseline (2008-2010), aged between 34 and 75 years (45.5% men, mean age: 51.9, SD: 9.09), with validated values of femoral carotid pulse wave velocity (cfPWV), and with information available about maternal education were included. ELSA-Brazil is a multicenter cohort of civil servants from universities and research institutions of six Brazilian cities that aims to investigate the determinants of cardiovascular disease. Arterial stiffness was measured by cfPWV. Childhood and adulthood SEP was measured by maternal education and participants’ own education, respectively. Accumulation of SEP disadvantages across the life course was evaluated using a score including maternal and participants’ own education. The following variables were used for adjustments: age, sex, race, mean arterial pressure, heart rate, smoking, physical activity, diabetes, antihypertensive use. Multiple linear regression models were used. **RESULTS:** Both lower childhood and adulthood SEP were associated with higher cfPWV in adult life, although the association with childhood SEP was not independent of adulthood SEP. However, cfPWV increased with increasing number of unfavorable SEP during the life course. Individuals exposed to low SEP in childhood and adulthood presented an average increase of 0.23m/s (95% CI: 0.13-0.34) in cfPWV in relation to individuals with high SEP in both periods of life. After all adjustments this association remained statically significant (β = 0.18, 95% CI: 0.07-0.29). **CONCLUSION:** Accumulation of exposures to socioeconomic disadvantages throughout life was associated with higher cfPWV in adults. Thus, it may imply that longer exposure to social disadvantages throughout life accelerates arterial aging.


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**033**

**Associations of Smoke-Free Policies With Blood Pressure Changes in the Coronary Artery Risk Development in Young Adults Study**

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**Introduction:** Laws banning smoking in indoor public places have been associated with reductions in second-hand smoke exposure and
cardiovascular disease among non-smokers. Second-hand smoke exposure has been associated with hypertension in prior studies. However, it is unknown whether smoke-free policies are associated with changes in blood pressure. **Hypothesis:** We tested the hypothesis that living in an area with a smoke-free policy banning smoking in restaurants, bars, and/or other workplaces is associated with reductions in systolic and diastolic blood pressure among non-smokers. **Methods:** Longitudinal data from 2,896 non-smoking participants of the Coronary Artery Risk Development in Young Adults (CARDIA) Study (aged 18-30 at enrollment, 1985-2011, 14,193 person-exam-years) were linked to state, county, and local 100% smoke-free policies in bars, restaurants, and/or non-hospitality workplaces based on participants’ census tract of residence at each exam. Fixed-effects linear regression estimated associations of each type of smoke-free policy (restaurant, bar, workplace) with within-person changes in systolic and diastolic blood pressure (SBP and DBP). Models adjusted for time-varying covariates: exam year (categorical), socio-demographic (education, income, marital status), health-related (body mass index, total physical activity, alcohol use), and policy (state cigarette tax, self-reported ban on smoking in their workplace) covariates, and interactions of baseline covariates (age, sex, race, field center) with exam year to account for differences in blood pressure patterns that were associated with these characteristics (p<0.05 for all interactions). Blood pressure values were adjusted to reflect antihypertensive medication use (+10 mmHg for SBP, +5 mmHg for DBP for those on medication). **Results:** At baseline, mean SBP was 110.5 mmHg and mean DBP was 69.3 mmHg. By year 25, a majority of participants were exposed to smoke-free policies in restaurants (1,759 of 2,264, 78%), bars (1,536 of 2,264, 68%), and other workplaces (1,518 of 2,264, 67%). Smoke-free policies were associated with within-person reductions in SBP and DBP in fully adjusted models (expressed as average change between exams in mmHg). Mean reductions in SBP were -0.77 (95% CI: -1.51, -0.02) for restaurant policies, -0.73 (95% CI: -1.54, 0.08) for bar policies, and -0.79 (95% CI: -1.51, -0.08) for workplace policies. Mean reductions in DBP were -0.67 (95% CI: -1.27, -0.06) for restaurant policies, -0.54 (95% CI: -1.20, 0.11) for bar policies, and -0.86 (95% CI: -1.44, -0.28) for workplace policies. **Conclusions:** Smoke-free policies in restaurants and other workplace are associated with within-person reductions in systolic and diastolic blood pressure among non-smokers. These results suggest an additional health benefit of these policies beyond those previously described in the literature.


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034

**Tracking Lifestyle Behaviors, Healthcare Access, and Healthcare Quality for Cardiometabolic Diseases at the State-Level From 1990-2016**

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**Introduction:** While a range of population-level and clinical interventions have been implemented to improve cardiometabolic (CM) health in the US, little is known about their different effects at the state-level.

**Objective:** To develop a novel index to evaluate the performance of the healthcare system and population-level interventions to improve CM health at the state-level from 1990 to 2016.

**Methods:** To evaluate healthcare access and quality, we estimated risk-standardized age-standardized mortality rates for six CM diseases that are amenable to healthcare. Risk-standardization removed geographic variation...
in all risk factors not directly amenable to medical intervention. To evaluate the effect of population-level interventions, we estimated the risk-weighted exposure to lifestyle risk factors including smoking, alcohol, diet, body mass index, and physical activity. We averaged the healthcare index with the risk factor index to create a single composite index. Data sources included mortality and risk factor estimates from the Global Burden of Disease 2016 Study.

Results: Between 1990 and 2016, healthcare access and quality for CM diseases significantly improved in 38 states. These increases were mainly driven by significant improvements nationwide in healthcare for ischemic heart disease, ischemic stroke, and rheumatic heart disease. Notably, healthcare for diabetes significantly worsened in 16 states. There were no significant changes in the lifestyle risk factor index since 1990. Stability was driven by diverging trends, with smoking and diet quality significantly improving and BMI significantly worsening in all states. Importantly, the gap between the best and worst performing states across all indices increased between 1990 and 2016, indicating greater health disparities.

Conclusions: This study has quantified the separate and combined effects of healthcare access, quality, and risk factors on CM health, with implications on priority setting for both population-level and clinical interventions.

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Background: Familial hypercholesterolemia (FH) significantly increases the risk of atherosclerotic cardiovascular disease (ASCVD); however, recent data from ambulatory care centers suggests that prescription rates for statins remain low in patients with severe dyslipidemia or diagnosed FH. National rates of screening, awareness, and treatment with statins among individuals with FH or severe dyslipidemia are unknown.

Methods: Data from the 1999 to 2014 National Health and Nutrition Examination Survey (NHANES) were used to estimate prevalence rates of self-reported screening, awareness, and statin therapy among U.S. adults ≥20 years of age (n=42,471 weighted to represent 212 million U.S. adults) with FH (defined using the Dutch Lipid Clinic criteria) and with severe dyslipidemia (defined as low-density lipoprotein cholesterol (LDL-C) levels ≥190mg/dL). Logistic regression was used to identify sociodemographic and clinical correlates of hypercholesterolemia awareness and statin therapy. Results were extrapolated to the U.S. adult population.

Results: The US prevalence of definite/probable FH was 0.47% (standard error 0.03%) and of severe dyslipidemia was 6.59% (SE 0.17%). Rates of cholesterol screening and awareness were high (>80%) among adults with definite/probable FH or severe dyslipidemia; however, statin use was uniformly low (52.3% (SE 8.2%) of adults with definite/probable FH
and 37.6% (SE 1.2%) of adults with severe dyslipidemia). Less than half of those on statins were prescribed a high-intensity statin. The prevalence of statin use in adults with definite/probable FH and severe dyslipidemia increased slightly over time but not faster than trends in the general population. Older age, insurance, having a usual source of care, diabetes, hypertension, and having a personal history of early ASCVD were associated with statin use. The discrepancy between cholesterol screening and treatment rates was most pronounced in younger patients, uninsured patients, and patients without a usual source of care.

**Conclusions:** Despite high rates of cholesterol screening and awareness, only about half of U.S adults with FH are on statin therapy and even fewer are prescribed a high-intensity statin; young and uninsured patients are at the highest risk for under treatment. A low rate of statin use in young adults is of particular relevance given the early onset of ASCVD in adults with FH. This study highlights an opportunity and an imperative to improve statin treatment rates in this high-risk population. Additional studies are needed to better understand how to close the gap between screening and treatment among adults with FH and improve treatment rates among those with limited access to care.

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**036**

**Derivation and Validation of a Novel Risk Equation for 10-year Risk of Incident Heart Failure in the General US Population**

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**Background:** Identification of individuals at risk for heart failure (HF) is necessary for implementation of primary prevention strategies. However, currently no validated prediction models exist for assessment of HF risk in a broad-based general population (ACC/AHA Stage 0 and Stage A individuals) based on routinely available clinical data.

**Methods:** Estimation of 10-year risk equations for developing a HF event were derived from community-based cohorts representative of the U.S. population of Whites and Blacks. Participants were included from ARIC (Atherosclerosis Risk in Communities) study, Cardiovascular Health Study, the CARDIA (Coronary Artery Risk Development in Young Adults) study, Multi-Ethnic Study of Atherosclerosis, and Framingham Offspring Study cohorts who were recruited between 1985-2000, between the ages of 30 to 80 years, free of cardiovascular disease at baseline, and had 12-years of follow-up. Sex- and race-specific 10-year risk equations were derived in a random pre-specified subset of the pooled sample (n=11,771) and subsequently validated in the remaining participants (n=11,770). Harrell’s C-statistic and Greenwood-Nam-D’Agostino chi-square were used to determine discrimination and calibration of these models.

**Results:** In the derivation cohort, 58% were women, 22% black, and mean age 52.7±11.9 years. HF occurred in 1,339 participants. Independent predictors of HF included in the model were age, blood pressure (treated or untreated), fasting glucose (treated or untreated), body mass index, cholesterol, smoking status, and QRS duration. The data-derived model had excellent discrimination in the 11,770 distinct participants in the validation cohort (C-statistics 0.71-0.85) and was well-calibrated (Figure). Conclusions: A 10-year HF risk score that incorporates readily available clinical parameters in the primary care setting can be used to identify individuals with higher likelihood of developing HF who may merit
intensive screening and/or targeted prevention strategies.

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037

Cost-effectiveness of Financial Incentives for Improving Diet Through Medicare and Medicaid

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Background. While economic incentives through health insurance are being considered to promote healthy behaviors, little is known about health or financial impacts of incentivizing diet, a leading risk factor for CVD. We estimated health and economic impacts of programs to incentivize healthful foods through Medicare and Medicaid over a 5, 10, and 20 y horizon.  

Methods. A validated microsimulation model, CVD PREDICT, was used to estimate reductions in CVD events, gains in quality-adjusted life-years (QALYs), costs, and cost-effectiveness of two policy scenarios within Medicare and Medicaid: (1) 20% subsidy on fruits and vegetables (F&V), and (2) 20% subsidy on broader healthful foods including F&V, whole grains, nuts/seed, seafood and plant-based oils. Model inputs included national demographic and dietary data from NHANES 2009-2014, policy effects from pricing meta-analyses, diet-disease effects from meta-analyses, and policy costs including program and healthcare costs, inflated to constant 2017 US dollars and discounted at 3% annually. Productivity gains were conservatively excluded.  

Results. Both incentive programs were cost-effective from a healthcare (government affordability) perspective (Table). Over 20 y, a 20% F&V subsidy could prevent 1.24M CVD events; while a broader 20% healthful food subsidy could prevent 1.91M CVD events. Incremental cost-effectiveness ratios for the F&V program ranged from $19,773/QALY for dual eligible to $26,862/QALY for Medicaid beneficiaries; and for the broader healthful food program, from $9,020/QALY for dual eligible to $13,484/QALY for Medicare beneficiaries. Findings were robust to a range of sensitivity analyses; within Medicare, the incentive program was more cost-effective among individuals with lower income. These incentive programs were also cost-effective at 5 and 10 y (not shown).  

Conclusions. Economic incentives for healthier foods through either Medicare or Medicaid could generate substantial health gains and healthcare cost savings.

Severe obesity in youth is associated with accentuated risks of chronic health problems. However, quantifying risk of cardiovascular disease (CVD) events later in life is challenged by long latent periods between risk factor development and overt disease outcomes. A 30-year CVD event risk score has been developed in the Framingham Offspring cohort to address this problem. The 30-year CVD event risks were estimated for adolescents with severe obesity prior to and up to 5 years after undergoing bariatric surgery. We hypothesized that adolescents with severe obesity would be at high risk for full CVD events within 30-years and that bariatric surgery would reduce that risk. Adolescents (n=215; mean age pre-op = 17 years; mean body mass index (BMI) = 53 kg/m²) from the Teen-Longitudinal Assessment of Bariatric Surgery (Teen-LABS) were used in this analysis. Data collected preoperatively and annually to 5 years were analyzed. A 30-year composite risk score (CVD event risk) was examined which included the following hard endpoints: coronary death, myocardial infarction, and stroke (fatal and nonfatal), coronary insufficiency, angina pectoralis, transient ischemic attack, intermittent claudication, and congestive heart failure. CVD event risk score requires the following risk factors for calculation: Sex, age, systolic blood pressure, antihypertensive treatment, smoking, diabetes mellitus, total cholesterol, high-density lipoprotein cholesterol, and BMI. Data are presented as mean (SD) with differences between time-points examined using linear mixed-models. Preoperatively, the likelihood of CVD events was 7.9 (6.7)%. Preoperatively, 52.6% of the cohort presented with >5% risk of CVD events, 22.3% with >10% risk of event, and 10.7% with >15% risk of event. At 1-year post-surgery a significant reduction in CVD events (7.9 [6.7]% to 4.0 [3.4]%, p<0.0001) was estimated. A reduction in proportion with >5% (52.6% to 22.1%), >10% (22.3% to 4.4%), and >15% (10.7% to 1.7%) risk of CVD events was observed. These predicted benefits for full CVD events were sustained at 2 years (4.0 [2.9]%), 3 years (4.2 [3.8]%), 4 years (4.3 [3.1]%), and 5 years (4.8 [3.8]%) post-surgery, with similar >5%, >10%, and >15% risks noted (p<0.0001 for all years versus baseline). These data suggest that prior to bariatric surgery, the risk of CVD event within 30-years is pronounced. However, following bariatric surgery, risk of hard endpoints is substantially reduced for up to 5 years following surgery.

Adherence to a Healthy Lifestyle in Relation to Cardiovascular Disease Incidence and Mortality Among Adults With Type 2 Diabetes

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Objective: To examine the associations of individual and combined low-risk lifestyle practices, including non-smoking, engaging in moderate to vigorous intensity physical activity (≥150 min/week), drinking alcohol in moderation (5-15 g/day for women and 5-30 g/day for men), and eating a high quality diet (top two fifths of Alternative Healthy Eating Index), with the risk of subsequent cardiovascular events among adults with incident diabetes. Methods: The prospective study included 11,527 participants with diabetes diagnosed during follow-up (8,970 women from the Nurses’ Health Study and 2,557 men from the Health Professionals Follow-Up Study), who were free of cardiovascular disease (CVD) and cancer at the time of diabetes diagnosis. Diet and lifestyle factors after diabetes diagnosis were repeatedly assessed every 2-4 years. Multivariable Cox regression models were used to estimate the hazard ratios (HRs) and 95% confidence intervals (CIs) of total CVD, coronary heart disease (CHD), and stroke incidence, and CVD mortality. Results: There were 2,311 incident CVD cases (including 498 stroke cases) and 858 CVD deaths during an average of 13.3 years of follow-up. After multivariate adjustment including medication use, the individual low-risk lifestyle factors after diabetes diagnosis were each significantly associated with a lower risk of CVD incidence and mortality. The multivariate-adjusted HR (95% CI) for participants with three or more low-risk lifestyle factors compared with zero was 0.48 (0.40-0.59) for total CVD incidence, 0.53 (0.42-0.66) for CHD incidence, 0.33 (0.21-0.51) for stroke incidence, and 0.32 (0.22-0.47) for CVD mortality (all P trend<0.001). The population-attributable-risk for poor adherence to low-risk lifestyle was 42.6% (26.7%-55.1%) for CVD mortality. In addition, greater improvements in lifestyle factors from pre- to post-diabetes diagnosis were also significantly associated with a lower risk of CVD incidence and mortality. For per one number increment in low-risk lifestyle factors, there was a 16% reduced risk of incident total CVD, a 12% reduced risk of CHD, a 21% reduced risk of stroke, and a 30% reduced risk of CVD mortality (all P<0.001). Similar results were observed when analyses were stratified by diabetes duration, sex/cohort, body mass index at diabetes diagnosis, smoking status, and lifestyle factors before diabetes diagnosis.

Conclusions: Greater adherence to an overall healthy lifestyle is associated with a substantially lower risk of CVD incidence and mortality among adults with type 2 diabetes. These findings further support the tremendous benefits of adopting a healthy lifestyle in reducing the subsequent burden of cardiovascular complications in diabetic patients.


Funding: No

The Effects of Coffee Consumption on Insulin Sensitivity and Other Risk Factors for Type 2 Diabetes

**Background:** In observational studies, coffee consumption has been consistently associated with a lower risk of type 2 diabetes mellitus. Trials examining the effect of coffee consumption on glucose metabolism have been limited by the use of surrogate insulin sensitivity indices, small sample sizes, lack of blinding, and short follow-up duration. We aimed to overcome these limitations in a randomized placebo-controlled trial examining the effects of coffee consumption on insulin sensitivity. **Methodology:** We conducted a 24-week randomized placebo-controlled trial in 126 overweight, insulin-resistant (HOMA-IR ≥ 1.30), Chinese, Malay and Asian-Indian males and females aged 35-69 years. Participants were randomly assigned to receive 4 cups of instant regular coffee (n=62) or 4 cups of a coffee-like placebo beverage (n=64) per day. The primary outcome was bodyweight-standardized M-value (Mbw) assessed with a hyperinsulinemic euglycemic clamp. Secondary outcomes included other clamp-based insulin sensitivity measures, biological mediators of insulin sensitivity, and measures of fasting glucose metabolism, body weight and composition. **Results:** Coffee consumption did not significantly change insulin sensitivity as compared with placebo [% mean difference in Mbw: 0.3% (95% CI: -12.0% to 14.2%), P=0.97]. Furthermore, no significant differences in fasting plasma glucose [3.0% (-1.1% to 7.3%), P=0.16] or biological mediators of insulin resistance, such as plasma adiponectin [1.5% (-3.4% to 6.6%), P=0.55], were observed between coffee and placebo groups after 24 weeks of intervention. Coffee consumption led to a loss of body weight as compared with placebo [-1.2% (-2.3% to -0.1%), P=0.03] resulting from a decrease in fat mass [-3.7% (-7.1% to -0.2%), P=0.04]. **Conclusions:** Consuming 4 cups per day of caffeinated coffee for 24 weeks had no significant effect on insulin sensitivity or biological mediators of insulin resistance. Coffee consumption led to a modest decrease in body fat as compared with coffee abstinence. **Trial Registration:** ClinicalTrials.gov identifier: NCT01738399. Registered on 28 November 2012. Trial Sponsor: Nestlé Research Center, Lausanne, Switzerland. Trial Site: National University of Singapore.

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041

**Smoking Cessation and Subsequent Risk of Type 2 Diabetes in Three Large Prospective Cohort Studies of Americans**

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Background The inter-relationships between smoking cessation, subsequent weight change, and type 2 diabetes (T2D) risk remain to be characterized.

Methods We prospectively followed 153,123 U.S. men and women from the Health Professionals Follow-up Study (1988-2012), Nurses’ Health Study (NHS, 1984-2012), and NHS II (1991-2013). Participants were followed biennially for smoking status, weight change, and diabetes risk. Self-reported T2D was confirmed using a validated supplementary questionnaire.

Results Compared with current smokers, T2D risk among quitters significantly increased and peaked after 5-7 years of quitting, and gradually decreased along extended durations. With a mean quitting duration of 9.9 years, the multivariate-adjusted hazard ratio (HR; 95% confidence intervals [95% CI]) of T2D was 1.26 (1.14, 1.39) for recent quitters (≤6 consecutive years) and 1.04 (0.95, 1.14) for longer-term quitters in three cohorts. The T2D risk approached that of never smokers after 30 years of quitting among older nurses. There was, on average, 5.5 kg weight gain within 6 years of smoking cessation whereas 2.2 kg was gained in the same period among current smokers. The weight change significantly modified the association of smoking cessation with T2D risk (p for interaction = 0.04): for quitters without weight gain (≤0 kg), 0-5 kg weight gain, and ≥5 kg weight gain within 6 years of smoking cessation, the HRs (95% CIs) of T2D were 0.92(0.73, 1.14), 1.27(1.10, 1.46) and 1.47(1.29, 1.67), respectively, compared with current smokers. We estimated that for quitters who did not gain weight within the first 6 years, their T2D risk approached that of never smokers after 5 years of quitting. Weight change within 6 years of quitting explained 22% (14.8%, 30.1%) of the elevated risk of T2D.

Conclusions Weight gain after quitting smoking may significantly attenuate the benefits of smoking cessation by increasing T2D risk. Our findings underscore the importance of weight control after quitting in maximizing the benefits of smoking cessation.


Funding: No

Funding Component:

042

Accelerometer-measured Light Physical Activity is Heart Healthy in Older Women: The OPACH Study

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Background: The longstanding, prevailing paradigm in physical activity (PA) research and US PA guidelines is that moderate to vigorous physical activity (MVPA) for at least 150 minutes/week, preferably in increments of at least 10 minutes, is needed to prevent cardiovascular disease (CVD) in adults. Because light physical activity (LPA; 1.1-<3 metabolic equivalents (METs)) is poorly measured by self-
report, we know little about its association with CVD.

**Methods:** Women’s Health Initiative participants in the OPACH Study (n=5861, mean age=78.5±6.7, 33.5% Black, 17.6% Hispanic) without a history of myocardial infarction or stroke wore accelerometers for up to 7 days and were followed for incident CVD for up to 4 years. Cox proportional hazards models were used to estimate hazard ratios (HR) and 95% confidence intervals (CIs) for CVD and coronary heart disease (CHD) across awake wear time adjusted quartiles of MVPA and LPA. Fully adjusted models accounted for age, race-ethnicity, smoking, education, body mass index, systolic blood pressure, co-morbidity score, physical function, and self-rated health. We then examined the LPA association with CVD/CHD after adjustment for MVPA.

**Results:** Higher levels of both LPA and MVPA were associated with reduced risks of CVD and CHD after adjusting for covariates (Table; p-trend <0.05, all). Women with the highest vs. lowest levels of MVPA had markedly reduced risks of CVD (31%) and CHD (50%). Women in the highest vs. lowest quartiles of LPA had 22% reduced risks of CVD and 39% reduced risks of CHD even after adjustment for many indicators of health status and CVD risk factors. The LPA association with CVD persisted after adjustment for MVPA (highest vs. lowest LPA quartile HR: 0.81 for CVD, p-trend=0.01; 0.74 for CHD, p-trend=0.04).

**Conclusions:** LPA is associated with reduced risks of incident CVD and CHD in older women independent of health status indicators, CVD risk factors, and MVPA. Increasing levels of LPA is an achievable behavioral intervention for improving heart health in older women.


**Funding:** No

**Funding Component:**

043

**Leisure-Time Physical Activity in Adulthood and Region of Interest (ROI) Brain Volumes: The Atherosclerosis Risk in Communities Neurocognitive Study (ARIC-NCS)**

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**Introduction:** Several studies report late-life physical activity (PA) to be associated with less brain atrophy. Associations of PA and subclinical brain markers evaluated at older ages may be subject to reverse causality due to comorbidity, age-related changes in lifestyle, or incipient cognitive impairment. Therefore, we aimed to compare late-life cross-sectional estimates of PA and ROI brain volumes to those using prospective PA measures from mid- to late-life.

**Methods:** Participants (n=1549, mean age: 75, 39% male, 20% Black) with repeat assessments of PA from visit 1 (1987-1989) and a brain magnetic resonance imaging (MRI) in 2011-2013 were included. Total volume of PA in metabolic equivalent-min/week was estimated using the Baecke Physical Activity Questionnaire and classified as no, low, middle or high at each visit. Based on visit 1 and 3 (1993-1995) PA assessments, a subset of participants (n=663)
were further categorized as habitually inactive or having habitually low, middle, or high PA in mid-life. Brain MRI using 3D-1.5T equipment quantified ROI volumes following a standardized protocol. Weighted linear regression adjusted for intracranial volume, demographics, select cardiovascular risk factors and ApoE4 estimated the standardized difference in ROI volumes. **Results:** Compared to no PA, high PA was associated with larger ROI brain volumes cross-sectionally in late-life (Table). High mid-life PA was only modestly associated with larger frontal cortical and deep gray matter volumes in late-life (Table). Habitually high PA in mid-life was not associated with less atrophy across brain regions in late-life. **Conclusions:** Our results do not support a causal interpretation of the cross-sectional associations between PA and brain volumes reported in late-life. Drawing on long-term population-based data, this study provides novel information on the associations of PA across life epochs with brain health, which can inform translational and intervention efforts to reduce age-related cognitive impairment.


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044

Cardiorespiratory Fitness May Explain a Proportion of Observed Racial Disparity in Incident Chronic Kidney Disease over 30 Years: Results From the CARDIA Study

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**Introduction:** Racial and ethnic minorities are at higher risk for Chronic Kidney Disease (CKD). Higher levels of cardiorespiratory fitness (CRF) can reduce the risk of a rapid decline in estimated glomerular filtration rate (eGFR) and incidence of CKD. Little is known regarding how CRF contributes to racial disparities in CKD. **Hypotheses:** We hypothesized that: 1) baseline CRF is inversely associated with the risk of incident CKD after adjustment for covariates and 2) differences in baseline CRF account for a proportion of the disparity in incident CKD between blacks and whites. **Methods:** A total of 4328 young adults without CKD (age 24.8±3.6 years, 52.8% (n=2285) women, 51.9% (n=2247 black) completed a maximal graded treadmill test at baseline. We calculated eGFR using the CKD-EPI formula (baseline eGFR: 102.1±17.9 and 92.3±14.1 mL/minute/1.73 m² for blacks and whites, respectively). We defined CKD status as eGFR of <60 mL/minute/1.73 m² during 10, 15, 20, 25, and 30 year follow-up assessments. Multivariable Cox models examined hazard ratios (HR) and 95% confidence intervals (CI) for incidence of CKD. Models adjusted for baseline race, sex, age, field center, alcohol intake, smoking status, healthy eating index, eGFR, maximal educational attainment, and time-varying BMI, diabetes, and hypertension. The percent reduction in parameter estimates determined the excess risk explained according to CRF. **Results:** During the 30 years of follow-up, 84 blacks and 43 whites developed CKD. Every 1-minute lower treadmill duration associated with 12% higher rate of CKD (HR=1.12 (1.01-1.22)).
Blacks were 1.89 times more likely to develop CKD compared to whites (HR=1.89 (1.23-2.91)). This was reduced to 1.75 (1.13-2.70) with CRF added to the model. This corresponds to a β reduction of 14.3% for race according to CRF. Conclusion: Both low fitness during young adulthood and black race are associated with higher incidence of CKD later in life. Fitness is a modifiable factor that could be targeted to address a portion of the disparity gap in CKD.


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Leisure Time Physical Activity is Associated With Higher Coronary Artery Calcium Density: The Multi-Ethnic Study of Atherosclerosis

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Introduction: Leisure-time physical activity (LTPA) has favorable effects on many risk factors for cardiovascular disease (CVD). Paradoxically, LTPA has also been associated with higher amounts of coronary artery calcium (CAC) in athletes. Recently, a higher density of CAC was shown to significantly mitigate the risk of CVD associated with a given volume of CAC. The effects of LTPA and non-LTPA on the density and volume components of CAC among individuals with calcified coronary atherosclerosis are unknown.

Methods: We evaluated 3,398 participants from the Multi-Ethnic Study of Atherosclerosis with prevalent CAC (50% of cohort). CAC was assessed via cardiac computed tomography, while physical activity was assessed via questionnaire and categorized by quintiles of moderate and vigorous LTPA (e.g. exercise) and non-LTPA (e.g. work). Multiple linear regression with mutual adjustment for LTPA, non-LTPA, demographics, and CVD risk factors was performed.

Results: Mean age of the sample was 66 years, 58% were male, 44% were Caucasian, 24% were African-American, 20% were Hispanic, and 12% were Chinese-American. Compared to the lower four quintiles, LTPA above the threshold of 2567 MET-minutes/week (quintile 5) was associated with 0.057 (0.008, 0.105) higher CAC density-units after full adjustment. LTPA at any level was not associated with CAC volume. Conversely, non-LTPA was associated with both lower CAC density and higher CAC volume in a stepwise fashion, with the highest quintile meeting statistical significance for both (see Table).

Conclusions: The highest quintile of LTPA was associated with higher CAC density but not higher CAC volume, suggesting a possible explanation for high CAC scores in athletes with favorable CVD risk factor profiles. Non-LTPA was associated with a less favorable CAC composition after adjustment for LTPA, an unexpected finding that merits further investigation.
Introduction: Low levels of cardiorespiratory fitness, moderate-to-vigorous-intensity physical activity (MVPA), and excess sedentary behaviors are associated with a greater risk of type 2 diabetes. Less is known about the role of fitness, MVPA, and sedentary behaviors before pregnancy with subsequent development of gestational diabetes mellitus (GDM), a strong risk factor for future diabetes and cardiovascular disease.

Objective: To assess the associations of pre-pregnancy fitness, MVPA, and time spent watching television (a surrogate for sedentary behavior) with risk of GDM.

Methods: Participants were 1,333 women enrolled in the Coronary Artery Risk Development in Young Adults (CARDIA) study who did not have diabetes at baseline (1985-86) or before post-baseline births. Baseline fitness was estimated using a graded symptom-limited maximal treadmill test and expressed in metabolic equivalent units (METS). Baseline MVPA (exercise units/day) was measured using the CARDIA physical activity history questionnaire, and television viewing (hours/day) was assessed by self-report in 1990-91. Logistic regression analysis was used to calculate odds ratios and 95% confidence intervals, adjusting for study center, baseline age, race, parity, education, family history of diabetes, smoking, alcohol, dietary fat, pre-pregnancy body mass index, HOMA-IR, HDL-cholesterol, and time from baseline to delivery.

Results: Over 25 years of follow up, 164 women developed GDM. As shown in the Table, the odds of developing GDM were 22% lower for each 1 standard deviation increment in baseline fitness after adjustment (2.3 METS; OR 0.78, 95% CI: 0.65, 0.95, p=0.013). MVPA and television viewing were not statistically significantly associated with developing GDM.

Conclusions: This is one of the first studies to report an inverse association between objectively measured pre-pregnancy fitness and subsequent development of GDM. Improved pre-conception fitness may benefit women at risk for GDM.
Sedentary Behavior Increases Risk for Cardiovascular Disease in Older Women: The Objective Physical Activity and Cardiovascular Health (OPACH) Study

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Background: Evidence on sedentary behavior and cardiovascular disease (CVD) is largely based on self-reported sedentary time. Furthermore, how sedentary time is accumulated (in longer vs. shorter bouts) may be related to CVD risk but has not been tested.

Methods: Women (n=5638, mean age=79±7) with no history of myocardial infarction or stroke wore accelerometers for 4-7 days and were followed for up to 4 years for incident CVD. Hazard ratios (HR) and 95% confidence intervals (CIs) for CVD and coronary heart disease (CHD) events were estimated across quartiles of sedentary time and mean sedentary bout duration using Cox proportional hazard models adjusting for covariates. Separate models evaluated associations after adding moderate-to-vigorous physical activity (MVPA) and possible mediators: body mass index, diabetes, hypertension, systolic blood pressure, fasting glucose, HDL-cholesterol, and triglycerides. We then tested whether mean bout duration was associated with increased risk for CVD and CHD among women with above median sedentary time (≥10hr/day).

Results: Covariate-adjusted HRs for CVD and CHD increased across quartiles of both sedentary time and mean bout duration (Table). All CHD associations remained significant but attenuated after adjustment for possible mediators. After adjustment for MVPA, highest vs. lowest quartile HRs (CI) for CHD were 1.6 (0.7-3.4; p-trend = .08) for sedentary time and 1.8 (0.9-3.5; p-trend = .047) for mean bout duration. Among women with high sedentary time, the HRs (CI) comparing the 75th vs. 25th percentile of mean bout duration were 1.05 (0.95-1.15) for CVD and 1.16 (1.01-1.34) for CHD.

Conclusions: Both sedentary time and mean bout duration showed independent, dose-response associations with increased risk of CVD and CHD events in older women. Among women with high sedentary time, longer mean bout duration was associated with higher CHD risk. Taken together, this provides evidence that both total sedentary time and the way it is accumulated are predictive of incident CHD.


Funding: No

Funding Component:

Circulating Branched-Chain Amino Acids and Incident Cardiovascular Disease in a Prospective Cohort of US Women

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Introduction: Recent metabolomics studies have identified circulating levels of branched-chain amino acids (BCAAs; isoleucine, leucine, valine) as strong predictors of type 2 diabetes (T2D). Whether BCAAs are implicated in cardiovascular disease (CVD) risk has not been established.

Hypothesis: We hypothesized that higher baseline levels of plasma BCAAs are associated with an elevated risk of incident CVD events, and evaluated whether this relationship was dependent on an intermediate diagnosis of T2D.

Methods: Participants enrolled in the Women’s Health Study prospective cohort were eligible if they did not report CVD or cancer prior to baseline blood collection (N=27,172, mean baseline age=54.7 years). Plasma BCAA metabolites were measured via proton NMR spectroscopy, ln-transformed, and standardized for analysis. We used multivariable Cox proportional regression models to estimate hazard ratios (HR) and 95% confidence intervals (CI) per standard deviation (SD) of total and individual BCAAs with incident CVD (myocardial infarction [MI], stroke, coronary revascularization).

Results: 1,917 confirmed CVD events occurred over follow-up (mean 18.6 years). In models adjusted for age, body mass index, smoking status, diet quality, physical activity, and other established CVD risk factors, total BCAAs were positively associated with CVD (per SD, HR=1.13, CI=1.08 to 1.19), comparable in magnitude to the association of LDL cholesterol with CVD (per SD, HR=1.15, CI=1.09 to 1.21). In particular, BCAAs were associated with coronary events (MI: HR=1.21, CI=1.10 to 1.33; revascularization: HR=1.15, CI=1.07 to 1.23), but not with stroke (HR=1.07, CI=0.98 to 1.15). The BCAA-CVD relationship was notably greater (p-interaction=0.008) among participants who developed T2D prior to a CVD event (HR=1.25, CI=1.13 to 1.39), vs. women without T2D (HR=1.07, CI=1.01 to 1.13). Isoleucine, leucine, and valine were each associated with CVD (p<0.05). Further adjusting for biomarkers of potential intermediates, HbA1c, lipids, and a lipoprotein-based insulin resistance score entirely eliminated the associations of BCAAs with CVD.

Conclusions: Circulating plasma BCAAs were positively associated with long-term incident CVD in a cohort of US women, in particular among women who developed T2D prior to a CVD event. Impaired BCAA metabolism may represent a shared pathway of insulin resistance that links the risks of T2D and CVD.


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049

Mitochondrial DNA Copy Number and Incident Atrial Fibrillation: The Atherosclerosis Risk in Communities Study (ARIC)

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Background: Atrial fibrillation (AF) is the most common clinical arrhythmia. Molecular studies suggest that mitochondrial dysfunction is associated with increased risk of AF through reduced production of adenosine triphosphate and increased production of reactive oxidative species. Mitochondrial DNA copy number (mtDNA CN), a marker of mitochondrial function, has been found to be associated with
sudden cardiac death and cardiovascular disease (CVD) in ARIC. However, the association between mtDNA CN and incident AF in the general population is unknown.

**Objective:** To examine the prospective association between mtDNA CN and the risk of incident AF.

**Methods:** Cohort study of 10,764 ARIC participants without AF at baseline (1987-89) and followed through December 31, 2014. AF were identified through electrocardiograms, review of hospital discharge codes, and death certificates. DNA samples were isolated from buffy coat. mtDNA CN was calculated from probe intensities on the Affymetrix Genome-Wide Human single nucleotide polymorphisms (SNP) Array and standardized using the residual method. Cox proportional hazards models adjusted for demographics and CVD risk factors were used to estimate hazard ratios (HR) for AF comparing the four lowest quintiles of mtDNA CN to the highest quintile.

**Results:** The mean (SD) age was 57.4 (6.0) years. During 21 years of median follow-up, 1,946 participants developed AF. In fully-adjusted models, the HRs (95% CI) for AF comparing quintiles 1 - 4 to quintile 5 of mtDNA CN were 1.17 (1.00, 1.37), 1.17 (0.99, 1.37), 0.92 (0.78, 1.10) and 1.05 (0.89, 1.24), respectively (p-trend 0.044; Figure). The HR for AF comparing 10th vs 90th percentile of mtDNA-CN was 1.16 (1.04, 1.30).

**Conclusions:** mtDNA CN was inversely associated with the risk of AF independent of traditional CVD risk factors. Decline in mitochondrial function may be a novel mechanism underlying biological changes that increase the risk of AF in the general population. mtDNA CN may provide potential for novel AF prevention strategies.

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**Funding Component:**

**050**

**Phenome Wide Association Study of IL6R Variants Identifies a Drug Target for Cardiovascular Disease and Inflammation**

Healthcare System, Boston, MA; on behalf of the VA Million Veteran Program

**Background:** Individuals with an interleukin 6 receptor (IL6R) genetic variant not on IL6R blocking therapy have biomarker profiles similar to those treated with IL6R blockers. Thus, studying whether the IL6R variant is protective for a phenotype can inform which diseases may benefit from treatment with IL6R blockade. To test this hypothesis, we performed a Phenome-Wide Association Study (PheWAS) to screen for associations between an IL6R variant and a broad range of phenotypes in the electronic health records (EHR).

**Methods:** We studied veteran participants in the Veteran’s Affairs Million Veteran’s Project using genomic data linked to EHR. We extracted all diagnoses codes and mapped them to phenotype groups using published PheWAS methods. Routine laboratory measurements, e.g., liver function tests, were also extracted. A PheWAS was performed by constructing logistic regression models testing associations between the IL6R variant (Asp358Ala, rs2228145) and 1,866 phenotype groups; linear regression models were constructed to screen for associations between IL6R and 26 routine laboratory measurements. All models were adjusted for age, gender, and race. Significance was reported using false discovery rate ≤0.05 and Bonferroni correction.

**Results:** We studied 342,529 participants; the minor allele frequency of the IL6R variant was 35.3%. IL6R was most strongly associated with a reduced risk of aortic aneurysm (OR 0.91-0.92, 95% CI 0.89, 0.94) (Figure 1). We observed the expected association between IL6R and reduced C-reactive protein. We also observed known side effects of IL6R blockade, elevated transaminases, as well as elevated triglycerides, an initially unexpected result in the early clinical trials.

**Conclusion:** In this proof of concept study, we demonstrate the utility of PheWAS to inform drug effects using the largest US-based biobank study. The strong association with aortic aneurysm corresponded with the newest indication for IL6R blockade to prevent aortic aneurysms due to large vessel vasculitis.


Funding: No

Funding Component:

051

**Genome-wide Association Study Identifies 12 Loci for Habitual Consumption of Bitter and Sweet Beverages**

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**Introduction**

Widely consumed beverages (e.g., soft drinks, coffee, tea) are critical sources of energy, added sugar and phytochemicals and are associated with obesity and chronic disease. Taste perception and preferences are highly heritable and strong determinants of food and beverage choice. We aimed to identify novel loci underlying habitual bitter and sweet beverage intake.

**Methods**

We performed a genome-wide association study (GWAS) of self-reported bitter and sweet beverage intake in participants of European
ancestry in the UK Biobank. Diet was assessed via multiple 24-h diet recalls (n=84703, subset) or questionnaire (n=335909, all). Bitter beverage intake was the sum of coffee, tea and grapefruit juice. Sweet beverage intake was the sum of artificially and sugar sweetened beverages and other fruit juice. Multivariable linear regression under an additive genetic model was applied. GW-significant (P < 5×10^-8) SNPs were followed-up for replication in independent studies of European ancestry.

**Results**

Multiple SNPs spanning 11 loci were associated with bitter beverage intake (P <5×10^-8, Table 1), and at least 5 of them reflected the caffeine content of coffee and tea. Multiple SNPs in the obesity candidate gene *FTO* were associated with sweet beverage intake (P <5×10^-8). The effect size per allele ranged from 0.02 to 0.2 cup per day. Loci in/near *AHR*, *CYP1A2*, and *FTO* were associated with both bitter and sweet beverage intake but in opposite directions. Replication efforts are ongoing. So far, associations at all loci, except 1q25.2 and 2q36.2, were replicated (P range: 0.04 to 1.8x10^-8) in independent studies (n=17322) which provided 80% power for replicating 8 of these 12 loci at P=0.05.

**Conclusions**

Loci linked to caffeine metabolism and obesity predisposition rather than taste are major determinants of beverage intake. These and other identified loci have been linked to chronic disease and risk factors, suggesting causal or pleiotropic effects. Our findings have potential public health and methodological implications.

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kernel association (SKAT) tests [5 and 50 kilobase (kb) sliding windows] were performed using a mixed model approach in GENESIS, with aggregate tests for variants with a minor allele frequency (MAF) < 1% only. Inverse normalized residuals were adjusted for sex, age, study, and an empirical genetic relationship matrix, allowing for heterogeneous variance by study. For PLT, several associations had the same index SNP (ARHGEF3, TPM4) or were in moderate LD (TAOK1, r²=0.46) with a previously reported signal; two associations were not in LD (r²<0.1) with a known locus. The first locus (rs73022249, p=1.2 x 10⁻⁸, MAF=16%), an intergenic variant upstream of telomerase reverse transcriptase (TERT), is common only in African ancestry populations (~36%, 1% in Europeans) and was significant only in JHS (p=4.7 x 10⁻⁹, p=0.91 FHS, absent OOA). This variant and an LD proxy (rs10052815) overlap a GATA1 binding site in erythroblasts, the sister lineage of platelet producing megakaryocytes. An intronic TERT variant (rs2736100) 17 kb away (r²=0.025, D'=0.418 in included TOPMed cohorts) has been associated with PLT in Europeans, as well as with red blood cell traits, telomere length, pulmonary fibrosis, and multiple cancer subtypes. The second locus (rs73437176, p=1.5 x 10⁻⁸, MAF=12%), an intronic variant in progestin and adipose receptor family member V (PAQR5), is also more frequent in African ancestry populations (~25%, 4% in Europeans) and significant only in JHS (p=2.5 x 10⁻⁹, FHS p=0.47, OOA p=0.12); the nearest previously identified signal is ~4 Mb away and not in significant LD (D'<0.01). Seven known platelet loci were identified for MPV (DNM3, ARHGEF3, CCDC71L, JMJD1C, RHOF, TAOK1, TPM4), with either the same lead variant as previously reported or a variant in close LD (r²>0.75). Aggregated sliding window tests did not identify any additional signals. These results show suggestive evidence for association with PLT for two novel variants common only in African ancestry populations, but larger sample sizes of diverse ancestry will be necessary for replication and further discovery of novel loci.
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Background: QT interval (QT) genome-wide association studies (GWAS) have identified upwards of 35 common variant loci, including SNPs adjacent to putative transcription elongation factor TCEA3. Transcription elongation control has broad effects on gene expression, the misregulation of which is known to influence cardiac conduction system morphogenesis as well as activation or repression of key regulatory genes. Thus, we hypothesized that a genome-wide gene-gene interaction study of TCEA3 lead SNP rs2298632 would identify novel loci that influence QT. Methods: Using 1000 Genomes imputed data (>20 million SNPs) in n=67,445 participants (69% Caucasian; 18% Hispanic/Latino; 11% African American) from 10 studies, we conducted genome-wide meta-analyses to test for the presence of: interaction effect loci by examining rs2298632xSNP interactions on QT; and joint effect loci by simultaneously examining SNP main effects and rs2298632xSNP interactions on QT. Inverse-variance weighted meta-analysis of genomically controlled ancestry- and study-specific summary effects estimated using multivariable adjusted linear models or generalized estimating equations that incorporated robust standard errors was performed using METAL. SNPs demonstrating evidence of heterogeneity (Cochran’s Q P<0.05) and SNPs that were infrequent or rare (minor allele frequency [MAF] <5%) were excluded. Results: We identified one genome-wide significant interaction effect locus (P_{INT}<5x10^{-8}) at PVT1 (lead SNP: rs4733591; mean MAF = 32%), a long non-coding RNA gene for which previous GWAS identified suggestive associations with left ventricular systolic dysfunction. We also identified four genome-wide significant joint effect loci (P_{JOINT}<5x10^{-8}) that mapped within or nearby NUCKS1 (lead SNP: rs823094; MAF = 0.33), CASR (lead SNP = rs17251221; MAF = 0.13), ACTBL2 (lead SNP = rs7737409; MAF = 0.22), and KDM1B (lead SNP = rs34969716; MAF = 0.26), loci with roles in calcium sensing, regulation of gene expression through histone modification, and tumor suppression. Conclusion: Extension of traditional main effects GWAS to interrogate gene-gene interactions for biologically motivated loci like TCEA3 may help inform the structure and function of genetic pathways underlying complex traits like QT.


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Funding Component:

054

Diet Beverage Intake is Positively Associated With Incident Coronary Heart Disease in People With Type 2 Diabetes

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Introduction: Diet beverages are calorie free beverages sweetened with non-nutritive sweeteners. People with diabetes are the highest per-capita consumers of diet beverages, tending to consume them as a replacement for dietary sources of sugar, especially in place of sugar sweetened beverages. This behavior is endorsed by dietetic and scientific organizations and diet beverages are marketed synonymously with better health, weight loss, and thus, are considered advantageous for diabetes control. The underlying public health concern is the lack of data to support or refute this concept.

Hypothesis: Higher diet beverage intake is positively associated with incident Coronary Heart Disease (CHD)

Methods: We pooled the data sets of the Atherosclerosis Risk in Communities (ARIC) study (1987-2014), Cardiovascular Health Study (CHS) (1989-2014), Framingham Offspring Study (FOS) (1995-2014), Jackson Heart Study (JHS) (2000-2012), and Multi-Ethnic Study of Atherosclerosis (MESA (2000-2013) to conduct a prospective examination of the association of diet beverage intake with the incidence of CHD among participants with clinically ascertained type 2 diabetes (T2D) without prevalent CHD and with valid dietary data (N=3,947). We carried out a 2-step meta-analysis using individual level, cohort-specific Cox regression analyses with identical adjustment for demographic, lifestyle, overall diet quality and clinical risk factors to generate effect estimates that were pooled together using fixed and random effects meta-analysis.

Results: 1,046 participants developed adjudicated CHD during follow-up. There was a positive, graded association between diet beverage intake and risk of incident CHD (Table). Results were consistent by sex, race and age.

Conclusions: Diet beverage intake is associated with increased risk of developing CHD in a population with T2D. These results suggest the need to further evaluate dietary recommendations related to diet beverages and consider their role in this high risk population.


Funding: Yes

Funding Component: National Center 055

Adherence to a DASH (Dietary Approaches to Stop Hypertension) Dietary Pattern and Risk of Abdominal Aortic Aneurysm

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Background: Abdominal aortic aneurysms (AAAs) develop in up to 8% of men and 6% of women over a lifetime. Although they typically remain asymptomatic, rupture of an AAA carries high mortality. Smoking and hypertension have been identified as modifiable risk factors for developing an AAA. The role of diet, however, is yet unclear.

Objective: To evaluate the relationship between adherence to a DASH-style dietary pattern and the risk of incident AAA in a large,
community-based cohort of middle-aged adults. **Methods:** Dietary intake was assessed via a 66-item FFQ at two visits in 14,322 participants enrolled in the ARIC study (Atherosclerosis Risk in Communities) without clinical AAA, incomplete dietary/covariate information or extreme energy intake at baseline. Adherence to a DASH-style dietary pattern was assessed using a previously developed dietary scoring index. Participants were followed for incident clinical AAAs using hospital discharge diagnoses, Medicare outpatient diagnoses, or death certificates through December 31, 2011. Cox proportional hazards models with covariate adjustment were used to estimate hazard ratios (HR) with 95% confidence intervals (CIs).

**Results:** During a median follow-up of 23 years, there were 539 incident AAA cases. Participants with a DASH diet score in the highest quintile had a 39% lower risk to develop AAAs than those in the lowest score quintile (HRQ5 vs. Q1: 0.61; 95% CI 0.45, 0.84; ptrend =0.004) after adjusting for sociodemographics, total caloric intake, smoking, physical activity, BMI, abdominal obesity, diabetes, hypertension, hypercholesterolemia and cardiovascular disease. Higher intake of fruits, vegetables, whole grains, low-fat dairy, and nuts and legumes was related to a decreased risk for AAA.

**Conclusions:** Greater adherence to a DASH-style dietary pattern was found to be associated with lower incidence of AAA. Higher consumption of fruits, vegetables, whole grains, low-fat dairy as well as nuts and legumes may help to decrease the burden of AAA in U.S. adults.

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**056**

**Serum Metabolomic Profile of the Dietary Approaches to Stop Hypertension (DASH) Dietary Pattern**

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**Introduction:** The DASH dietary pattern emphasizes vegetables, fruits, and low-fat dairy products and is associated with improved cardiometabolic outcomes. No biomarkers exist for assessing adherence to this dietary pattern. The objective of the study was to use metabolomics to identify serum compounds associated with the DASH diet.

**Methods:** We conducted untargeted metabolomic profiling in stored serum specimens collected from participants at the end of an 8-week multi-center, randomized, controlled feeding study (N=218) comparing the DASH diet to a diet typical of intake in the U.S. (control). Multivariable linear regression was used to compare the association of individual log-transformed metabolites between the two diets after adjusting for age, sex, race, education, body mass index, and hypertension. Partial least squares-discriminant analysis was used to identify a composite of compounds that discriminate between the DASH and control diets. The area under the curve was calculated as the cumulative ability to distinguish between diets.

**Results:** Serum levels of 97 known metabolites were significantly different among participants randomized to the DASH diet compared to the control diet at the Bonferroni threshold (p<6.11x10^-5; Figure). The majority of these 97 metabolites were lipids (n=64; 66.0%), followed...
by amino acids (n=15), xenobiotics including food components (n=10), cofactors and vitamins (n=6), carbohydrate (n=1), and nucleotide (n=1). The ten most influential metabolites for discriminating between the DASH and control diets were: N-methylproline, stachydrine, tryptophan betaine, theobromine, 7-methylurate, chiro-inositol, 3-methylxanthine, methyl glucopyranoside, β-cryptoxanthin, and 7-methylxanthine (C statistic=0.986).

**Conclusion:** An untargeted metabolomic platform identified a broad array of serum metabolites that differed between the DASH and control dietary patterns. The composite of top ten metabolites may be used to assess adherence to the DASH dietary pattern.


Funding: No

Funding Component:

057

**Estimating the Benefits of the Proposed FDA Sodium Reformulation Policy on Cardiovascular Disease, Disparities and Economic Costs**

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**Background**
Sodium consumption is a leading modifiable risk factor for CVD mortality and morbidity in the US. In 2016, the US Food and Drug Administration (FDA), following recent effective examples in several other countries, proposed voluntary sodium targets for industry to reduce sodium in processed foods.

**Aim**
We aimed to estimate the potential CVD, equity and economic impacts of implementing this policy.

**Methods**
We used the validated US IMPACT Food Policy microsimulation model to estimate the CVD cases averted, quality-adjusted life-years (QALYs) gained and cost-effectiveness from 2017-2036 of the FDA sodium reformulation policy in US adults (30+ years). Model inputs included national demographics and sodium intakes from NHANES, FDA short- and long-term sodium reformulation targets, sodium effects on blood pressure and of blood pressure on CVD from meta-analyses, government costs to administer and monitor the policy and industry reformulation costs, and validated healthcare and productivity costs. We modelled 3 scenarios:

a) Optimal, 100% compliance of 10-year reformulation targets
b) Modest, 50% compliance of 10-year reformulation targets
c) Pessimistic, 100% compliance of 2-year reformulation targets with no further progress

Costs were inflated to 2017 US dollars and outputs were discounted annually by 3%. We
took a societal perspective for this analysis. Rigorous probabilistic sensitivity analyses were conducted.

**Results**

The optimal scenario achieving the 10-year sodium reduction targets could prevent ~450,000 CVD cases (95% Uncertainty Interval: 240,000-740,000), gain 2.1 million QALYs (1.7m-2.4m), and produce $41billion ($14bn-$81bn) cost-savings from 2017-2036. The modest and pessimistic scenarios were also cost-saving, with both health gains and savings about one half and one quarter, respectively, of the optimal scenario.

Relative disparities between non-Hispanic white and non-Hispanic black populations would be reduced in all scenarios. The pessimistic scenario yielded the largest reduction in absolute disparities (70,000 CVD cases (33,000-120,000) prevented in non-Hispanic blacks vs. 13,000 (0-54,000) in non-Hispanic whites). The optimal scenario would prevent approximately 4.6% (130,000 cases (65,000-220,000)) of all CVD cases in non-Hispanic blacks compared to 1.5% (220,000 cases (120,000-360,000)) in non-Hispanic whites. Despite a smaller population, total net savings would be over 50% larger in non-Hispanic blacks than non-Hispanic whites ($19bn vs $12bn) in the optimal scenario.

**Conclusions**

Implementing and even partly achieving the FDA sodium reduction targets could generate substantial health gains and net cost savings. Crucially, this policy could also reduce CVD disparities between non-Hispanic black and non-Hispanic white populations.

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incident diabetes. Participants were followed for a mean time of 21±5 years. We considered 4 models that examined LP-IR and IRDRF both as continuous and categorical variables and adjusted for various traditional predictors of diabetes.

**RESULTS**
Model 3, which adjusted for components of metabolic syndrome, had the best model fit in all cases (Table 1). LP-IR and IRDRF had a significant linear relationship with incident diabetes. Participants who had LP-IR and IRDRF scores in Q4 were significantly more likely to develop diabetes than those with scores in Q1.

**CONCLUSIONS**
In conclusion, LP-IR and IRDRF can be derived from a clinically-available NMR LipoProfile test, and both were associated with incident diabetes independent of traditional predictors.

**Background**
N-terminal pro-B-type natriuretic peptide (NT-pro-BNP), a commonly used marker of cardiac function, is associated with presence of stroke symptoms and is a strong risk factor for future atrial fibrillation, stroke and mortality. Little data are available on the association between NT-pro-BNP levels and stroke recurrence.

**Objective**
We studied the relationship between NT-proBNP with the risk of future ischemic stroke across a spectrum of pre-existing cerebrovascular conditions, ranging from history of stroke symptoms, to prior transient ischemic attack (TIA), to prior stroke.

**Methods**
The Reasons for Geographic and Racial Differences in Stroke (REGARDS) cohort enrolled 30 239 black and white Americans age 45 years and older in 2003-14. Among a case-cohort study sample including 1109 stroke cases and a 4311-person cohort random sample, we calculated hazard ratios of future ischemic stroke by baseline NT-proBNP stratified by presence of prior cerebrovascular conditions.

**Results**
In the cohort sample, there were 3056 participants without any history of cerebrovascular disease, 738 with prior stroke symptoms, 196 with history of TIA and 338 with history of prior stroke. In a fully adjusted model, elevated NT-proBNP was associated with risk of stroke in participants without a pre-existing cerebrovascular condition (HR 2.32, 95% CI 1.84, 2.94), and in participants with a history of stroke symptoms (HR 1.67 95% CI 1.00, 2.78) or TIA (HR 2.66, 95% CI 1.00, 7.04), but not among those with prior stroke (HR 1.26, 95% CI 0.71, 2.21).

**Conclusions**
These findings further support the potential for NT-proBNP testing to identify patients who are at highest risk for future stroke, although not in those with prior stroke.
Plasma Sphingolipids and Risks of Heart Failure and Atrial Fibrillation in Older Adults: The Cardiovascular Health Study

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INTRODUCTION. Ceramides and sphingomyelins (sphingolipids) are circulating lipids involved in multiple physiological pathways relevant to heart failure (HF) and atrial fibrillation (AF), including apoptosis, oxidative stress, and inflammation. Experimental studies suggest that sphingolipids with different saturated fatty acids exhibit different biological activities, but their relationships with HF and AF are unknown.

HYPOTHESIS. Higher levels of plasma ceramide and sphingomyelin that contain the fatty acid 16:0 are associated with higher risks of HF and AF; and higher levels of ceramides and sphingomyelins that contain the fatty acid 20:0, 22:0 or 24:0 are associated with lower risks.

METHODS. We measured sphingolipids in the Cardiovascular Health Study (CHS) in plasma samples from 1994-95 (N=4026) or from 1992-93 (N=586). We assessed the separate associations of the levels of 8 sphingolipids with risks of incident HF and incident AF using Cox regression. A p-value threshold of 0.006 was used to account for multiple testing.

RESULTS. Among 4,612 participants, 1179 incident HF and 1198 incident AF occurred during >40,000 person-years of follow-up. In adjusted analyses, higher levels of Cer-16 (ceramide with 16:0) and SM-16 (sphingomyelin with 16:0) were associated with higher risk of incident HF, but not with risk of incident AF (Table). In contrast, higher levels of Cer-20, Cer-22 and Cer-24 were each associated with lower risk of AF, but not with risk of HF. Higher levels of SM-20, SM-22, and SM-24 tended to be associated with lower risks of AF and HF, with only the association of SM-20 with AF significant.

CONCLUSIONS. Plasma levels of ceramide and sphingomyelin with 16:0 show different associations with HF and AF than species with 20:0, 22:0 or 24:0. Associations of Cer-16 and SM-16 specifically with higher risk of HF may be due to a role of apoptosis in HF. The novel findings that Cer-20, Cer-22, and Cer-24 are associated with lower risk of AF warrant further examination of the role of these sphingolipids in protecting from AF.
Background: Cardiovascular disease (CVD) is the leading cause of death in women. Sex differences in risk factors, prevalence and mortality suggest the involvement of sex hormones in disease processes. Coronary artery calcium (CAC) is a marker of subclinical atherosclerosis and its progression. CAC is prognostic of CVD risk, independent of traditional risk factors, even among low-risk women. We hypothesized that a more androgenic hormone pattern will predict CAC progression over 10 years in post-menopausal women.

Methods: We studied 2759 post-menopausal women, aged 45-84 years, participating in MESA who underwent serum sex hormone measurement and a cardiac CT scan for CAC at baseline (2000-2002). Among these, 2427 women had up to 3 follow-up cardiac CT scans at subsequent visits spanning 10 years. CAC was assessed by Agatston units. CAC and sex hormones were log-transformed for analysis. Using multivariable-adjusted Poisson and linear mixed effects models, we tested the longitudinal associations of testosterone (T), free T, dehydroepiandrosterone (DHEA), estradiol (E2), and sex hormone binding globulin (SHBG) with prevalent CAC and progression of CAC over 10 years.

Results: At baseline, average age was 65 years, 46% had prevalent CAC and 32% were using hormone therapy (HT). Cross-sectionally, there were no associations between sex hormones and prevalent CAC. After adjustment for demographics, lifestyle factors and use of HT, higher levels of free T and lower levels of SHBG were associated with an increase in CAC progression over 10 years (Table, Model 2). These associations remained statistically significant after adjusting for potential mediating cardiovascular risk factors (Model 3) and in sensitivity analyses excluding women on HT.

Conclusion: A more androgenic hormone profile of higher free T and lower SHBG is associated with a greater CAC progression over 10 years in post-menopausal women. Sex hormone levels may help identify women at increased CVD risk who may benefit from other risk reduction strategies.


Funding: Yes

Funding Component:

MP05

N Terminal Pro B Type Natriuretic Peptide as a Stroke Risk Factor in the European Population: Results From the Biomarcare Consortium

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Introduction: N-terminal pro-B-type natriuretic peptide (NT-proBNP) is a risk factor for atrial fibrillation and a marker of cardiac function used in detection of heart failure. Few studies evaluated the role of NT-proBNP as risk factor for stroke.

Hypothesis: Given the link between cardiac dysfunction and stroke, NT-proBNP is a candidate marker of stroke risk. Our aim was to evaluate the association of NT-proBNP with stroke outcomes and to determine the predictive value beyond a panel of established risk factors for stroke.

Methods: Based on the Biomarkers for Cardiovascular Risk Assessment in Europe (BiomarCaRE)-project we analysed data of 43,815 participants (48.3% men; mean age 52 yr) free of cardiovascular disease from 6 prospective population-based cohorts across Europe with a maximum follow-up of 22 years. All NT-proBNP measurements were performed on frozen samples in the central BiomarCaRE laboratory. The endpoints considered were validated fatal and non-fatal stroke.

Results: We observed 565 stroke events (78 fatal) in men and 290 (54) in women. Growing quartiles of NT-proBNP were associated with increasing risk of stroke (Table; multivariable cox regression analysis adjusted for the base model: age, centre, smoking, BMI, diabetes, hypertension medication, systolic and diastolic blood pressure, total and HDL cholesterol), both in men (p for trend <0.0001) and in women (P<0.0001). Examining C-statistics for prediction of stroke we could observe only very small changes after the addition of NT-proBNP to the base model (delta AUC=0.0053 and 0.0048 in men and women, respectively).

Conclusions: In European individuals free of cardiovascular disease, levels of NT-proBNP in the top quartile (>87.7 pg/mL) are associated with a doubled risk of stroke. However, the addition of NT-proBNP to variables of established risk score poorly improves prediction of stroke disease.


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MP06

Circulating Fatty Acids in the De Novo Lipogenesis Pathway and Total and Cause-
Specific Mortality Among Older Adults: The Cardiovascular Health Study

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De novo lipogenesis (DNL) is a crucial metabolic pathway that convert excess carbohydrates to fatty acids (FA) for energy and storage. Both DNL and the synthesized FA have biologic effects that may affect cardiometabolic risk. Yet, the association between DNL FA and mortality and CVD are not well-established in older adults, especially using serial biomarkers which objectively allow more accurate estimates of long-term FA exposure, as well as changes over time. We investigated the longitudinal association between serial levels of circulating DNL FA and total mortality, cause-specific mortality, and total CVD among 3,869 older U.S. adults (mean age 75 y) free of prevalent CVD at baseline. Levels of plasma phospholipid palmitic (16:0), palmitoleic (16:1n-7), stearic (18:0), and oleic acid (18:1n-9) were quantified at baseline, year 6, and year 13. Outcomes were centrally adjudicated using multiple sources. Risk was assessed in multivariable-adjusted Cox models with time-varying FA and covariates. During 46,974 person-years, 3,227 deaths (including 1,131 from CVD, 2,096 from non-CVD causes) and 1,754 incident total CVD events occurred. After multivariable-adjustment, cumulative levels of 16:0, 16:1n-7 and 18:1n-9 were each positively, while 18:0 was inversely, associated with total mortality (Table). Associations were generally similar for CVD vs. non-CVD mortality, and vs. total incident CVD (not shown). Among non-CVD deaths, associations for dementia and pulmonary deaths were generally similar to total mortality; while only 16:0 and 18:1n-9 were positively associated with cancer mortality. Higher long-term levels of circulating 16:0, 16:1n-7 and 18:1n-9 were positively, while 18:0 was inversely, associated with total mortality in older adults. Novel findings highlight the potential relevance of DNL later in life, and the need for further experimental research and interventions on the relevant underlying physiology and long-term health effects of DNL FA. Findings for FA changes over time to be presented.

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**Soluble Urokinase-type Plasminogen Activator Receptor is associated with progression of hypertension-attributed chronic kidney disease in African Americans**

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**Introduction:** Soluble urokinase-type plasminogen activator receptor (suPAR), a circulating signaling protein and marker of immune activation, has been linked to incident and progressive chronic kidney disease (CKD) in select patient populations, often with few African Americans.

**Hypothesis:** We assessed the hypothesis that higher circulating levels of suPAR are associated with risk for progression of hypertension-attributed CKD in African Americans.

**Methods:** We quantified baseline plasma levels of suPAR in participants of the African-American Study of Kidney Disease and Hypertension (AASK), a clinical trial of African Americans with hypertension-attributed CKD, and regular assessment of measured glomerular filtration rate (mGFR), and proteinuria. We used Cox proportional hazards regression to assess the associations of suPAR with CKD progression (defined as doubling of serum creatinine or end-stage renal disease [ESRD]), ESRD, worsening proteinuria (pre-ESRD doubling of 24-hour urine protein to creatinine ratio [UPCR] to ≥220 mg/g), and all-cause death.

**Results:** Among 955 AASK participants, the median baseline suPAR was 4462 pg/mL (25th to 75th percentile: 3425-5923 pg/mL), mean mGFR was 46 mL/min per 1.73 m², and median 24-hour UPCR was 79.6 mg/g. After controlling for baseline demographics, AASK trial arm, mGFR, proteinuria, APOL1 risk status, and clinical risk factors, there was a 1.42-times higher risk for CKD progression per two-fold higher baseline suPAR (HR 1.42, 95% CI: 1.17-1.71, \(p < 0.001\)). Higher suPAR was also independently associated with ESRD (HR 1.59, 95% CI: 1.26-2.00, \(p < 0.001\)) and death (HR 1.40, 95% CI: 1.12-1.75, \(p = 0.003\)). Only in patients with two APOL1 risk alleles was suPAR associated with worsening proteinuria (HR 1.77, 95% CI 1.11-2.82, \(p = 0.016\); \(p_{interaction} = 0.008\)).

**Conclusion:** Our study provides evidence of associations between higher suPAR levels and risk for various adverse outcomes in African Americans with hypertension-attributed CKD, independent of proteinuria and GFR.

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Coffee Consumption and Incident Kidney Disease: Results From the Atherosclerosis Risk in Communities (ARIC) Study

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Background: Moderate coffee consumption has been consistently associated with a lower risk of diabetes, a major precursor to chronic kidney disease (CKD). However, the association between coffee and CKD has not been fully established.

Hypothesis: We hypothesized that coffee consumption was associated with a lower risk of incident CKD after adjustment for major covariates among adults in the Atherosclerosis Risk in Communities (ARIC) study.

Methods: We conducted a prospective analysis of 14,209 participants aged 45-64 years from the ARIC study. Coffee consumption (cups/day) was assessed at visit 1 (1987-89) and visit 3 (1993-95) using food frequency questionnaires. Our primary outcome was incident CKD defined as eGFR <60 mL/min/1.73 m² accompanied by ≥25% eGFR decline, CKD-related hospitalization or death, or end-stage renal disease.

Results: There were 3,845 cases of incident CKD over a median of 24 years of follow-up. Men, whites, current smokers, and participants without comorbidities were more likely to consume higher amounts of coffee per day. After adjustment for demographic, clinical, and dietary factors, higher categories of coffee consumption were associated with lower risk of incident CKD (Table). Compared to participants who never consumed coffee, participants who consumed any amount of coffee had an 11% lower risk of CKD (HR: 0.89; 95% CI: 0.82-0.96; p for trend<0.001). In the continuous analysis, for each additional cup of coffee consumed per day, the risk of incident CKD was lower by 3% (HR: 0.97, 95% CI: 0.95-0.99, p<0.001). Results were consistent across the three progressively adjusted models and in a sensitivity analysis using a secondary definition of CKD. Stratification of analyses by smoking status suggested an inverse association among never smokers and former smokers.

Conclusions: Coffee consumption was inversely associated with incident CKD after adjusting for covariates. Coffee consumption may not adversely affect kidney disease risk and may instead be protective.


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MP09

Geographic Disparities in Rates of End-Stage Renal Disease and Organ Supply in Gulf States Compared to Non-Gulf States
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Background: Organ Procurement Organizations are responsible for procuring and allocating organs for transplantation from deceased donors in Donation Service Areas (DSAs). The Final Rule prohibits geographic disparities in access to organs, but the current kidney allocation system does not account for potential supply variations based on disease burden and other population characteristics within DSAs. As such, regions with traditionally high rates of comorbid disease, such as the Gulf States region, may be disadvantaged if local supply is limited.

Methods: Using data from the 2016 Robert Wood Johnson Foundation County Health Rankings, the Scientific Registry of Transplant Recipients public reports, and the United States Renal Data System, we compared comorbid disease prevalence, rates of end-stage renal disease (ESRD), and expected organ donation rates by Gulf States location.

Results: Prevalence of African American ethnicity, diabetes, fair/poor self-rated health, physical inactivity, food insecurity, and uninsurance were higher among DSAs in the Gulf States region vs. non-Gulf States (Table). Conversely, the prevalence of non-Hispanic White ethnicity, college education, and median household income were higher among non-Gulf States. The rate of ESRD varied by DSA, ranging from < 162 cases per 100,000 to > 225 cases per 100,000 (Figure). Median rate of ESRD was 214.4 per 100,000 among DSAs in the Gulf States, vs. 187.1 per 100,000 in the non-Gulf States (p=0.003). Expected rate of organ donation per 100 eligible deaths was 71.1 in Gulf States and 75.4 in non-Gulf States (p=0.01). Conclusion: Higher rates of ESRD were observed in the Gulf States region, suggesting a greater need for organs than non-Gulf States. However, fewer donors were estimated in Gulf States, likely due to high comorbid disease burden, compared to non-Gulf States. These data suggest the need to examine allocation policy to prevent geographic disparities in access to deceased donor transplantation.


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Increasing Obesity Prevalence in the United States End-stage Renal Disease Population

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Background: Obesity has become a national epidemic, and is associated with increased risk for comorbid diseases including end-stage renal disease (ESRD). Among ESRD patients, obesity may improve dialysis-survival but decreases likelihood of transplantation, and as such, obesity prevalence may directly impact growth of the incident dialysis population.

Methods: Incident adult ESRD patients with complete body mass index (BMI, kg/m²) data were identified from the United States Renal Data System from 01/01/1995-12/31/2010 (n=1,822,598). Data from the Behavioral Risk Factor Surveillance System of the Centers for...
Disease Control and Prevention (n=4,303,471) represented the US population when weighted. Trends in BMI and obesity classes I (BMI of 30-34.9), II (BMI of 35-39.9), and III (BMI ≥40) were examined by year of dialysis initiation. Trends in median BMI slope were compared between the ESRD and US populations using linear regression.

**Results:** Median BMI of ESRD patients in 1995 was 24.2 as compared to 28.0 in 2010, a 15.7% increase, while the US population’s median BMI increased from 24.2 in 1995 to 25.6 in 2010, a 5.8% increase. Comparable trends were noted with respect to prevalence of obesity classes I, II, and III (Table). BMI increase among the ESRD population was significantly more rapid than among the US population (β: 0.15, 95% CI: 0.14-0.17, p<0.001) (Figure).

**Conclusion:** The median BMI of ESRD patients and prevalence of obesity among ESRD patients is increasing more rapidly than the US population. Given the increased dialysis-survival and decreased likelihood of transplantation associated with obesity, healthcare costs will likely increase, and thus, future research should be directed at examining medical expenditures.


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**MP11**

**Serum Metabolites Associate With Kidney Function Among Bogalusa Heart Study Participants**

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Chronic kidney disease (CKD) is an important public health challenge due to its high prevalence, potential for progression to end-stage renal disease, and associated increases in risks of cardiovascular disease morbidity and mortality. While traditional risk factors for reduced kidney function have been identified, the biological pathways underlying this complex phenotype remain largely unknown. A metabolome-wide association study was conducted among 825 white and 436 African-American participants of the Bogalusa Heart Study (BHS) to identify metabolites associated with kidney function. Estimated glomerular filtration rate (eGFR) was calculated among BHS participants using the CKD Epidemiology Collaboration (CKD-EPI) equation. Untargeted, ultra-high performance liquid chromatography tandem-mass spectroscopy was used to quantify 1,466 metabolites. A total of 1,202 metabolites passing rigorous quality control were tested for association with eGFR in race stratified and combined multiple regression analyses that adjusted for age, sex, education, cigarette smoking, alcohol drinking, physical activity, body mass index, and race (in combined analyses). Significant metabolites were identified as those achieving Bonferroni corrected significance (P<4.16×10^-5) in one race group and the entire cohort, with a similar trend observed in the other race group. Results of these analyses are presented in the Figure. Among 302 significant metabolites, 89 were novel and in known metabolic pathways, 106 were novel and in unknown metabolic pathways, and 107 were previously reported. The 89 novel metabolites were classified into the following pathways: 40 in amino acids, 3 in carbohydrates, 7 in cofactors, 1 in energy, 6 in nucleotides, 9 in peptides, and 14 in xenobiotics. In conclusion, the current analysis not only validated previous findings, but identified novel metabolites associated with kidney function. These data provide important
insights into the biological pathways underlying this complex phenotype.

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**MP12**

**Cardiovascular Health Promoting Behaviors in Older Patients With Chronic Kidney Disease**

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**Background:** The chronic kidney disease (CKD) epidemic continues to grow, and cardiovascular disease (CVD) is the leading cause of death. To modify CVD risk, CKD patients are asked to engage in health promoting behaviors. However, older patients with CKD likely face challenges to engage in healthy behaviors due to social and health factors. This study examined the relationship of social and health factors to health promoting behaviors among younger and older CKD patients and the association of these behaviors with CVD events, death, and CKD progression.

**Methods:** Data from the Chronic Renal Insufficiency Cohort (CRIC) Study were analyzed using latent class analysis (LCA) to identify health promoting behavior clusters, stratified by <65 and ≥65 years of age. LCA was based on: BMI of >20 and ≤25kg/m² vs. other, healthy diet vs. not, physical activity ≥150min/week vs. not, blood pressure ≤140/90mmHg vs. greater, never/past smoker vs. current, and <7.0% hemoglobin A1c vs. greater. Social factors (self-efficacy, social support, education, income, insurance) and health factors (depressive symptoms, cognition, co-morbidities) were measured by validated surveys and self-report. Logistic regression assessed the association of social and health factors to the behavior clusters. Cox proportional hazards models estimated risk of clusters to CVD events (myocardial infarction/vascularization, peripheral arterial disease, or stroke), CKD progression (incident end-stage renal disease or 50% decline in eGFR), and death from any cause.

**Results:** All social and health factors significantly differed between age groups. Three clusters with varying levels of engagement in health promoting behaviors were identified separately among <65 and ≥65 years of age. Among <65 years, the cluster with the highest level of engagement in healthy behaviors was associated with more self-efficacy and lower depressive symptoms. In this age group, in multivariable adjusted models, the clusters with less healthy behavior engagement had a statistically significant increased risk of CVD events (32-81%), death (29-78%), and CKD progression (32-38%). Among ≥65 years, the cluster with the highest level of engagement in healthy behaviors was associated with higher self-efficacy, social support, cognition, and less depressive symptoms. In this age group, in multivariable adjusted models, the clusters with less healthy behaviors had a statistically significant 49% increased risk of death.

**Conclusion:** This study demonstrated three clusters of health promoting behaviors that distinguish risk for CVD and other outcomes among older and younger CKD patients. These clusters could identify high-risk groups and be targeted for aggressive management. Clusters with less health promoting behaviors were associated with self-efficacy and depressive symptoms, which could serve as potential targets for intervention.
Comparative Effectiveness of Direct Oral Anticoagulants and Warfarin on Risk of Bleeding Resulting in Hospitalization Among Venous Thromboembolism Patients

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Background: Direct oral anticoagulants (DOACs), including rivaroxaban, dabigatran, apixaban and edoxaban, have been approved as alternatives to warfarin for the primary treatment of venous thromboembolism (VTE). However, understanding of their comparative effectiveness in practice-based populations is limited.

Objective: Among anticoagulant-naïve VTE patients, estimate the association of type of oral anticoagulant (OAC) with the rate of bleeding resulting in hospitalization.

Methods: Patients with VTE and prescription for an OAC were identified from the US Truven Health MarketScan® Commercial and Medicare Supplemental databases for the period from 2011-2015. Hospitalization related to bleeding events (inclusive of intracranial, gastrointestinal and other) was defined using a validated algorithm. In head-to-head comparisons, initiators of a specific OAC were matched with up to 5 initiators of the comparing OAC by age, sex, and time since database enrollment. Cox proportional hazards regression was used to calculate hazard ratios (HR) and 95% confidence intervals (95%CI) for bleeding by OAC, adjusted for age, sex, and a comorbidity propensity score (created using prevalence of 20 common diagnoses and procedures).

Results: The final analysis included 83,831 VTE patients who were 49.9% female and on average (standard deviation) 59.0 (16.0) years old. Of these, the initial OAC prescribed for 2,604 was apixaban, for 1,669 dabigatran, for 28,518 rivaroxaban, and for 48,514 warfarin. A total of 1,947 bleeding events occurred over an average of 13 months. Compared to new warfarin users, risk of bleeding was lower among patients initiating apixaban [HR (95%CI): 0.55 (0.36, 0.83)] and rivaroxaban [0.80 (0.72, 0.89)], but similar among new dabigatran users [0.96 (0.72, 1.27)]. In head-to-head DOAC comparisons, relative to rivaroxaban, risk of bleeding was lower among users of apixaban [0.57 (0.36, 0.89)] but similar for users of dabigatran [1.05 (0.73, 1.51)]. Due to low numbers we did not conduct analyses of edoxaban or a head-to-head comparison of dabigatran versus apixaban.

Conclusion: In this practice-based population of 83,831 patients prescribed OACs for the treatment of VTE, subsequent risk of hospitalized bleeding was lowest among those prescribed apixaban, intermediate among those prescribed rivaroxaban, and highest among those prescribed warfarin and dabigatran. These data demonstrate that differences in bleeding risk exist by DOAC. While risk factors for bleeding might impact choice of warfarin versus the DOACs, the choice between DOACs may be less likely to be based on patient conditions.
Proteinuria is Associated With a Greater Risk of Lower Limb Amputation in Patients With Peripheral Artery Disease

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Introduction: Proteinuria is shown to be associated with increased risk of peripheral artery disease (PAD). However, its association with the risk of lower limb amputation in patients with PAD is unknown. Hypothesis: We hypothesized that proteinuria is associated with the risk of amputation in patients with PAD in a graded fashion. Methods: We identified 3,388 PAD patients with data on urine dipstick proteinuria within two years prior to PAD diagnosis between 1997 and 2017 in the Geisinger Health System (mean age 69.7 years, 44.8% female, 97.4% non-Hispanic White, 57.8% diabetic). We quantified the association of proteinuria with the risk of amputation using Cox proportional hazards models, adjusting for demographics, calendar year, estimated glomerular filtration rate, HbA1c, comorbidities including diabetic retinopathy/neuropathy, and medication use (antiplatelet drug, statin, and renin-angiotensin system inhibitor). Results: There were 55.2% with negative dipstick proteinuria, 11.1% trace, 14.1% with 1+, and 19.5% with ≥2+. A total of 245 patients underwent amputations over a median follow-up of 3.4 years. Incidence rate of amputation was 1.15 per 100 person-years for dipstick negative, 1.47 for trace, 2.11 for 1+, and 3.78 for ≥2+. This dose-response relationship remained similar even after accounting for potential confounders (p-trend=0.015), with particularly evident association for ≥2+ of dipstick (an adjusted hazard ratio of 1.52 [95% confidence interval: 1.08-2.17, p=0.017] (Figure). When we added proteinuria to other covariates, the risk discrimination slightly improved (Δc-statistic 0.007 [0.001-0.014]). Conclusions: Higher proteinuria was associated with a greater risk of lower limb amputation among patients with newly diagnosed PAD. Our results suggest the importance of considering proteinuria in risk assessment of limb loss in PAD patients.


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MP15

Aspirin is Effective in Preventing Venous Thromboembolism After Knee or Hip Arthroplasty

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Introduction: Venous thromboembolism (VTE) is a known complication of major orthopedic surgery. Although guidelines now allow the use of aspirin as an alternative to anticoagulants as VTE prophylaxis after knee or hip arthroplasty, there is limited data on contemporary use and outcomes with aspirin. We conducted a retrospective cohort study to describe antithrombotic agents used after knee and hip arthroplasty and post-operative VTE outcomes. Hypothesis: We assessed the hypothesis that VTE prevention with aspirin was not related to an increased risk of postoperative VTE after knee or hip arthroplasty compared to anticoagulation. Methods: We used data from MedAssets, which is an administrative database containing billing details on the patient-level
from about 400 hospitals in the U.S., and included all adults with a principal hospital discharge diagnosis of knee or hip arthroplasty based on International Classification of Diseases, 9th edition (ICD-9) codes between January 1, 2013, and December 31, 2014. We identified charges for medications used for VTE prophylaxis within 7 days after the index surgery. The primary outcome was postoperative VTE, identified by searching for VTE-specific ICD-9 codes from the index hospitalization, rehospitalization within 30 days, or during an outpatient visit within 90 days. We compared postoperative VTE risk between patients receiving aspirin-only and those receiving anticoagulants using propensity score-adjusted multivariable logistic regression models adjusted for VTE risk factors, hospital characteristics and length of stay. Results: We identified 74,234 patients who underwent knee arthroplasty and 36,192 with hip arthroplasty who received pharmacologic VTE prophylaxis. The most common post-operative anticoagulant medications were warfarin (25.2%; 27,850 of 110,426) and enoxaparin (24.1%; 26,560 of 110,426). Aspirin was used as the sole agent in 27.0% (20,047 of 74,234) of knee and 29.8% (10,769 of 36,192) of hip arthroplasties. Patients receiving only aspirin were younger and had fewer comorbidities compared to those who received anticoagulants. Postoperative VTE events occurred in 495 of 74,234 (0.67%) patients undergoing knee arthroplasty and 145 of 36,192 (0.40%) undergoing hip arthroplasty. Patients who received only aspirin after surgery did not have a higher risk for postoperative VTE compared to patients who received anticoagulants: adjusted odds ratio 0.92; 95% CI, 0.61-1.39 for knee and adjusted odds ratio 0.73; 95% CI, 0.56-0.95 for hip arthroplasty. Conclusions: In conclusion, aspirin was the most frequently administered individual antithrombotic agent in a large contemporary sample of U.S. patients undergoing knee or hip arthroplasty. Postoperative VTE prophylaxis with aspirin-only may be a safe option in this population and was not associated with a higher risk of postoperative VTE compared to anticoagulants.

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Trends in Statin Utilization Among Adults With Severe Peripheral Artery Disease Including Critical Limb Ischemia in an Integrated Healthcare Delivery System

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Background: Studies have demonstrated benefit of statin therapy in patients with peripheral artery disease (PAD). However, use of statins in patients with PAD has been found to be suboptimal. We examined trends in statin use and discontinuation among adults with severe PAD including critical limb ischemia (CLI) from 2002-2015. Methods: Using electronic health record data from a large, integrated healthcare delivery system, we identified patients aged ≥40 yrs with incident severe PAD/CLI and 12 months of prior continuous coverage of health and drug benefits. Statin intensity was defined at first prescription fill. Discontinuation of statin therapy was defined as the first 90-day gap in treatment within 1 yr after diagnosis. Results: We identified 11,059 patients with incident severe PAD/CLI from 2002-2015. Mean (SD) age was 69 (11.3) yrs, 40% were female, 54% were White, 23% Hispanic, 16% Black and 4% Asian/Pacific
Islander. Statin use in the yr before diagnosis increased from 50% in 2002 to 66% in 2015. Overall, 60% (n=6578) were on a statin in the yr before diagnosis. Of these patients, 18%, 54% and 28% were receiving high, moderate and low intensity statins, respectively. The proportion of patients on high intensity statins increased from 7.3% in 2002 to 41.9% in 2015 while the proportion on low intensity statins decreased (Figure). Of the 40% (n=4481) who were not on a statin in the yr before diagnosis, 13.5% (n=607) newly initiated statin therapy within 1 month after diagnosis. The proportion of patients with no statin use increased with increasing LDL-C, while the percentage with any statin use decreased (Figure). Following diagnosis of PAD/CLI, 13% discontinued statin therapy within 1 yr. **Conclusions:** Use of statins and high intensity statins increased from 2002-2015 among a population of patients with severe PAD including CLI. However, a substantial proportion remained untreated with statins, representing a significant treatment gap in this population at high risk for cardiovascular events and adverse limb outcomes.

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**MP17**

**Galectin-3 and Subsequent Risk of Lower-extremity Peripheral Artery Disease: The Atherosclerosis Risk in Communities (ARIC) Study**

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**Background:** Galectin-3 is involved in the regulation of inflammation and the formation of fibrosis and has been linked to atherosclerosis. However, there are no studies investigating prospective associations of galectin-3 with incidence of lower-extremity peripheral artery disease (PAD).

**Methods:** Among 9,827 ARIC participants without a history of PAD, we investigated whether galectin-3 (measured at visit 4 [1996-98]) was associated with incident clinical PAD through 2013, defined as hospitalizations with PAD diagnosis or leg revascularization. We defined PAD cases with rest pain or tissue loss as critical limb ischemia (CLI). We constructed Cox models with galectin-3 modeled categorically (quartiles) and continuously (log transformed).

**Results:** During a median follow-up of 15.8 years, 287 participants developed PAD (105 incident CLI cases). In demographically adjusted
models, galectin-3 demonstrated a dose-response association with incident PAD: hazard ratios (HRs) 2.55 (95% CI 1.80-3.61) and 1.69 (1.18-2.41) for the highest and second highest quartiles, as compared to the lowest quartile (Table; Model 1). Additional adjustment for traditional cardiovascular risk factors attenuated the associations, although the highest quartile remained borderline significant (HR 1.44 [0.99-2.07], p=0.051, Table: Model 2) and galectin-3 as a continuous variable remained significant (1.15 [1.02-1.29]). Similar results were observed for the association of galectin-3 with CLI.

Conclusions: Galectin-3 was modestly associated with future risk of clinical PAD events in a community-based cohort, supporting the involvement of inflammation and fibrosis in the development of clinical PAD.


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MP18

The Risk of Venous Thromboembolism is Lower in Multiple Asian Ethnic Groups

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Background: Several studies suggest a lower risk of venous thromboembolism (VTE) in Asians compared to other racial groups, and genetic mechanisms have been suspected. Despite their biological and cultural diversity, data have been sparse comparing risk of VTE among specific Asian ethnicities. Our previous report from 2000 on hospitalizations for VTEs in Asian Americans had included 337 subjects (all races) and numbers were insufficient to study specific Asian groups. We present here data from a new study with 4,674 VTE subjects.

Hypothesis: Similar low VTE risk is present in multiple Asian ethnic groups.

Methods: We studied composite VTE risk in 61,459 members of a comprehensive health plan, who had supplied self-classified ethnicity data on prior health examinations between 1978 and 1985 and had remained plan members in 1996, when outpatient diagnoses were added to computerized files. The subjects were 58% (n = 35,573) female and 42% (n= 25,886) male. From 1996 through 2015, at least one diagnosis of VTE was made during an outpatient visit or hospitalization for 4,675 persons. With Whites as the referent group, we performed logistic regressions controlled for age, sex, education, BMI, and smoking, yielding hazard ratios (HR) and 95% confidence intervals (CI).

Results: The table shows HRs (CI) versus Whites (n=32,557) with 2,576 VTE. These lower HRs for VTE in Asians were generally similar in men and women. In the Asian stratum, a model with Chinese as referent showed an increased HR = 1.87 (1.09-3.21; p=0.02) for South Asians. Among covariates sex, education, and smoking were unrelated to VTE risk and BMI was positively associated; these results were similar in Whites, Blacks, and Asians.

Conclusions: In conclusion, Chinese, Japanese, Filipinos and Other Asian Americans but not South Asians had substantially lower VTE risk compared to Whites. These data indirectly support a genetic explanation.
Can Clinical Measurements of Blood Pressure Replace Research-based Measurements?

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Introduction: There is growing interest in embedding research protocols into clinical practice, including use of electronic health records (EHR) for measures of blood pressure (BP). However, the accuracy and reliability of EHR-derived BP compared to research-based BP are unknown.

Hypothesis: We hypothesized EHR-derived measurements would overestimate systolic BP (SBP) and have higher variance compared to research measurements.

Methods: We analyzed EHR-derived BP and research BP measurements in participants from a randomized trial, Five+ Nuts and Beans. EHR-derived measurements were made following the implementation of a standardized BP protocol, including the use of automated devices, clinical training, and systems support, to enhance the quality of clinic BP measurements. EHR-derived SBP measurements and change in SBP, calculated from closest clinic visits prior to the start and after the end of the trial period, were compared with measures obtained in the research setting.

Results: Participants were 87% female (107 of 123); mean age was 58.6±9.7 yrs. Of the 123 participants, 118 had at least one primary care visit within 6 months of the research period. EHR-derived SBP were higher and more variable than research measurements, though these differences were attenuated for visits occurring within 7 days of research measurements (Table 1). EHR-based change in SBP was also more variable (SD=19.6) than research-based change (SD=14.0); using these SD’s, we estimate that a 2-arm trial conducted with clinic measurements would need to enroll 95% more participants (324 vs 166) to detect a 5 mmHg difference in SBP at a power of 0.9.

Conclusions: Despite implementation of a standardized BP protocol, clinic measurements of SBP were higher and more variable than research protocol-based measurements. These results suggest that, in clinical trials, use of BP measurements obtained in clinical care, even if standardized, will reduce power and require greater sample size compared to measurements obtained in research settings.

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Introduction: Recent studies report an association between neighborhood residence and health outcomes. There is less information on the relative utility of neighborhood socioeconomic status (nSES) in models that predict future health outcomes and the impact that age may have on this.

Objective: To quantify if nSES data alone or in concert with electronic health record (EHR) data can improve risk prediction for myocardial infarction (MI) and stroke beyond current models. Methods: Neighborhood SES was derived using the AHRQ SES index. Clinical and demographic data was obtained from the EHR of patients seen at the Duke University Health System from 2009-2015; it was split into a training set (2009-2012) and testing set (2012-2015). Age (in yrs) was categorized as young (18-44), middle age (45-64), and old (≥65). Logistic regression models were fit for each outcome over 6 time horizons (30, 90, & 180 days; 1, 2, & 3 years) using machine learning methods (least absolute shrinkage and selection operator [LASSO]) for model selection to determine if nSES improved discrimination, as measured by the c-statistic. Results: Of 106703 patients, 63% were female, 41% were Black, 2.6% had CVD, 12% had diabetes, and 29% had hypertension at baseline with mean age of 47 years. The majority of the correlation between EHR variables and nSES ($r^2=0.31$) was explained by demographic information within the EHR ($r^2=0.29$; $p<0.01$). In LASSO models incorporating EHR and SES data, EHR variables (e.g., comorbidities) were frequently selected while nSES variables (e.g., AHRQ SES index) were rarely chosen. The c-statistic for predicting MI and stroke when using nSES data with and without EHR data was higher in middle aged and older patients as compared to younger patients (Figure). Conclusions: The added value of nSES was less than expected as much variability in nSES may be phenotyped through demographic information in the EHR. In discrete instances, nSES can improve risk prediction but varies by age, clinical outcome, and time horizon.

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Feasibility of Electronic Health Records-based community surveillance of cardiovascular disease: Findings from the Atherosclerosis Risk in Communities Study.

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Background: Accurate community surveillance of cardiovascular disease requires hospital record abstraction, which is typically a manual process. The costly and time-intensive nature of manual abstraction precludes its use on a regional or national scale in the US. Whether an efficient system can accurately reproduce traditional community surveillance methods by processing electronic health records (EHRs) has not been established.
Objective: We sought to develop and test an EHR-based system to reproduce abstraction and classification procedures for acute myocardial infarction (MI) as defined by the Atherosclerosis Risk in Communities (ARIC) Study.

Methods: Records from hospitalizations in 2014 within ARIC community surveillance areas were sampled using a broad set of ICD discharge codes likely to harbor MI. These records were manually abstracted by ARIC study personnel and used to classify MI according to ARIC protocols. We requested EHRs in a unified data structure for the same hospitalizations at 6 hospitals and built programs to convert free text and structured data into the ARIC criteria elements necessary for MI classification. Per ARIC protocol, MI was classified based on cardiac biomarkers, cardiac pain, and Minnesota-coded electrocardiogram abnormalities. We compared MI classified from manually abstracted data to (1) EHR-based classification and (2) final ICD-9 coded discharge diagnoses (410-414).

Results: These preliminary results are based on hospitalizations from 1 hospital. Of 684 hospitalizations, 355 qualified for full manual abstraction; 83 (23%) of these were classified as definite MI and 78 (22%) as probable MI. Our EHR-based abstraction is sensitive (>75%) and highly specific (>83%) in classifying ARIC-defined definite MI and definite or probable MI (Table).

Conclusions: Our results support the potential of a process to extract comprehensive sets of data elements from EHR from different hospitals, with completeness and accuracy sufficient for a standardized definition of hospitalized MI.


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Feasibility of Electrocardiographic Identification and Classification of Myocardial Infarction Using Electronic Health Records. The Atherosclerosis Risk in Communities Study (ARIC)

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Background: Standardized coding of 12-lead electrocardiograms (ECGs) enables an accurate classification of hospitalized myocardial infarction (MI). Although the costs of ECG coding are difficult to sustain in long-term community surveillance, automated protocols for identifying and classifying MI using electronic health records (EHR) have not incorporated ECG coding. We developed a process to retrieve and automatically code ECGs from EHR and compared its performance to ECGs coded at a specialized ECG reading center.

Methods: Samples of EHR pertaining to hospitalizations previously included in hospital record abstraction and Minnesota coding of ECGs per the ARIC protocol were obtained. We assigned Minnesota codes (MCs) to the terms used by manufacturers of three ECG devices to
interpret ECGs, extracted machine interpretation text from the EHR, and applied natural-language processing to match the interpretations to MCs. We defined MI by MCs as any major Q code (1.1.x, 1.2.x), or the co-occurrence of any minor Q (1.3.x) and major ST segment depression (4.1, 4.2) or T wave inversion code (5.1, 5.2). MI algorithmically ascertained from EHR was then compared to that based on MCs assigned by the ECG reading center.

**Results:** Among 160 hospitalizations from 149 individuals admitted in 2014 to one hospital, ECG interpretations were matched to a median of three Minnesota-coded terms. There was moderate-to-substantial agreement between EHR-derived and ARIC-assigned MI by MC ($\kappa=0.60$, 95% CI: 0.41, 0.79). Thirteen (81%) of the 16 ECGs with ARIC-assigned MCs defining MI also had EHR-derived MCs defining MI (Table 1). The corresponding specificity, positive predictive value, and negative predictive value were 0.92±0.02, 0.56±0.12, and 0.97±0.01.

**Conclusion:** Novel, EHR-based automated approaches to electrocardiographic identification and classification of MI are feasible, relatively accurate even without pending refinements, and promise to reduce the effort and costs associated with population-based MI surveillance.


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**MP23**

**Completeness in the Abstraction of Cardiac Biomarkers and Cardiac Pain Data From**

**Electronic Health Records (EHR). Findings From the Atherosclerosis Risk in Communities (ARIC) Study**

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**Background:** Calibration of case-finding algorithms from electronic health records (EHR) against established disease surveillance protocols is key to avoiding misclassification bias when using EHR data in epidemiological research. We examined the agreement in the classification of troponin I levels and identification of cardiac pain in hospital EHR data against manually abstracted charts for hospitalizations observed by the ARIC community surveillance of cardiovascular events.

**Methods:** A structured data request for laboratory data and provider notes was submitted to hospitals in the ARIC community surveillance program. Computer programs were developed to extract dates of service, type of laboratory assays performed, and individual assay values for days 1-4 of each hospitalization. Presence of cardiac pain was extracted from provider notes using natural language processing protocols. We calculated percent agreement for troponin I values, kappa statistics for their classification as abnormal (values ≥ twice upper limit normal (ULN)), equivocal (values ≥ULN, but < twice ULN) normal (<ULN), and incomplete, and validity statistics for cardiac pain. Abstraction of information from the medical records by trained abstractors was considered the “gold standard” for comparisons. The analysis sample consisted of all events eligible for full abstraction discharged from one hospital in 2014. Analytical code was created using a “training” dataset randomly-selected from the analysis sample, with the final results computed.
using a validation sample.

**Results:** Of the 126 EHRs, 104 were eligible for abstraction of cardiac biomarkers and pain information. Agreement in the troponin I values was 75.5% (95% CI: 65.8%, 83.6%) for day 1 of the hospitalization, decreasing thereafter to 62.5% (95% CI: 24.5%, 91.5%) for Day 4. The kappa coefficient for the classification of troponin I values was 0.96 (95% CI: 0.90, 1.00), We observed a high sensitivity in the abstraction of information on cardiac pain (0.99 (95% CI: 0.94, 1.0)). The specificity of cardiac pain information was 0.24 (95% CI: 0.16, 0.35) when extracted from all note types, increasing to 0.90 (95% CI: 0.75, 0.97) if extracted from discharge notes.

**Conclusion:** Troponin I values and manifestation of ischemia such as cardiac pain are critical to the classification of acute coronary events. Therefore, the observed excellent agreement with the gold standard ARIC abstraction shows promise for the use of EHRs in the surveillance of acute cardiovascular disease.

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**MP24**

**Comparison of on-site versus Remote Support for a Mobile-Device Pilot Study: A Collaboration Between the Framingham Heart Study and Health eHeart Study (FHS-HeH)**

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**Background:** New “e-Cohort” study designs provide resource-effective methods for collecting participant data. It is unclear if implementing an e-cohort without direct, in-person participant contact can achieve successful participation rates. The FHS-HeH randomized pilot study compared two distinct implementation strategies for co-enrolling participants from the Framingham Heart Study (FHS) into the Health eHeart Study, a digital cohort with infrastructure for collecting mHealth data. **Methods:** FHS participants who had an email address and smartphone were randomized to one of two approaches: remote vs. on-site support. In the remote arm, participants received an email containing an enrollment URL, and, upon enrollment, were sent four Bluetooth sensor devices. Participants in the on-site arm were invited to visit FHS and were provided in-person support for enrollment and connecting the devices. **Results:** Compared to participants that declined, individuals that accepted an invitation to participate in our pilot study (n=101 remote, n=101 on-site) were more often women, highly educated, and younger (Figure 1). All on-site participants completed the consent, compared to 93% of the remote arm. Of participants who consented to participate, connection and initial use of devices was also higher in the on-site arm (100% connected the activity monitor, 94% the blood pressure cuff and scale, and 84% the electrocardiogram) compared to the remote arm (74%, 75%, 80%, and 42%). Roughly 75-78% of those that initially connected in both arms were still using the devices by the 3rd month and 58-60% were still participating by the 6th month. **Conclusions:** Our pilot study demonstrated that deployment of mobile devices among middle-aged and older adults in the context of an on-site clinic visit was associated with higher initial rates of device use as compared to offering only remote support.
Once connected, drop-off rates were similar in both groups.

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MP25

Obesity, Heart Failure Risk & Cardiorespiratory Fitness

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Introduction: Obesity, defined as body mass index (BMI) ≥30 kg/m², is associated with increased incidence of heart failure (HF). Increased cardiorespiratory fitness (CRF), as indicated by increased exercise capacity, is associated with lower risk of cardiovascular disease and HF. However, the CRF-BMI-HF interaction has not been fully explored.

Hypothesis: We assessed the hypothesis that the risk of HF associated with increased BMI is moderated by increased CRF.

Methods: We identified 19,881 Veterans (mean age: 58.0±11.3 years) who completed an exercise tolerance test (ETT) to assess either CRF status or suspected ischemia at two VA Medical Centers (Washington DC and Palo Alto, CA). None had documented HF at baseline or evidence of ischemia during the ETT. We established four BMI categories: <25 kg/m²; 25-29.9 kg/m²; 30-34.9 kg/m²; and ≥35 kg/m². In addition, we established four CRF categories based on age-stratified quartiles of peak metabolic equivalents (METs) achieved (mean ± SD): Least-Fit (4.5±1.2 METs; n=4,743); Low-Fit (6.6±1.3; n=5,103); Moderate-Fit (8.0±1.3 METs; n=5,084); and High-Fit (11.1±2.4 METs; n=4,951). Multivariable Cox models were used to estimate hazard ratios (HR) and 95% confidence intervals [CI] for incidence of HF across BMI categories for the entire cohort, using BMI 25-29.9 kg/m² (lowest HF rate) as the reference group. We then stratified the cohort by the four BMI categories and assessed HF risk across CRF categories within each stratum, using the Least-fit category as the reference group. The models were adjusted for age, race, gender, cardiac risk factors, sleep apnea, alcohol dependence, medications.

Results: During follow-up (median=11.8 years), 2,193 developed HF (10.5 per 1,000 person-years of follow-up). The HF risk for normal weight individuals (18.5-24.9 kg/m²) was 10% higher (p=0.93). For obese individuals, the HF risk was 22% higher in those with BMI 30-34.9 kg/m² (HR=1.22; 95% CI: 1.09-1.35) and 50% higher (HR=1.50, 95% CI: 1.32-1.72) for those with BMI ≥35 kg/m². When CRF (peak METs achieved) was introduced in the model, the risk for those with BMI 30-34.9 was reduced from 22% to 16% (HR=1.16; 95% CI: 1.04-1.29) and from 50% to 29% (HR=1.29; 95% CI: 1.13-1.48) among those with ≥35 kg/m². For every 1-MET increase in exercise capacity, HF risk was 15% lower (HR=0.85; 95% CI: 0.83-0.87). We then assessed the impact of CRF on the risk of HF within each of the four BMI categories. The HF risk declined progressively (range: 25% to 69%; p<0.01) with increasing fitness within all BMI categories.

Conclusions: The obesity-associated increased risk of HF was attenuated by increased CRF. The
HF risk was progressively decreased with increased CRF within all BMI categories.

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**MP26**

**Obesity is Associated With Accelerated Epigenetic Aging in Midlife: The Coronary Artery Risk Development in Young Adults (CARDIA) Study**

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Background: Obesity is associated with increased risk of cardiovascular and other age-related diseases that may represent accelerated aging. As methylation levels in DNA change with aging, epigenetic age (EA), which integrates whole-genome methylation has emerged as a novel biomarker of aging and has been associated with mortality and age-related morbidity. Epigenetic age acceleration (EAA), is based on the residual value of 353 previously defined methylation markers regressed on chronologic age (CA), and is thus independent of CA. Therefore, we sought to examine the association of obesity and EAA in midlife.

Methods: A subset of participants in the CARDIA cohort (n=1200) randomly selected (balanced on race and sex) underwent genome-wide DNA methylation profiling with the Illumina EPIC array from exam year 15 (2000-01 [age 33-45 years]) and 20 (2005-06 [38-50 years]) for calculation of EAA. Body mass index (BMI) was measured at Y15 and Y20, respectively. We used linear regression to examine the association of obesity (independent variable) with EAA after adjusting for CA, race, sex, education, study center, smoking status, physical activity, and alcohol intake. Results: Participants were 52% female and 41% black and had mean BMI 28.5±6.2 kg/m² at Y15 and 29.2±6.4 kg/m² at Y20. At Y15, participants who were obese had 1.04 (0.38) years higher EAA compared to normal BMI participants (p<0.01, Figure). Similar results were observed at Y20. Results were similar when evaluating the association of BMI continuously with EAA (p<0.05). Conclusions: EAA is a promising molecular biomarker of aging associated with obesity. Changes in DNA methylation may serve as an intermediate phenotype prior to the onset of age-associated pathologies related to obesity.

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**MP27**

**Weight Change, BMI, and Mortality Among Survivors of Myocardial Infarction: Analysis of Two Prospective US Cohort Studies**

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Background: The relation between BMI, weight change and mortality among survivors of Myocardial Infarction (MI) remains controversial, with some studies reporting favorable survival outcomes among overweight and obese patients, as compared to those with
normal weight. We aim to examine the relationship between BMI reported shortly before and after MI diagnosis in addition to weight change with all-cause and cardiovascular disease (CVD) mortality among MI survivors.

**Methods:** Using the data from Nurses’ Health Study (NHS) and Health Professionals Follow up Study (HPFS) cohorts, we studied 4278 participants who were free of CVD and cancer before their MI. Weight change (in BMI units) was categorized as loss of (> 4, 2-4, <2-0 (reference)), or gain of (0.1-2, or >2) units. Multivariable Cox models were used to estimate hazard ratios and 95 % confidence interval for mortality across BMI/weight change categories.

**Results:** During up to 36 (NHS) and 28 (HPFS) years of follow-up post-MI, there were 2071 all-cause and 835 CVD deaths. Overweight patients with BMI before or after MI of 25-27.49 kg/m² had decreased mortality as compared to normal weight patients (22.5-24.9 kg/m²). All-cause mortality increased progressively with higher BMI. Obese patients (BMI≥30) had the highest risk of CVD mortality (HR=1.35; 95% CI, 1.06-1.73). Among MI patients who had never smoked (N=1484) or were younger than 65 years of age at the time of diagnosis (N=1873), no survival advantage was observed for overweight/obese patients. Compared to stable weight (a BMI reduction of 0-1.99 units) from before to after MI, a reduction of 2-4 or >4 BMI units was associated with increased mortality (HR=1.12; 95% CI, 0.96-1.29 and 1.42; 95% CI, 1.17-1.71 respectively, Figure).

**Conclusions:** We observed a J-shaped association between BMI and mortality among all MI patients, but not among those who had never smoked or were younger than 65 years of age. Weight loss associated with acute MI, potentially related to disease severity, is an important predictor of higher mortality.

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**MP28**

**Cardiorespiratory Fitness Attenuates Risk of Cancer in Obese**

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**Introduction:** An association exists between being overweight and obese and an increased risk of certain types of cancers. In recent years even though there has been a decline in cancer rates in the general population, cancer rates in the overweight and obese have increased. Specific factors that may protect obese individuals against cancer have not been identified. **Hypothesis:** We assessed the hypothesis that improved cardiorespiratory fitness (CRF) will attenuate the risk of obesity associated cancer. **Methods:** We studied a total
of 6,830 obese Veterans aged 56.2 ±10.4 years, of whom 67.2% (6471 of 6830) were African-American, 94.7% (4581 of 6830) males, 57.4% (3921 of 6830) smokers, 94.4% (6439 of 6830) with a past history of alcohol or drug use and 60.0% (4100 of 6830) were on statins. Obesity was defined as body mass index (BMI) ≥30.0 kg/m² and mean BMI for the cohort was 34.4±4.2 kg/m². None of the patients had a diagnosis of cancer at baseline. Participants completed a maximal exercise tolerance test (ETT) as a part of clinical evaluation at either the Department of Veterans Affairs Medical Centers in Washington, DC or Palo Alto, CA and metabolic equivalents (METs) were estimated based on peak exercise time and treadmill grade. Based on these METs achieved on ETT, patients were divided into 4 age-based CRF categories (mean ± SD): least-fit (4.8±1.3 METs; n=1978), low-fit (6.8±1.2 METs; n=2210), moderately-fit (8.3±1.2 METs; n=1674), and high-fit (11.1±2.2 METs; n=968). Multivariable Cox models were used to estimate hazard ratios (HR) and 95% confidence intervals (CI) for incidence of cancer across these age-based fitness categories for the entire obese cohort, using least-fit as the reference group. The models were adjusted for age, race, gender, smoking, alcohol and drug use. Results: During a median follow-up of 11.1 years, 9.5% (646 of 6830) of the cohort developed cancer with an event rate of 8.0 per 1000-person years of follow-up. An inverse and graded association was observed between CRF and cancer rates. The adjusted risk of cancer was 15% lower for each 1-MET increase in exercise capacity (HR=0.85; CI: 0.82-0.89). When incidence rates were assessed across CRF categories using the least fit as the referent group, the incidence of cancer was 31% lower in the moderately-fit group (HR=0.69; 95% CI: 0.56-0.86) and 81% lower in the high-fit group (HR=0.19; 95% CI: 0.12-0.29). Conclusions: CRF was inversely associated with rate of cancer in obese Veterans. For each 1-MET increase in fitness, cancer rate was 15% lower.
were compared between phenotypes using linear or logistic regression (adjusted for sex, race, baseline BMI, age). Multinomial logistic regression analysis was used to determine which factors [obesity duration, BMI change (ΔBMI), obesity onset age, physical activity (PA), alcohol intake, smoking] associated with transient MHO and MUO, relative to stable MHO.

**Results:** Participants were 55% black and 72% women. Relative to transient MHO (n=184, 25%), stable MHO (n=347, 47%) had 5.4±0.5 yrs later obesity onset, 3.4±0.4 kg/m<sup>2</sup> smaller ΔBMI, 5.6±0.5 yrs shorter obesity duration, and 2.4±0.5 yrs longer MHO duration (all p<0.0001), with no significant differences for PA (moderate, vigorous or total), alcohol or smoking. Relative to stable MHO, transient MHO were less likely to be female, but more likely to smoke, have increased obesity duration and ΔBMI. Relative to stable MHO, MUO (n=204, 28%) were less likely to be female or black, more likely to smoke, have lower total PA, lower alcohol, and increased ΔBMI (Table 1).

**Conclusion:** Obesity duration, ΔBMI and smoking were the strongest correlates of transition from MHO to MUO. MUO were more likely to have adverse health factors. Additional research should explore the cardiovascular consequences of the transition of MHO to MUO.

**Table 1.** Multinomial logistic regression: examining obesity status from childhood to adulthood phenotype

| Phenotype | Transient MHO vs. Stable MHO | Transient MHO vs. MUO | p-value | Transient MHO vs. Stable MHO | p-value | p-value |
|-----------|-----------------------------|-----------------------|---------|-----------------------------|---------|
| Race (white vs. nonwhite) | 0.01 (0.01-0.02) | 0.01 | 0.01 (0.01-0.02) | 0.01 | 0.01 |
| Gender (male vs. female) | 0.03 (0.03-0.04) | 0.03 | 0.03 (0.03-0.04) | 0.03 | 0.03 |
| BMI change (ΔBMI) | 0.01 (0.01-0.02) | 0.01 | 0.01 (0.01-0.02) | 0.01 | 0.01 |
| Obesity duration (yrs) | 0.02 (0.02-0.03) | 0.02 | 0.02 (0.02-0.03) | 0.02 | 0.02 |
| Obese adult (yes vs. no) | 0.02 (0.02-0.03) | 0.02 | 0.02 (0.02-0.03) | 0.02 | 0.02 |


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**MP30**

**Longitudinal Tracking of Obesity From Childhood and Adolescence Into Adulthood: The International Childhood Cardiovascular Cohort (i3C) Consortium**

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Obesity in childhood and adolescence tracks into adulthood. However, limited longitudinal data exist on variation in tracking in relation to pediatric development periods, race, and gender. The study objective was to relate adult (age>30) weight status to that in childhood (3-11, mean 8.5 yrs; adult 36.6 yrs; N=4,511) and adolescence (12-17, mean 14 yrs; adult 39.9 yrs; N=7,215) from seven i3C cohorts. Overall tracking of BMI into adulthood was highly significant (p<0.0001) and similar from childhood and adolescence. Almost all obese children (74.3%) and adolescents (81.6%) became obese adults, and few obese children (6.5%) or adolescents (4.2%) became normal-weight adults. Overweight children and adolescents also were more likely to become obese adults (60.7% and 65.2%, respectively), and few became normal weight (11.7% and 6.6%). Normal weight children and adolescents tended to remain normal weight into adulthood (43% and 40.3%), but 22.7% of both normal-weight children and adolescents became obese. Patterns differed by race and gender (both p<0.001). Obese adolescent females had the highest persistence of obesity in adulthood.
(84.2%), followed by obese adolescent males (79.3%), obese male children (78.1%) and obese female children (70.6%). Normal weight male and female children and adolescents had a similar low prevalence of obesity as adults (22-23%), but females were more likely than males to remain normal weight from childhood (51.2% and 33.1%) and adolescence (48.7% and 30.6%). Tracking by race (see Table) showed that blacks had greater risk of adult obesity regardless of childhood or adolescent weight category. The results show that: 1) almost all obese and most overweight children and adolescents became obese adults; 2) one-fifth of white normal weight children and adolescents became obese adults; 3) even normal weight black children and adolescents are at significant risk of becoming obese adults. These data strongly suggest the need for early intervention to prevent adult obesity-related morbidity.


Funding: No

Funding Component:

MP31

State-Level Impact of Low Physical Activity on All-Cause Disease Burden

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Introduction
While a consensus for the beneficial effects of physical activity exists, the optimal level of exercise and its effect on the disease burden across all states of the United States has not been evaluated.

Objective
To systematically quantify the attributable burden to physical inactivity in all states of the United States by age, sex, year, and cause.

Methods
We obtained data on categorical prevalence of domain-specific and total physical activity levels from nationally or subnationally representative surveys. Risk-outcome effect sizes of total physical activity were gathered from a meta-analysis of prospective cohort studies. The optimal level of physical activity was determined based on the activity levels associated with lowest risk of mortality in prospective observational studies. A comparative risk assessment analysis then quantified the proportion of death and disability attributable to low physical activity. The variation of physical activity levels and its associated burden was further evaluated across each state of the United States.

Results
In 2016, physical inactivity accounted for 87 (95% UI: 122.6-44.5) thousand DALYs in the United States (84.4% from CVD, 9.1% from DM, and 6.5% from cancers), with 59% of DALYs coming from men and 41% in women. Only 5 states (WY, ME, MT, AK, VT) demonstrated mean total physical activity levels above our suggested physical activity level of 3500 MET-mins per week. The highest burden attributable to physical activity was seen in Mississippi, while the lowest was seen in Colorado (955 & 458 DALYs per 100,000, respectively).

Conclusion
Our findings suggest that population inventions to increase physical activity at the population level could save hundreds of thousands of life years across the United States.
Disclosures: P. Sur: None. A. Afshin: None.

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MP32

Muscular Strength and Type 2 Diabetes Prevention

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Introduction: There is little evidence on the effects of muscular strength, independent of cardiorespiratory fitness, on the development of type 2 diabetes. Hypothesis: We hypothesised that muscular strength, independent of cardiorespiratory fitness, has significant benefits in type 2 diabetes prevention. Methods: Participants were 5,578 men and women aged 18 to 100 years (mean age, 44) who received preventive medical examinations during 1980-2006 in the Aerobics Center Longitudinal Study. Participants were free of myocardial infarction, stroke, cancer, and diabetes at baseline. Total body muscular strength was quantified by combining 1 repetition maximum (1-RM) measures for leg and bench presses and categorized into three groups, lower (weak), middle, and upper (strong), based on the tertiles (thirds) of muscular strength. Cardiorespiratory fitness was measured by a maximal treadmill exercise test. Type 2 diabetes was defined as a fasting plasma glucose level of ≥126 mg/dl, a history of diabetes, or current insulin therapy. Cox regression was used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) of incident type 2 diabetes by muscular strength after adjusting for baseline age, sex, examination year, body mass index (BMI), current smoking, heavy alcohol drinking, parental history of diabetes, hypertension, hypercholesterolemia, glucose level, and maximum treadmill test time. Results: During an average follow-up of 8 years, 270 (4.8%) individuals developed type 2 diabetes. Compared with the individuals in the lower third of muscular strength, individuals in the middle third had a 30% lower risk of developing type 2 diabetes (HR: 0.70, 95% CI: 0.51-0.95), whereas no significant benefit was found in individuals in the upper third (HR: 1.16, 95% CI: 0.86-1.57) after adjusting for potential confounders and cardiorespiratory fitness. We found similar results in men and women, young (<50 years) and old (≥50 years), and normal (BMI <25 kg/m²) and overweight/obese (BMI ≥25 kg/m²) individuals. In the combined analysis of muscular strength and cardiorespiratory fitness, we also found similar results that individuals in the middle third of muscular strength showed lower risks of developing type 2 diabetes in both low (lower 50%) and high (upper 50%) cardiorespiratory fitness, compared with individuals in the lower third of muscular strength and low cardiorespiratory fitness. Conclusions: We found that a moderate level of muscular strength, independent of cardiorespiratory fitness, is associated with a lower risk of developing type 2 diabetes. Additional studies on the dose-response relationship of muscular strength and incident type 2 diabetes are warranted.

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MP33

Association Between Twenty-year Trajectories of Physical Activity From Midlife to Old Age and Cardiovascular Disease Risk Factors: A 20-Year Cohort Study of British Men

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Introduction: Maintenance of physical activity during later life is associated with reduced risk of cardiovascular disease; however, how long-term trajectories of physical activity into old age are associated with established and novel cardiovascular disease risk factors remains unclear. This study examined the association between 20-year physical activity trajectories and a wide range of cardiovascular disease biomarkers in early old age.

Hypothesis: We assessed the hypothesis that persistent long-term physical activity from midlife to old age is associated with the lowest levels of cardiovascular disease risk factors in old age.

Methods: 7735 men (mean baseline age 50.2 ± 5.8 years) recruited in 1978-80 were followed up after 12, 16 and 20 years, reporting habitual physical activity levels at each wave. At the 20-year follow up, surviving men also attended a physical examination and provided a fasting blood sample. Initially, group-based trajectory modelling was used to identify the trajectories of physical activity. Then regression analyses were used to examine the association between trajectory group membership and a number of cardiometabolic, cardiac and inflammatory markers. Analyses were adjusted for a range of sociodemographic, health and lifestyle factors and use of blood pressure-lowering and antihypertensive drugs.

Results: A total of 3228 men providing physical activity data at ≥3 time points with cardiovascular biomarker data were included in the analysis. Three distinct 20-year trajectories were identified: low decreasing (20.1%), light stable (52.7%) and moderate increasing (27.2%). In comparison to the low decreasing group, membership of the light stable and moderate increasing physical activity trajectory groups was associated with a more favourable cardiometabolic profile, including lower HbA1C and insulin; lower levels of inflammation, including lower levels of interleukin 6 and C-reactive protein; and lower levels of the cardiac marker high-sensitivity troponin T. The magnitude of the associations was similar for the light stable and moderate increasing groups.

Conclusion: In conclusion, twenty-year trajectories of physical activity from midlife to old age were associated with established and novel cardiovascular disease risk factors. Effect sizes were similar for members following a light stable and a moderate increasing physical activity trajectory, suggesting that even relatively light but persistent physical activity into old age can be a determinant of lower cardiovascular disease risk.


Funding: No

Funding Component:

MP34

Tai Chi Exercise is More Effective Than Brisk Walking in Reducing Cardiovascular Disease Risk Factors

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Background: Physical inactivity is one of the major modifiable lifestyle risk factors associated with cardiovascular disease (CVD). Tai Chi (TC) is safe and popular among older adults; yet direct comparisons between TC and brisk walking (BW) on reducing CVD risk factors are lacking.

Methods: A total of 246 adults (mean age=64.4±9.8 years, 45.5% men) with hypertension and two other CVD risk factors (i.e., smoker, diabetic, dyslipidemia, or overweight) were randomly assigned to either TC (n=82), BW (n=82), or control (C, n=82) groups. The TC and BW groups had 150 minutes/week, moderate-intensity physical activity for three months; with home-based practice encouraged for another six months. The primary outcome was blood pressure (BP).
Secondary outcomes were: fasting blood sugar (FBS), HbA1c, total cholesterol, triglycerides, high and low density lipoprotein, body mass index (BMI), waist circumference and perceived stress. Data were collected at baseline, post-intervention at 3-month, 6-month and 9-month follow-up assessments. Generalized estimating equations models compared changes in the outcomes over time between groups.

**Results:** At baseline, average BP=141/81, smokers=11%, diabetics=58%, dyslipidemia=61%, average BMI=26; with no significant differences between groups. TC significantly lowered BP (systolic -13.33 mmHg; diastolic -6.45 mmHg), FBS (-0.72 mmol/L), HbA1c (-0.39%), and perceived stress (-3.22 score) at 9-months, compared to C group. Pairwise comparisons indicated significantly greater reductions in SBP (p<0.001), DBP (p=0.049), FBS (p=0.001), HbA1c (p=0.002), and perceived stress (p=0.027) in TC group, compared to BW group. No significant changes in other CVD risk indicators over time between groups were observed.

**Conclusion:** TC was better than BW in reducing several CVD risk factors, and can be recommended as a viable exercise to build a healthier life free of CVD.

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**Funding Component:**

**MP35**

**Physical Activity Before and After Cancer Diagnosis and Total and Cause-Specific Mortality**


**Background:** Given the increased prevalence of cancer survivors in the United States, it is imperative to define risk factors for potential reductions in total and cause-specific mortality. Physical activity (PA) represents a promising target for intervention.

**Design:** We prospectively evaluated PA from questionnaires before and after cancer diagnosis with total and cause-specific mortality among 13,297 subjects diagnosed with invasive cancer combined from the Physicians’ Health Study (PHS) (n=6328), Physicians’ Health Study II (PHS II) (n=912), and Women’s Health Study (WHS) (n=6057). WHS and PHS participants were free of baseline cancer; PHS II participants reported no active cancer at baseline. We ascertained PA before and after an incident cancer diagnosis based on reports on repeated follow-up questionnaires. Death was ascertained by medical records and death certificates. Cox regression estimated combined hazard ratios (HRs) of mortality by PA adjusted for age, randomized treatments, BMI, and other lifestyle/demographic factors. We evaluated the interaction between PA before and after cancer diagnosis by comparing PA ≤1 versus ≥2 times/wk.

**Results:** The mean follow-up after cancer diagnosis was 8.0, 7.5, and 5.2 y for WHS, PHS, and PHS II, respectively, during which there were 5623 deaths (WHS, 2164; PHS, 3269; PHS II; 190). Higher PA before cancer diagnosis was associated with significantly lower mortality. Compared with PA ≤ once/wk, the HRs (95% CIs) associated with PA 2-4 and >4 times/wk were 0.87 (0.82-0.93) and 0.88 (0.82-0.94) for total mortality; 0.77 (0.63-0.95) and 0.79 (0.62-
Higher PA after cancer diagnosis was associated with significantly lower total and cancer mortality and non-significantly lower CVD mortality, with HRs (95% CIs) of 0.65 (0.58-0.72) and 0.66 (0.59-0.73) for total mortality; 0.78 (0.59-1.03) and 0.82 (0.61-1.10) for CVD mortality, and 0.66 (0.57-0.77) and 0.64 (0.55-0.74) for cancer mortality. There was a significant interaction of PA before and after cancer diagnosis for total (p_int=0.02) and cancer (p_int=0.007) mortality, but not CVD mortality (p_int=0.38).

Conclusions: Greater PA both before and after cancer diagnosis were significantly associated with lower total and cancer mortality. Higher PA before cancer diagnosis was also associated with lower CVD mortality. PA may be an important target for lower mortality after cancer diagnosis.


Funding: No

Funding Component: MP36

Poverty Modifies the Association of Health-Related Fitness and School Absenteeism in New York City Middle School Girls

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Introduction One-fifth to one-third of students in high-poverty, urban school districts do not attend school regularly (missing ≥6 days per year). Health related fitness is shown to be associated with absenteeism, although this relationship may differ across poverty and gender subgroups. Hypothesis We hypothesized that area poverty would be a stronger effect modifier on the association of fitness (cardiorespiratory, muscular endurance, and muscular strength fitness composite percentile scores) and subsequent absenteeism (one-year lagged days absent) in girls compared with boys. Methods Six cohorts of New York City public school students were followed from grades 5-8 during 2006/7-2012/13 (n=349,381). Stratified three-level longitudinal generalized linear mixed models were used to test the modification of poverty on the association of fitness changes and one-year lagged child-specific days absent across gender. Results The fitness-absenteeism association was not significant in boys attending schools in high/very high (p=0.075) or low/mid poverty (p=0.454) areas. In girls attending schools in high/very high poverty areas, greater improvements in fitness the prior year were associated with greater improvements in attendance (p=0.034). Relative to the reference group (>20% decrease in fitness composite percentile scores from the prior year), girls with a large increase in fitness (>20%) demonstrated 10.3% fewer days absent (IRR 95% CI: 0.834, 0.964), followed by those who had a 10-20% increase in fitness (9.2%, IRR 95% CI: 0.835, 0.987), no change (5.4%, IRR 95% CI: 0.887, 1.007) and a 10-20% decrease in fitness (3.8%, IRR 95% CI: 0.885, 1.045). In girls attending schools in low/mid poverty areas, the fitness-attendance relationship was also positive, but no clear trend emerged. Conclusions Fitness improvements may be more important to attendance improvements in high/very high poverty girls compared with low/mid poverty girls, and both high/very high and low/mid poverty boys. In conclusion, expanding school-based physical activity programs for girls in...
high-poverty neighborhoods may increase student attendance.


Funding: No

Funding Component:

MP37

Diet Quality and Lifetime Risk of Total Cardiovascular Disease in US Adults

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Introduction

Suboptimal diet is a leading risk factor for cardiovascular disease (CVD). Yet, the relationship between diet quality and lifetime CVD risk, and whether it differs by age, are unclear.

Methods

Diet data from 10 US prospective cohorts were harmonized according to a standard protocol. Three diet quality indices were calculated within each cohort: Dietary Approaches to Stop Hypertension (DASH) diet, alternate Healthy Eating Index 2010 (aHEI-2010), and alternate Mediterranean (aMED) diet. CVD included coronary heart disease, stroke and heart failure. Study sample was divided into younger (<40 years old), middle-aged (40-60) and older (>60) groups based on age at the first dietary assessment. Cumulative CVD risk according to 5-year interval was estimated using modified Kaplan-Meier analysis, adjusting for competing risk of death. Multivariable proportional hazards regression was applied to determine the association between the three diet quality indices and CVD by sex and age.

Results

A total of 129,892 participants with 1,603,199 person years of follow-up were analyzed. The adjusted cumulative CVD risk was lower in younger and middle-aged men and all women who had higher DASH score (Figure 1). Age modified the diet-CVD association in both men and women (P <0.0005). Compared to the lowest DASH score quintile (poorest diet), the adjusted hazard ratio (HR) for CVD decreased with increasing quintile of diet quality. The HR for the highest quintile was 0.41 (95% CI: 0.20-0.87) in younger men, 0.97 (0.82-1.16) in middle-aged men, 1.03 (0.89-1.19) in older men, 0.47 (0.21-1.05) in younger women, 0.73 (0.63-0.84) in middle-aged women, and 0.82 (0.76-0.88) in older women. Results were similar for aMED and aHEI-2010 score.

Conclusions

Better diet quality is associated with lower lifetime CVD risk in all women and men except older men. Stronger inverse diet quality-CVD association in younger than middle-aged and older adults suggests that relative benefits of a healthy diet for CVD risk reduction may be greater at younger ages.


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MP38

Effect of Dietary Carbohydrate Type on Serum Lipid Profile, Adipose Tissue Macrophage Infiltration and Inflammatory Status, and Peripheral Macrophage Cholesterol Efflux
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Introduction: While much has been published on the effect of different amounts of dietary carbohydrate (carb) on cardiovascular disease (CVD) risk, data on effects of different types of carb (simple, refined and unrefined) are limited. Objective: To determine the relative comparability for an isocaloric replacement of unrefined-carb (UC; e.g., brown rice and bread/pasta made from whole wheat flour), refined-carb (RC; e.g., white rice and bread/pasta made from white flour) and simple-carb (SC; e.g., sucrose and high fructose corn syrup) on serum lipid and lipoprotein profile, adipose tissue gene expression of macrophage and inflammation markers, cytokine secretion and adipocyte size, and cholesterol efflux in peripheral blood mononuclear cells (PBMC).

Methods: Study subjects (men and postmenopausal women [N=11], 65±8 y, BMI 29.8±3.2 kg/m², LDL-C ≥2.6 mmol/L) were provided with isocaloric diets (60% E total carb, 15% E protein, 25% E fat) enriched in SC, RC or UC for 4.5 weeks, with a 2-week washout period between diet phases, using a randomized, cross-over design. Body weight was maintained within +/- 2 kg. At the end of each diet phase serum lipid and lipoprotein profile was determined using standard methods. Abdominal subcutaneous adipose tissue biopsies were collected and used to assess gene expression of macrophage and inflammation markers, cytokine secretion and adipocyte size, and cholesterol efflux in peripheral blood mononuclear cells (PBMC).

Results: Fasting serum TC (p=0.004) and LDL-C (p=0.002) concentrations were higher after subjects consumed the RC diet than after the SC and UC diet phases. No significant differences were observed among diets in serum HDL-C (p=0.32), VLDL-C (p=0.17), TG (p=0.19), and NEFA (p=0.99) concentrations. Adipocyte size was largest after subjects consumed the RC diet and smallest after the SC diet (p<0.0001). There were no significant differences among diets in gene expression of the macrophage markers CD14 (p=0.62) and CD68 (p=0.62), and the inflammatory markers adiponectin (p=0.66), leptin (p=0.42), and IL-6 (p=0.92), except for a trend towards higher serum amyloid-1 expression after the RC diet (p=0.059). Inflammatory cytokine secretion of adiponectin (p=0.52), leptin (p=0.89), and IL-6 (p=0.07) were not significantly different among diet phases. No significant differences were observed in macrophage cholesterol efflux among diets (p=0.18).

Conclusions: Consuming the RC diet resulted in higher serum TC and LDL-C concentrations, and concurrently increased abdominal subcutaneous adipocyte size. Dietary carb type had no significant effect on markers of macrophage infiltration, inflammation or cytokine secretion in adipose tissue, or macrophage cholesterol efflux. Results from this study provide mechanistic support for the epidemiologic findings that increasing consumption of RC diet is positively associated with CVD risk.


Funding: No

Funding Component:

MP39


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Introduction: Unhealthful diet is one of the top contributors to the chronic disease burden in
the U.S. There are growing concerns that socioeconomic disparities exist in Americans’ diets and this disparity may have widened over time.

**Aim:** To characterize trends in dietary intake of key food groups and nutrients among low-income Americans who participated in the Supplemental Nutrition Assistance Program (SNAP), and assess whether disparities in U.S. diets have persisted, improved, or worsened over time.

**Methods:** Nationally representative sample of 6,162 adults aged 20 years or older who participated in SNAP, 6,692 income-eligible nonparticipants, and 25,842 higher-income nonparticipants from 8 National Health and Nutrition Examination Survey (NHANES) cycles (1999-2014). Exposures are calendar year and SNAP participation status. Survey-weighted, energy-adjusted mean scores and proportion meeting the American Heart Association (AHA) 2020 Strategic Impact Diet Goals (5 primary components: fruits/vegetables, whole grains, fish/shellfish, sugar-sweetened beverages (SSBs), sodium; 3 secondary components: nuts/seeds/legumes, processed meats, saturated fat). Intakes of individual food groups and nutrients were also assessed.

**Results:** From 2003-2004 to 2013-2014 among SNAP participants with data on two-day dietary recall, primary diet score (maximum of 50) modestly increased (15.6 to 16.6; P-trend =0.03) while the secondary diet score (maximum of 80 points) did not change (31.5 to 32.1; P-trend =0.11). The proportion of SNAP participants having a poor diet decreased from 74.3% to 68.6%, the proportion having an intermediate-quality diet increased from 25.5% to 31.2%, and the proportion of having an ideal diet remained unchanged (0.2%). Among primary components, changes were strongest for SSBs (-0.43 servings/d, P-trend=0.001) and whole grains (+0.25 servings/d, P-trend<0.001). Compared to higher-income nonparticipants and income-eligible nonparticipants, SNAP participants had weaker improvements in both primary and secondary diet scores. From 1999-2000 to 2013-2014, disparities persisted for most dietary components, worsened for nuts/seeds and added sugars, and weakened for sodium.

**Conclusion:** Despite some improvements in diet quality, SNAP participants still fall far short of meeting the AHA Goals for a healthful diet, and dietary disparities persisted or worsened for most dietary components.

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**MP40**

**Associations of Monounsaturated Fatty Acids From Plant and Animal Sources With Total and Cardiovascular Mortality Risk**

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**Background:** Studies regarding monounsaturated fatty acid (MUFA) intake and mortality have reported inconsistent findings. Dietary MUFAs can come from both plant and animal sources with divergent nutrient components that potentially obscure the associations for total MUFAs.

**Hypothesis:** We hypothesized that MUFA from...
plant sources (MUFA-P) is more likely to be inversely associated with mortality than MUFA from animal sources (MUFA-A). Replacing saturated fatty acids (SFA), trans fat, or refined carbohydrates by MUFA-P would be associated with a lower risk.

**Methods:** We included 63,412 women from the Nurses’ Health Study (1990-2012) and 29,966 men from Health Professionals Follow-up Study (1990-2010). MUFA-Ps and MUFA-As were calculated based on validated food frequency questionnaires collected every 4-y and food composition databases that capture changes in composition over time.

**Results:** During 1,896,864 person-years of follow-up, 20,672 total and 4,588 cardiovascular deaths occurred. MUFA-P was inversely associated with total mortality after adjusting for potential confounders [HR: 0.84 (95%CI: 0.79, 0.89); \( P < 0.01 \)], whereas MUFA-A was associated with higher risk [1.21 (1.07, 1.37); \( P < 0.01 \)]. Isocalorically replacing SFAs (5% of total energy), refined carbohydrates (5% energy), or trans fat (2% energy) with MUFA-Ps was associated with 15%, 14%, and 10% lower risk of total mortality, respectively. Mortality risk was 24% lower when MUFA-Ps were modelled to replace MUFA-As (5% energy), and 20% lower when the sum of SFAs and MUFA-As (5% energy) was replaced. Similar results were observed for cardiovascular mortality for the same substitutions: HR (95%CI) were 0.74 (0.64, 0.85; \( P < 0.01 \)) for replacing MUFA-A and 0.83 (0.76, 0.92; \( P < 0.01 \)) for replacing SFA+MUFA-A.

**Conclusions:** Higher MUFA-P intake was associated with lower total mortality and MUFA-A was associated with higher mortality. Significantly lower mortality was observed when SFAs, trans fats, or refined carbohydrates were replaced by MUFA-P, but not MUFA-A.

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**MP41**

**Quantifying the Health and Economic Impact of the FDA Added Sugar Labeling Mandate in the US: A Cost-Effectiveness Analysis**

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**Introduction.** Excess added sugars, particularly from sugar-sweetened beverages (SSBs), are linked to cardiometabolic risk including obesity, type 2 diabetes (T2D) and CVD. Despite recent declines in SSB intake in the US, added sugar intake from SSBs and foods remains high and exceeds dietary recommendations. In May 2016, the US Food and Drug Administration (FDA) announced major revisions to the Nutrition Facts panel, including mandatory...
labeling of added sugar content, as a strategy to target added sugars from packaged foods and beverages. Yet, potential health effects remain unclear; and the FDA recently announced delays in implementation.

**Aim.** To estimate the cardiometabolic and economic effects of implementing FDA’s added sugar labeling policy over a 20-year horizon.

**Methods.** A validated microsimulation model, the US IMPACT Food Policy Model, was used to estimate the T2D and CVD cases averted and quality-adjusted life-years (QALYs) gained from the FDA policy for US adults age 30+ years. Model inputs included: nationally representative demographics and added sugar intakes from NHANES; policy effects on consumer intake from labeling intervention studies; obesity-mediated effects and direct independent effects of added sugars from SSBs and other foods, considered separately, on T2D and CVD from meta-analyses; policy costs including government administrative costs and industry compliance costs from federal government reports; national health statistics from the CDC; and healthcare costs including medical, productivity, and indirect costs from the AHA and American Diabetes Association. All costs were inflated to constant 2017 US dollars, discounted annually at 3%. We took a societal perspective and assumed a willingness to pay of $100,000 per QALY. Probabilistic sensitivity analysis accounted for model parameter uncertainty and population heterogeneity.

**Results.** Between 2018 and 2037, the FDA added sugar labeling policy could prevent approximately 580,000 (95% UI: 270,000–960,000) T2D cases and 210,000 (96,000–440,000) CVD cases, generating 600,000 (290,000–970,000) discounted QALYs. The policy would produce discounted net cost savings (health savings minus policy costs) of $47.3bn (21.7–78.6), including $25.6bn (11.9–43.1) from direct healthcare cost reductions. Most (>60%) savings were driven by costs related to T2D. Incorporating modelling and input uncertainty, the FDA added sugar label was estimated with >80% probability to be cost-effective by 2020 and cost-saving by 2022.

Potential additional reductions from industry reformulations were not included and could further increase cost-savings.

**Conclusions:** Implementing the FDA added sugar labeling mandate would generate substantial health gains and cost savings for the US population, highlighting the need for timely implementation, monitoring and evaluation.


Funding: No

Funding Component:

**MP42**

**Dietary Linoleic Acid Intake Is Inversely Associated With Type 2 Diabetes Risk In Three Large Prospective Cohort Studies Of U.s. Men And Women.**

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Introduction: Recent studies reported inverse associations between circulating levels of n-6 polyunsaturated fatty acids (PUFAs) and type 2 diabetes (T2D) risk, although whether intake of these fatty acids is associated T2D risk remains to be elucidated. Hypothesis: We examined the hypothesis that long-term intake of n-6 PUFAs, especially linoleic acid (LA), is associated with lower T2D risk. Methods: Diet was assessed using validated food-frequency questionnaires every 4 years in women participating in Nurses' Health Study (NHS, n=83,648) and NHSII (n=88,610), and men participating in the Health Professionals Follow-Up Study (n=41,771). Incident T2D was identified by self-report and confirmed by a supplemental questionnaire. Results: N-6 PUFAs accounted for 4.7-6.8% total energy on average, and 98% of n-6 PUFA intake was from LA. We identified 18,442 T2D cases during 4.93 million person-years of follow-up. In multivariate-adjusted models, HRs (95% CIs) of T2D comparing extreme quintiles (high vs low) were 0.92 (0.88, 0.97; P_trend=0.01) for LA intake, and 1.14 (1.08, 1.20; P_trend<0.001) for arachidonic acid (AA) intake. It was further estimated that T2D risk were 6% lower when SFAs (2% of total energy) were iso-calorically replaced by LA intake (table below). For each 2% energy from LA intake, T2D risk was 17% lower for iso-calorically replacing trans fats, and 4% lower for iso-calorically replacing total carbohydrates, and refined carbohydrates (All P values <0.05). These findings remained after adjusting for baseline BMI instead updated BMI, further adjusting for incident hypertension and hypercholesterolemia, or placing a 4-year lag between dietary assessments and disease incidence. Conclusion: Higher LA consumption is associated with a lower T2D risk, especially when substituting for SFAs, trans fats, or refined carbohydrates. AA mainly comes from poultry and meats, and is associated with higher T2D risk.

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MP49

Racial/Ethnic Differences in Receipt of Follow-up Care and Type 2 Diabetes Diagnosis Following Gestational Diabetes

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Introduction. Gestational diabetes mellitus (GDM) affects up to 14% of pregnancies in the U.S. and is associated with a sevenfold increased lifetime risk for type 2 diabetes (T2D). Clinical guidelines recommend postpartum glucose screening 4-12 weeks after a GDM pregnancy, and re-screening every 1-3 years thereafter. However, an inadequate proportion of persons with GDM actually receive these screenings. Racial/ethnic differences in risk of developing T2D following GDM may partially be driven by differential receipt of screening services. The aim of this study was to examine racial/ethnic differences in subsequent development of T2D, receipt of screening
services, and glycated hemoglobin (HbA1c) in a nationally representative sample of women with a GDM history. Methods. We analyzed data from the National Health and Nutrition Examination Survey (NHANES, 2007-2014). Race/ethnicity, GDM and diabetes diagnosis, and receipt of diabetes screening tests were determined by self-report; HbA1c was measured using standard laboratory procedures. Associations of race/ethnicity with outcomes of interest were evaluated using linear, logistic, and Cox regression, with adjustment for demographic, clinical, and healthcare access factors. Results. Among 629 women with a history of GDM in NHANES, non-Hispanic Black women had 98% higher risk (95% CI (1.28, 3.08), p=0.003), and Hispanics about double the risk (HR = 2.04, 95% CI (1.25, 3.32), p=0.005) of developing T2D following GDM compared to non-Hispanic Whites. In fully adjusted models, this was attenuated slightly, although still statistically significantly greater risk for both non-Hispanic Black (p=0.05) and Hispanic (p=0.03) women. Both non-Hispanic Black and Hispanic women were less likely to report being screened for diabetes in the past 3 years. In adjusted linear regression models, among women who remained diabetes-free, non-Hispanic Blacks had 0.40-% point higher HbA1c (p=0.02), and Hispanics had 0.26-% point higher HbA1c (p<0.001) compared to non-Hispanic Whites. Additionally, the odds of prediabetes were 4.9-fold higher for non-Hispanic Blacks (p<0.001), and 2.4-fold greater for Hispanics (p=0.03) as compared to non-Hispanic Whites. Odds of undiagnosed diabetes (HbA1c>6.5%) were significantly higher in non-Hispanic Blacks (OR=3.3, p=0.05) and marginally greater in Hispanics (OR=3.5, p=0.07) compared to non-Hispanic Whites. Conclusions. Differential receipt of follow-up services by minority women may exacerbate observed disparities in the burden of T2D. In this study, racial/ethnic disparities were apparent with regards to T2D diagnosis, receipt of diabetes screening tests, and HbA1c. Additional investigation to identify underlying factors contributing to this observed disparity will be particularly important to inform recommendations to improve delivery of quality care equitably across population subgroups.

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Serum Metabolomic Profile of Incident Diabetes

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Background: Metabolomic profiling offers the potential to reveal metabolic pathways relevant to diabetes pathophysiology and to improve diabetes risk prediction. Methods: We prospectively analyzed metabolites and incident diabetes from baseline (1987-1989) through December 31, 2015 in a subset of 2,939 Atherosclerosis Risk in Communities (ARIC) Study participants with metabolomics data and without diabetes at baseline. Metabolomic profiling was conducted in stored serum specimens collected at baseline using a reverse phase, untargeted ultra-performance liquid chromatography tandem mass spectrometry approach. Results: Among the 245 named compounds we identified, 7 metabolites were significantly associated with incident diabetes after Bonferroni correction and covariate adjustment.
(age, sex, race, center, batch, education, blood pressures, body mass index, lipids, smoking, physical activity, history of cardiovascular disease, eGFR, fasting glucose). These 7 metabolites consisted of a xenobiotic (erythritol) and compounds involved in amino acid metabolism [isoleucine, leucine, valine, asparagine, 3-(4-hydroxyphenyl)lactate] and glucose metabolism (trehalose). Higher levels of the metabolites were associated with an increased risk of incident diabetes, with the exception of asparagine which was associated with a lower risk of diabetes (HR per 1 SD increase: 0.78, 95% CI: 0.71, 0.85; p=4.19x10^-8). The 7 metabolites improved the prediction of incident diabetes beyond fasting glucose and established risk factors (C statistic for model with vs. without 7 metabolites, respectively: 0.744 vs. 0.735; p-value for difference in C statistics=0.001).

Conclusions: Branched chain amino acids may play a role in diabetes development. Our study is the first to report asparagine as a protective biomarker of diabetes risk. The serum metabolome reflects known and novel metabolic disturbances that improve diabetes prediction.


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difference 95% confidence interval (CI): -3.8, 2.0) or men (LTR difference 95% CI: -5.8, 0.2).

**Conclusion:** LTRs for ASCVD were similar among normoglycemia and IFG categories. However, LTR among middle-aged participants with DM were 39-48%; approximately twice as high as those with IFG. These data strongly support the importance of public health and clinical strategies that target prevention of incident DM by midlife.


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**MP52**

**Population Health Impact of Sodium Glucose Co-Transporter 2 Inhibitors and Glucagon-Like Peptide-1 Receptor Agonists in US Adults With Type 2 Diabetes**

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**Introduction**

Recently, sodium glucose co-transporter 2 inhibitors (SGLT2i) and glucagon-like peptide-1 (GLP-1) receptor agonists have been introduced as novel antidiabetic agents, but their potential health impact in the US is unknown. We assessed the number of potentially eligible type 2 diabetes (T2D) patients, as well as projected changes in death and complication rates for nationwide use.

**Methods**

Based on inclusion criteria of SGLT2i and GLP-1 receptor agonist RCTs, we determined eligibility in a weighted sample of 69.2M T2D patients from 2007-2014 National Health and Nutrition Examination Survey (NHANES) data. We employed a validated microsimulation model based on the Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial to simulate virtual life courses of eligible US patients. Pooled hazard ratios from meta-analyses of published RCTs were applied to model death and non-fatal adverse event rates with SGLT2i and GLP-1 receptor agonist use.

**Results**

The proportion eligible in NHANES was 9.2% (95% CI 7.3-11.1), which translates into ~6.4M US adults. Simulated 10-year mortality (32.5%) decreased by 4.6% (95% CI 2.7-7.3) with SGLT2i and by 2.9% (95% CI 1.6-4.8) with GLP-1 receptor agonists. Mean life expectancy was 16.5 y, and increased by 1.3 y (95% CI 0.6-2.2) with SGLT2i and by 0.8 y (95% CI 0.4-1.5) with GLP-1 receptor agonists. With SGLT2i, lifetime heart failure risk decreased by 7.4% (95% CI 4.1-12.3) and end-stage renal disease (ESRD) risk decreased by 0.4% (95% CI -0.1-0.9). Improvements in these event risks were uncertain with GLP-1 receptor agonist use (Figure). With lifetime SGLT2i use, fracture risk increased from 16.9 to 22.4% (95% CI of Δ 2.5-9.6) and amputation risk rose from 5.7 to 11.2% (95% CI of Δ 2.3-9.5).

**Conclusions**

Nationwide use of SGLT2i or GLP-1 receptor agonists may save over 8 or 5M life years, respectively. Moreover, SGLT2i may avoid over 470K new cases of heart failure and over 28K ESRD cases. Further research should illuminate whether these benefits outweigh additional costs and harms.
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**MP53**

1,5-anhydroglucitol to Identify Older Adults with Diabetes at Risk of Hospitalization and All-cause Mortality

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**Introduction**: Older adults with diabetes have variable prognosis. There is critical need to improve risk stratification among this population to understand who is most likely to experience adverse outcomes. Low 1,5-anhydroglucitol (1,5-AG) is a biomarker of glycemic variability and has demonstrated value for identification of middle-aged adults with diabetes at risk for major clinical outcomes. Total hospitalizations are a useful summary measure of poor health outcomes. It is unknown whether 1,5-AG can identify older adults at risk for hospitalizations and all-cause mortality.

**Methods**: We included 2,061 participants from the Atherosclerosis Risk in Communities (ARIC) Study with diagnosed diabetes who attended the 2011-2013 visit. We dichotomized 1,5-AG (≥6µg/mL; <6µg/mL) and followed participants until December 31, 2015. We examined the associations of 1,5-AG with total and diabetes-related hospitalizations using negative binomial regression and all-cause mortality using Cox regression.

**Results**: Participants ranged in age from 67-90 years, 57% were female, 30% were black, and 17% had 1,5-AG <6µg/mL. Median HbA1c was 6.2% in those with 1,5-AG ≥6µg/mL and 7.8% in persons with 1,5-AG <6µg/mL. During a median of 3.6 years of follow-up, there were 2,813 hospitalizations (1,689 diabetes-related) and 247 deaths. Compared to 1,5-AG ≥6µg/mL, individuals with 1,5-AG <6µg/mL had a significantly higher risk of hospitalizations, diabetes-related hospitalizations, and death (Table). After adjustment for diabetes medication use or HbA1c, associations with hospitalizations were attenuated and non-significant, while the relationship with all-cause mortality remained.

**Conclusion**: Among older adults with diagnosed diabetes, glycemic variability may be an important risk factor for major short-term complications.

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**MP54**

Circulating Prolactin Concentrations and Risk of Type 2 Diabetes in US Women

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Background Prolactin, a multifunctional hormone, is involved in regulating insulin sensitivity and glucose homeostasis in experimental and cross-sectional human studies. However, whether circulating levels of prolactin are associated with risk of type 2 diabetes (T2D) remains unclear.

Methods We analyzed the prospective relationship between circulating prolactin levels and T2D risk in the Nurses’ Health Study (NHS) and Nurses’ Health Study II (NHSII) with up to 22 years of follow-up. Total plasma prolactin was measured using immunoassay in 8,637 women free of T2D and cardiovascular disease at baseline blood collection (NHS: 1989-1990; NHSII: 1996-1999) and a subset of 1,017 NHS women who provided a second blood sample in 2000-2002. In addition, baseline bioactive prolactin levels were measured in a subset of 2,658 women using the Nb2 lymphoma cell bioassay. We calculated hazard ratios (HRs) using Cox regressions.

Results A total of 701 incident T2D cases were documented during 159,517 person-years of follow-up. Circulating prolactin levels were inversely associated with T2D risk; the multivariable HR comparing the highest with the lowest quartile of prolactin levels was 0.71 (95% confidence interval, 0.54-0.93; \(P_{\text{trend}}=0.02\)). The associations were similar by menopausal status and risk factors (\(P>0.70\) for interaction). Additional adjustment for sex hormones, growth factors, adipokine, and inflammatory markers did not alter the results. The association of bioactive prolactin with T2D risk was suggestively stronger than that of total prolactin (comparable HR=0.56 vs. 0.82 among the 2,658 women). The inverse association of total plasma prolactin with incident T2D waned linearly with time, with a significant association observed during the first 9 years after blood draw.

Conclusion High circulating prolactin level was independently associated with lower risk of T2D in women. Our findings are consistent with experimental evidence, supporting a possible protective role for prolactin in the pathogenesis of T2D.


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MP55

Associations Between Traffic-Related Air Pollution and Cardiovascular Disease Risk Factors Were Stronger in More Walkable Neighborhoods: The Cardiovascular Health in Ambulatory Care Research Team Cohort

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Introduction Studies suggest living in a more walkable neighborhood may protect against cardiovascular disease risk factors such as hypertension (HTN) and diabetes mellitus (DM) by encouraging physical activity. Walkable neighborhoods, however, often carry higher levels of traffic-related air pollution. Little is known regarding whether synergistic effects may exist between walkability and air pollution on these risk factors.

Hypothesis We hypothesized that the association between traffic-related air pollution, hypertension, and diabetes mellitus would be stronger in more walkable areas.

Methods We drew a cross-sectional sample of individuals ages 40-74 on January 1, 2008 from
the CANHEART cohort. HTN and DM were ascertained using validated algorithms.
Walkability (quintiles, Q5 highest, Q1 lowest) was measured using a validated index which has previously been shown to be inversely associated with obesity and diabetes. Exposure to nitrogen dioxide, a valid marker for traffic-related air pollution, was assessed using a land use regression models. The associations were tested using logistic regression with cluster-robust standard errors, adjusting for age, sex, area-level income, ethnicity, and comorbidities.

Results In total, 2,618,584 individuals were included in the analysis (mean (SD) age = 53.2 (9.2), 52% female). Walkability was inversely associated with odds for HTN (Q5 vs. Q1 OR = 0.80, 95% CI: 0.79, 0.82) and DM (Q5 vs. Q1 OR = 0.89, 95% CI: 0.87, 0.91), while NO2 was positively associated with each (HTN: OR = 1.02 per 10 ppb (1.01, 1.03); DM: OR = 1.11 per 10 ppb (1.09, 1.13)). We observed significant interactions between walkability and NO2 on odds for HTN and DM, with stronger NO2 associations in the most walkable neighborhoods (Fig. 1).

Conclusions We observed significant interactions between traffic-related air pollution and walkability on odds for HTN and DM. This finding suggests that benefits from living in more walkable neighborhoods may be offset by stronger negative associations with air pollution.


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Social Role Stress, Reward and the American Heart Association Life’s Simple 7 in Midlife Women: The Study of Women’s Health Across the Nation

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Introduction: American women can occupy multiple social roles, such as employee, caregiver, mother and spouse during midlife. These roles can be both stressful and rewarding, which may influence adherence to heart-healthy behaviors and risk factors. The aim of this study was to test the association of social role stress and reward with achievement of the American Heart Association Life’s Simple 7 risk factors in a cohort of midlife women in the United States.

Methods: The Study of Women’s Health Across the Nation (SWAN) is an longitudinal cohort study initiated in in 1996-1997 of women aged 42-52 who were premenopausal. At the fifth annual follow-up visit women first were asked if they occupied four social roles (employee, caregiver, spouse, mother), and then were asked to rate how stressful and how rewarding each occupied role was, using five point scales. Average role-related stress and reward were calculated for each woman (range 1-5). Ideal cardiovascular risk factors were assessed at the same follow-up visit using anthropometric measurement (body mass index, blood pressure), blood draw (glucose, cholesterol), and validated questionnaires (physical activity, diet and smoking). Multivariate linear regression was used for cross-sectional analyses of the number of ideal factors, using average role stress and reward as exposures. Adjusted logistic regression models were used to estimate odds of achieving the ideal level of each individual risk factor. Models were
adjusted for age, race, site, education and menopause status.

Results: At the fifth SWAN follow-up visit, 1,777 women had data on all seven risk factors, and reported occupying at least one social role. The mean (standard deviation) of the number of ideal factors was 3.2 (1.3). Only 5% of the sample had five or more ideal factors. Women who reported greater role-related stress achieved fewer ideal factors, and a higher reward score was related to more ideal factors. A one unit higher role stress score was associated with 18% lower odds of having a healthy diet, and 18% reduced odds of having a BMI under 30. Women with a one unit higher role reward score had 56% greater odds of ideal physical activity, and 34% greater odds of being a non-smoker. Higher job stress was associated with 13% reduced odds of having a healthy blood pressure. There was no evidence of an interaction between stress and reward. Adjusting for depression and social support attenuated, but did not eliminate the significant relationships between role stress and reward and cardiovascular risk.

Conclusion: Midlife women experience stress from multiple social roles while simultaneously deriving reward from these roles, which may be beneficial for their cardiovascular disease risk factors. Understanding the influence and determinants of role stress and reward may be important when designing interventions to improve diet, physical activity and smoking behaviors in midlife women.


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MP57


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Background: It is well documented that perceived neighborhood environment is associated with cardiovascular (CV) health factors but little is known about how neighborhood environment perception (NEP) relates to routine healthcare utilization, a likely determinant of CV health outcomes. Methods: Using cross-sectional Dallas Heart Study data, we examined the relationship between NEP and routine healthcare utilization. NEP was defined via total score and sub-scores using factor analysis [perceived neighborhood violence, physical environment (i.e. aesthetics), and social cohesion; higher score=more unfavorable perception]. Routine healthcare utilization was based on self-reported time since last visit to a healthcare provider for routine checkup. We used linear regression to determine the relationship between NEP scores and routine healthcare visits, adjusting for age, sex, race/ethnicity, income, education, health insurance status, CV disease burden, and neighborhood deprivation index (NDI). Results: Within the study population (N=1756; 58% black, 27% white and 15% Hispanic), those who reported more recent routine visits were found to be older, more educated and have higher income. When adjusting for confounders (Table), more unfavorable NEP was associated with less frequent routine healthcare visits. Specifically, individuals who perceived a more unfavorable neighborhood physical environment or greater violence level reported greater time since last routine visit. There was no relationship between perceived social cohesion and healthcare usage. Conclusions: Unfavorable NEP was found to significantly
relate to decreased routine healthcare utilization even when accounting for health insurance, CV disease and NDI. Furthermore, unfavorable perceived neighborhood violence and physical environment are associated with less routine healthcare utilization. Our findings suggest that NEP may act as a barrier to routine preventive healthcare and ideal CV health outcomes in at-risk communities.

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Racial Residential Segregation is Associated With Worse Cardiovascular Health in African American Adults: The Jackson Heart Study

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Introduction: Racial residential segregation results in increased exposure to adverse neighborhood environments for African Americans; however, the impact of segregation on ideal cardiovascular health (CVH) has not been examined in large, socioeconomically diverse African American samples. Using a novel spatial measure of neighborhood-level racial residential segregation, we examined the association between segregation and ideal CVH in the Jackson Heart Study (JHS).

Hypothesis: Racial residential segregation will be associated with worse cardiovascular health among African American adults.

Methods: The sample included 4,354 men and women ages 21-93 from the baseline exam of the JHS (2000-2004). Racial residential segregation was assessed at the census-tract level. Data on racial composition (% African American) from the 2000 US Census was used to calculate the local G* statistic- a spatially-weighted z-score that represents how much a neighborhood’s racial/ethnic composition deviates from the larger metropolitan area. Ideal CVH was assessed using the AHA Life’s Simple Seven (LS7) index which includes 3 behavioral (nutrition, physical activity, and smoking) and 4 biological (systolic BP, glucose, BMI, and cholesterol) metrics of CVH. Multivariable regression models were used to test associations between segregation and the LS7 index continuously (range: 0-14) and categorically (Inadequate: 0-4; Average: 5-9; and Optimal: 10-14). Covariates included age, sex, income, education, and insurance status.

Results: The average LS7 summary score was 7.03 (±2.1) and was lowest in the most racially
segregated neighborhood environments (High Segregation: 6.88 ±2.1 vs. Low Segregation: 7.55 ±2.1). The prevalence of inadequate CVH was higher in racially segregated neighborhoods (12.3%) compared to neighborhoods that were the least segregated (6.9%). After adjusting for key socio-demographic characteristics, racial residential segregation was inversely associated with ideal CVH ($B=-0.041 \pm 0.02$, $p=0.0146$). Moreover, a 1-SD unit increase in segregation was associated with a 6% increased odds of having inadequate CVH (OR: 1.06, 95% CI: 1.00-1.12, $p=0.0461$).

**Conclusion:** In conclusion, African Americans in racially segregated neighborhoods are less likely to achieve ideal CVH even after accounting for individual-level factors. Policies aimed at restricting housing segregation/discrimination and/or structural interventions designed to improve neighborhood environments may be viable strategies to improving CVH in this at-risk population.


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**MP59**

**The Association Between Acute Mental Stress and Abnormal P-wave Axis**


**Background:** Exposure to psychological stress has been associated with the development of sustained arrhythmias. Acute changes in atrial electrophysiology may serve as intermediate phenotypes for stress-induced arrhythmia. The relationship between atrial electrical changes and stress related changes in heart rate and myocardial ischemia is unknown. We sought to study the effect of altered atrial electrophysiology and stress related rise in HR and myocardial ischemia in females and males.

**Methods:** We examined if acute mental stress was associated with abnormal P-wave axis development in 359 patients (mean age=56 ± 9.9 years; 62% men; 43% white) with stable coronary heart disease and normal baseline P-wave axis (between 0º and 75º) who underwent mental stress testing (speech task). We computed the percentage of patients who had abnormal P-wave axis during stress and recovery. Sex-stratified analyses were performed. A multivariable logistic regression model was used to determine if mental stress ischemia independent predictors of abnormal P-wave axis development.

**Results:** A total of 46 (13%) patients developed abnormal P-wave axis during either stress or recovery (stress: n=43, 12%; recovery: n=12, 3%). A rise in heart rate during mental stress was associated with an increased risk of abnormal P-wave axis development (per 5-unit increase: OR=1.37, 95%CI=1.03, 1.30). Mental stress-induced myocardial ischemia was associated with increased risk of abnormal P-wave axis in women (OR=5.2, 95%CI=1.7, 15.6) and not in men (OR=0.1, 95%CI=0.01, 1.01), p-interaction=0.004). Interactions were not detected for other characteristics.

**Conclusion:** Acute mental stress results in the development of abnormal P-wave axis, and this phenomenon is related to increases in heart rate and, among women, mental stress-induced ischemia. Our data suggest that acute psychological stress can promote adverse transient electrical changes in the atria.

Depressive Symptoms and Risk of Incident Atrial Fibrillation: The Multi-Ethnic Study of Atherosclerosis

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Background: Depression has been suggested as a potential risk factor for atrial fibrillation (AF) through effects on the autonomic nervous system and hypothalamus-pituitary-adrenal axis. Current literature examining the prospective relationship between depression and AF is inconsistent and limited to studies performed in predominantly white populations. We determined the relationship of both depressive symptoms and anti-depressant use with incident AF in a multi-ethnic cohort.

Methods: The Multi-Ethnic Study of Atherosclerosis is a prospective study of 6,814 individuals without clinical cardiovascular disease. Depressive symptoms were assessed at baseline by the 20-item Center for Epidemiologic Studies Depression Scale (CES-D) and use of anti-depressant medications. Five CES-D groups were created based on the score distribution in approximate quartiles, and the top quartile split in 2 such that the top group represented persons with a score ≥16, a value commonly used to identify clinically relevant symptoms. Incident AF was identified from study ECGs verified for AF, ICD-9 hospital discharge diagnoses consistent with AF, and, for participants enrolled in fee-for-service Medicare, inpatient and outpatient AF claims data.

Results: 6,644 participants (mean age=62; 53% women; 38% white; 28% black; 22% Hispanic; 12% Chinese-American) were included and followed for a median of 13 years. In separate adjusted Cox proportional hazards analyses, a CES-D≥16 (referent=CES-D<2) and anti-depressant use were each associated with higher incidence of AF (Table). Associations did not differ by race or gender (interaction p-values of 0.18 and 0.17 respectively). Similar results were obtained using time-updated measures of depression.

Conclusions: Depressive symptoms are associated with an increased risk of incident AF. Further study into whether improving depressive symptoms reduces AF incidence is important.


Funding: No

Funding Component: MP60
**Background:** Ambient air pollution mixtures including fine particulates and gases have been associated with cardiovascular disease (CVD). Although mechanisms underlying the associations remain largely uncharacterized to date, examining epigenetic responses to air pollution mixtures may identify biological systems affected by exposure and provide insight into the pathophysiology and environmental epidemiology of CVD. Therefore, we undertook a multi-pollutant, methylome-wide study of associations between DNA methylation (DNAm) at 485,000 Cytosine-phosphate-Guanine (CpG) sites and pollutants regulated by the U.S. Environmental Protection Agency under the Clean Air Act.

**Methods:** Data from the Atherosclerosis Risk in Communities Study and three sub-studies within the Women’s Health Initiative (WHI) included information on 8,567 participants, 83% of whom were women, 46% African American, and 9% Hispanic/Latino (mean age, 61.3 years). Daily mean, geocoded participant address-specific concentrations of ambient particulate matter with diameter ≤ 10μm (PM10), ≤2.5μm (PM2.5), and 2.5-10μm (PM2.5-10); ozone (O3); nitrogen dioxide (NO2); nitrogen oxides (NOx); carbon monoxide (CO); and sulfur dioxide (SO2) were averaged over 2, 7, 28, and 365 days before measurement of leukocyte DNAm in whole blood. Methylome-wide, pollutant-DNAm associations were estimated separately at each averaging period in each stratum defined by race/ethnicity and study using multi-level, linear mixed models adjusting for sociodemographic, behavioral, and meteorological characteristics; estimated leukocyte proportions; and technical covariates. Estimates were combined across strata in pollutant- and period-specific, fixed-effects, inverse-variance weighted meta-analyses. Then multi-pollutant, period-specific effects were examined using the adaptive sum of powered scores (U) test (aSPU). CpG sites associated with multi-pollutant significance (aSPU $P < 1.0 \times 10^{-7}$) were characterized in silico to assess their putative function and biological plausibility.

**Results:** Overall analyses identified a significant, 28-day mean, multi-pollutant association at cg15008743 near ZNF83 on chromosome 19 ($p = 1 \times 10^{-7}$) and a highly-suggestive 28-day mean, multipollutant association at cg00489219 near ZNF621 on chromosome 3 ($p = 5 \times 10^{-7}$). ZNF83 and ZNF621 encode zinc finger proteins with a potentially broad reach across biological systems given their transcription factor, metal, and DNA binding activities. ZNF621 also harbors rare genetic variants with large effects on blood pressure.

**Discussion:** Methylome-wide associations of DNAm with EPA-regulated ambient air pollutants suggest biologically plausible pathways underpinning the increasingly well-documented ties between multi-pollutant mixtures and cardiovascular disease.


**Funding:** No
Role of Rare and Low-Frequency Variants in Gene-Alcohol Interactions on Plasma Lipid Levels

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Introduction: Alcohol intake modifies plasma lipid levels and such effects may be modulated by genetic variants. We use emerging statistical methods that extend well-established common variant approaches to characterize the role of aggregated rare and low-frequency variants in gene by alcohol consumption interactions associated with fasting plasma lipid levels.

Methods: Up to 247,870 exonic variants on the Illumina HumanExome BeadChip and fasting plasma triglycerides (TG), and high- and low-density lipoprotein cholesterol (HDL-c and LDL-c) were measured in 46,443 European Americans from 4 studies (the Atherosclerosis Risk in Communities (ARIC) study, the Framingham Heart Study, the Netherlands Epidemiology of Obesity Study and the Women’s Genome Health Study) of the Cohorts for Heart and Aging Research in Genomic Epidemiology (CHARGE) Consortium. Using the gene-based rareGE method, we conducted exome-wide gene-environment (GxE) tests with genetic main effects estimated as fixed and random effects, and a joint analysis of genetic main and GxE interaction effects. Rare and low-frequency (minor allele frequency ≤ 5%) functional variants, (i.e. frameshift, nonsynonymous, stop/gain, stop/loss, and splicing) were aggregated by genes. Two dichotomous self-reported alcohol consumption variables, current drinker (at least 1 drink per week, yes/no) and regular drinker (at least 2 drinks per week, yes/no) were considered. A sample size weighted Z-test (weighted Stouffer’s method) was used to meta-analyze study-specific p-values. Exome-wide significance level was set at \( p < 3.7 \times 10^{-6} \) (0.05/13368 genes), using a Bonferroni procedure to correct for multiple testing.

Results: We identified 24 gene-lipid associations at 13 known lipid loci (within 500kb) harboring rare and low-frequency variants through the joint analysis. In ARIC, numerous genes (PCSK9, LPL, LIPG, ANGPTL4, APOB, APOC3-A5) remained significant after conditioning on common index single nucleotide polymorphisms (SNPs), suggesting an independent role for rare variants at loci highlighted by previous genome-wide association studies. However, no significant gene-alcohol interactions were observed with rare and low-frequency variants on TG, HDL-c or LDL-c.

Conclusion: This study applied new statistical approaches to investigate the role of rare and low-frequency variants in gene-alcohol consumption interactions on lipid levels. Results show promise for other larger scale studies analyzing rare variant GxE interactions.


Funding: No
Fine-mapping and Characterization of Adiponectin Gwas Loci Harboring Extensive Allelic Heterogeneity

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Background: Elevated levels of adiponectin, an adipose-tissue derived hormone, are associated with a decreased risk for development of obesity, cardiovascular disease, and type 2 diabetes. We sought to fine-map and characterize loci from an adiponectin genome-wide association study (GWAS) to better understand the genes, variants, and mechanisms that contribute to adiponectin levels.

Methods: We performed a GWAS of plasma adiponectin levels in 9,262 nondiabetic Finnish men from the Metabolic Syndrome in Men (METSIM) study using an efficient mixed model (EPACTS) to account for cryptic relatedness among the subjects. To identify multiple association signals within 1 Mb of each other, we used stepwise conditional analyses and Genome-wide Complex Trait Analysis (GCTA). We annotated association signals using regulatory elements based on chromatin marks from adipocyte nuclei (Epigenomic Roadmap) and ATAC-seq data from adipose tissue (METSIM) and SGBS preadipocyte cells. We also evaluated expression quantitative trait loci (eQTL) in subcutaneous adipose RNA-seq data from 387 METSIM samples. To test for allele-specific effects on transcriptional activity, we performed transcriptional reporter assays in HeLa cells.

Results: We identified 5 loci associated with adiponectin ($P<5\times10^{-8}$): CDH13, ADIPOQ, IRS1, PBRM1, and EPHA3. Two loci (CDH13 and ADIPOQ) contained 2 and 7 association signals ($P<1\times10^{-5}$), respectively. At CDH13, the first signal contained the lead adipose eQTL variant for CDH13. At the novel second signal at CDH13, rs4782722 is located in a regulatory element and the G-allele showed increased transcriptional activity compared to the T-allele, suggesting a functional role for this variant. At ADIPOQ, the first association signal also contained the lead adipose eQTL variant for ADIPOQ. All signals at ADIPOQ contained ≥1 variant in a putative enhancer, and the 7th signal includes rs62625753, a coding variant (G90S; $P_{\text{init}}=3\times10^{-3}, P_{\text{cond}}=6\times10^{-4}$) predicted to be deleterious (SIFT) and probably damaging (PolyPhen). Accounting for multiple signals resulted in a 1.6-fold increase in variance explained over the lead signals alone (5.9 vs 9.4%).

Conclusions: Fine-mapping, annotation, and experimental validation of GWAS signals and variants provide novel insight into the molecular mechanisms underlying genetic association signals, leading to a clearer biological basis for disease.


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**MP64**

**APOL1 Renal Risk Variants Associate With Heart Failure With Preserved Ejection Fraction in African-American Women**

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**Introduction.** African origin coding variants in *APOL1*, encoding apolipoprotein L1, are strongly associated with various kidney diseases in African Americans, with odds ratio ranging from 7 to 89 for two renal risk allele carriers. *APOL1* renal risk genotypes may influence risk for cardiovascular disease and mortality, but findings have been inconsistent. **Hypothesis.** Given that African-American aging women are at high risk for cardiovascular disease and stroke, we asked whether *APOL1* risk genotypes affect these outcomes. **Methods.** We used data from 11,137 African-American postmenopausal women who participated in the Women’s Health Initiative prospective cohort, followed from enrollment (1993-1998) to 2014. *APOL1* genotypes were obtained directly or by imputation from whole exome sequencing data. Adjudicated outcomes were incident coronary heart disease, stroke and subtypes, heart failure and subtypes, and overall and cause-specific mortality obtained from hospital records and death certificates. End-stage renal disease status (ESRD) was obtained from the US Renal Data System. We estimated incident rates for each outcome and used Cox proportional hazard to estimate hazard ratios (HR) and 95% confidence intervals (CI) for the associations of *APOL1* high and low risk groups with outcomes. **Results.** Mean age was 61.7 years. *APOL1* high risk carriers (12.3% of participants) had higher prevalence of hypertension, use of cholesterol lowering medication, and reduced estimated glomerular filtration rate (eGFR), defined as <60 mL/min/1.73 m². After 11 years mean follow-up *APOL1* high risk subjects had a higher incident rate of ESRD and hospitalized heart failure with preserved ejection fraction (HFP EF) than low risk carriers, but showed no difference in the incident rates of other outcomes. In adjusted models, there were a significant 43% increased hazard of ESRD (95% CI 1.01, 2.02), and a 58% increased hazard of hospitalized HFP EF (95% CI 1.03, 2.41) among high risk compared to low risk *APOL1* carriers. In sensitivity analyses restricted to the genome-wide association sample and accounting for population stratification (n=7,797), the associations remained significant for HFP EF. These associations were no longer significant after adjusting for eGFR. **Conclusions.** We identified novel associations of *APOL1* high risk status with hospitalization for HFP EF among postmenopausal women, which are likely mediated by *APOL1*-induced chronic kidney disease. We also showed lack of association of *APOL1* with incident coronary heart disease, stroke and mortality.

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**MP65**

**Metabolomics Associated With Augmentation Index and Pulse Wave Velocity: Findings From the Bogalusa Heart Study**

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**Background:** Large scale untargeted metabolomics studies are needed to understand the mechanisms of arterial stiffness.

**Methods:** We performed untargeted metabolomics profiling among 1,239 participants of the biracial Bogalusa Heart Study. After quality control, 1,202 metabolites were evaluated for associations with augmentation index (AI) and pulse-wave velocity (PWV) overall and by race, adjusting for age, sex, education, smoking, drinking, body mass index, and physical activity. Weighted correlation network analysis (WGCNA) was applied to build metabolites modules among all participants. Bonferroni correction was used to determine significant metabolites. Significant metabolites should also have $P<0.05$ and consistent effect directions in both races.

**Results:** We identified 4 and 17 novel metabolites associated with AI and PWV, respectively (Table). We also replicated associations of 12 previously reported metabolites with PWV in the overall sample, including 1,5-anhydroglucitol ($P=5.55E-9$), glucose ($P=8.19E-14$), glutamic acid ($P=1.56E-8$), glycine ($P=9.87E-6$), serine ($P=0.003$), urea ($P=0.03$), uridine ($P=0.002$), glutamine ($P=0.001$), 3-phenylpropionate ($P=0.004$), trans-4-hydroxyproline ($P=0.001$), pyruvate ($P=0.002$), and lysine ($P=0.007$). WGCNA identified two modules in significant associations with both AI ($P=3E-4$ and $8E-4$, respectively) and PWV ($P=2E-6$ and $7E-5$, respectively). One module was composed of metabolites of glycerolipids recycling pathway. The other module consisted of amino acids involved in glutamate, leucine, isoleucine, valine, methionione, systein, taurine, and alanine metabolisms. WGCNA also identified a network of sphingolipid metabolism for PWV ($P=0.002$). Investigation to hub metabolites of these modules identified 3 novel metabolites for AI and 4 novel metabolites for PWV (Table).

**Conclusions:** The current study identified important metabolites and metabolites networks associated with AI and PWV.

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**MP66**

**Lipidomics Profiling and Progression of Carotid Artery Atherosclerosis in HIV-infected Individuals**

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**Background** Lipid metabolism disruption and excess cardiovascular disease (CVD) risk have been associated with HIV infection, yet plasma lipidomics profile and its relationship with CVD
risk has been rarely examined in HIV-infected individuals. **Methods** Using liquid chromatography tandem mass spectrometry, 211 plasma lipid species from 13 classes were profiled in 737 women and men aged 35-55 years (520 HIV+, 217 HIV-) from the Women’s Interagency HIV Study and the Multicenter AIDS Cohort Study. Repeated B-mode carotid artery ultrasound imaging was obtained in 2004-2013. Poisson regression and network analysis were used to examine associations of baseline lipids with incident carotid plaque over 7 years (112 cases, 90 HIV+ and 22 HIV-). **Results** Adjusted for demographic and behavioral factors, 120 individual species from 11 lipid classes showed significant associations with incident carotid plaque (all \( P < 0.05 \) FDR adjusted). The risk ratios were 1.22 to 1.44 per standard deviation increment for top significant lipids from 11 classes. Further adjustment for HIV serostatus and conventional CVD risk factors did not change the results. No evidence of effect modification by HIV serostatus was observed. Network analysis identified 2 lipid modules (Blue and Pink), which included triacylglycerols (TAGs) and phosphatidylcholines of higher acyl carbon number and greater double bond content, showing the strongest associations with incident carotid plaque (Figure). Of note, the Blue module, but not the Pink module, also showed a strong positive association with HIV infection. Most lipids in the Blue module had higher levels in HIV+ compared to HIV- individuals, and were associated with increased risk of carotid plaque (Figure). **Conclusions** Lipidomics profiling identified that multiple lipids, especially, TAGs, are increased in HIV infection and associated with progression of atherosclerosis. Our data provide new insights into early lipid metabolism alterations preceding the development of CVD in HIV infection.


Funding: No

Funding Component:

**MP67**

**Pregnancy Outcomes in Women With Congenital Heart Defects in Colorado: Results From the Colorado CHD Surveillance System in Adolescents and Adults (COCHD)**

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**Introduction:** The normal hemodynamic changes of pregnancy can trigger cardiac dysfunction in women with congenital heart defects (CHD), leading to an increased risk of cardiac events. Further, utero-placental flow is impaired in women with CHD which can result in higher risk of adverse offspring outcomes. **Hypothesis:** Severity of maternal CHD is associated with adverse maternal cardiovascular events and offspring events by severity of CHD in 1074 pregnancies that resulted in a live birth in Colorado between 2011-13. **Methods:** Using data from the
Colorado CHD Surveillance System in Adolescents and Adults, 926 pregnant women with CHD were identified that resulted in 1074 live births between 2011-2013. Maternal CHD type was dichotomized as severe (n=149) and moderate (total n=882). The risk of adverse maternal cardiac and offspring events were calculated out of the total number of pregnancies in each severity category. Results: Primary maternal cardiac events including cardiovascular mortality, arrhythmia, heart failure, thromboembolic events (pulmonary embolism, valve thrombosis or deep venous thrombosis), vascular events (stroke, myocardial infarction or dissection) and endocarditis occurred in 15% and 7% of women with severe and moderate CHD, respectively. Premature birth (delivery <37 weeks) and/or low birth weight (<2,500 grams) occurred in >18% of the women with severe CHD and 17% of women with moderate CHD. The risk of offspring congenital anomalies among women with severe CHD was extremely high for circulatory/respiratory, musculoskeletal/integumentary, cyanotic congenital heart disease and Down syndrome. The risk of infant congenital anomalies was lower for women with moderate CHD, with the most common being circulatory/respiratory, urogenital, Down syndrome and cyanotic congenital heart disease. Conclusions: Population-level surveillance system of CHD in Colorado provides novel assessment of the substantial risk of maternal and neonatal cardiac events associated with pregnancy in women with CHD.


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MP68

Association of Clinical and Subclinical Blood Pressure Elevation During Pregnancy With Maternal Health and Risk of Neonatal Low Birth Weight

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Introduction Gestational hypertension is a leading cause of maternal mortality and fetal growth restriction (FGR). However, elevated maternal blood pressure at which trimester contributes to FGR is unknown, and whether gestational prehypertension (a systolic blood pressure [SBP] of 120 - 139 mmHg or a diastolic blood pressure [DBP] of 80 - 89 mmHg) is related with FGR and maternal health is not fully studied.

Methods We analyzed the relation of elevated gestational blood pressure with risk of neonatal low-birth-weight (LBW, birth weight < 2,500 g) and maternal health throughout pregnancy in 21,620 women from a birth cohort in Wuhan, China. Maternal health indicators, including SBP and DBP, were clinically measured during up to 22 antenatal visits. LBW were acquired from medical records. Linear mixed models were used to evaluate the relations of maternal SBP and DBP with LBW. Logistic regressions were used to assess the associations of SBP and DBP in late pregnancy (38.3 weeks) with LBW. Linear regressions were used to evaluate the association of prehypertension/hypertension with indicators of maternal health.

Results Gestational blood pressure increases throughout pregnancy, but a significant elevation of SBP and DBP between 15 and 25 gestational weeks were only observed for
women who later delivered LBW newborns. High gestational SBP (≥ 140 mmHg) or DBP (≥ 90 mmHg) was associated with a 220% or 98% higher risk of LBW (P < 0.03). Notably, preclinical high SBP (120 - 139 mmHg) was also associated with a 40% higher risk of LBW (P = 0.036). At late pregnancy, elevated gestational SBP and DBP were associated with elevated liver enzymes, blood urea nitrogen, creatinine, and uric acid levels, and decreased activated partial thromboplastin time and prothrombin time.

**Conclusions** A fast blood pressure elevation in the second trimester may relate with increased risk of LBW. Pregnancy prehypertension was associated with not only LBW risk, but also impaired maternal liver, kidney, and coagulation functions.

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**MP69**

**How Well Do Cardiovascular Risk Factors Before and During Pregnancy Correlate? The International Childhood Cardiovascular Cohort (i3C) Consortium**

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**Background:** Pregnancy complications such as gestational diabetes and pre-eclampsia predict later cardiovascular (CV) outcomes. However, it still is not clear whether pregnancy complications unmask preexisting impairments or instigate lasting injury. If pre-pregnancy and during-pregnancy CV risk factors are strongly correlated, it becomes more plausible that pregnancy unmasks an existing problem than creating a new one. **Methods:** Data from the i3C Consortium, a group of studies assessing the relationship between child/adolescent CV risk factors and adult outcomes, were used. 290 women from four cohorts had data on the same risk factor (blood pressure, lipids, glucose) from visits both prior to and during pregnancy. Correlation coefficients between the pre- and during pregnancy measures were calculated, and the mean difference between the measures modeled with adjustment for age, BMI, race, smoking, and study. Differences by gestational age and time between the pre-pregnancy visit and pregnancy visit were also examined. **Results:** All measures were strongly correlated at pre- and during-pregnancy visits (p<0.01), with r of between 0.3 and 0.55. The exception was glucose (r=0.11, p=0.15). These relationships held after adjustment for confounders. Interactions with gestational age indicated stronger correlations with measurements taken in the first and second trimesters than the third. The correlation did not differ by the time elapsed between the pre-pregnancy and pregnancy visits. **Conclusions:** Pre- and during-pregnancy CV risk factors are moderately well correlated. It is likely that women who develop pregnancy complications enter the pregnancy with higher risk rather than pregnancy inducing new vascular effects.
Hypothesis: Gestational diabetes mellitus (GDM) is a disorder of glucose metabolism during pregnancy characterized by pancreatic beta cell dysfunction and greater insulin resistance, but it is unclear whether dysfunction exists before pregnancy. The disposition index (DI) is a physiologic measure of beta cell compensation for insulin resistance strongly predictive of future diabetes. This prospective study evaluates whether a clinical approximation of DI before pregnancy is associated with risk of GDM. Methods: This analysis included 696 women (45% black, 55% white) enrolled in the CARDIA Study, a U.S. multi-center prospective cohort of young adults aged 18-30 at baseline (1985-86) who gave birth at least once during 30 years of follow up, reported GDM status and had fasting glucose and insulin measured before one or more post-baseline births. DI was defined as HOMA-B divided by HOMA-IR using standard formulas. Multinomial logistic regression models estimated odds ratios (OR) and 95%CI for GDM among pre-pregnancy DI tertiles (low, moderate, high) and fully adjusted for time to birth, race, age, parity, BMI, lifestyle behaviors and family history of diabetes, and also stratified by pre-pregnancy BMI. Results: 9% of women reported GDM (64/696) for 794 births. 55% of GDM and 30% of non-GDM were categorized as low DI. Low pre-pregnancy DI compared to moderate DI was associated with higher fully adjusted odds of GDM (OR=2.71, 95%CI:1.37-5.35) in the entire sample. In models stratified by pre-pregnancy BMI, low DI was associated with 4-fold higher odds of GDM among Overweight/Obese (OR=4.22, 95%CI:1.35-13.91) and somewhat attenuated higher odds of GDM among Normal BMI (OR=1.94, 95%CI:0.78−4.86); Table 1. Only family history of diabetes was strongly associated with GDM independent of DI. Conclusions: Inadequate beta cell compensation is present before pregnancy and discriminates greatest risk of GDM among high BMI, and may identify higher risk among women of normal BMI.

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MP71

Ten Year Predicted Cardiovascular Disease Risk in Young Women With Adverse Pregnancy Outcomes

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MP70

Pre-pregnancy Beta Cell Compensation for Insulin Resistance Associated With Subsequent Gestational Diabetes Mellitus: The CARDIA Study

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Hypothesis: Gestational diabetes mellitus (GDM) is a disorder of glucose metabolism during pregnancy characterized by pancreatic beta cell dysfunction and greater insulin resistance, but it is unclear whether dysfunction exists before pregnancy. The disposition index (DI) is a physiologic measure of beta cell compensation for insulin resistance strongly predictive of future diabetes. This prospective study evaluates whether a clinical approximation of DI before pregnancy is associated with risk of GDM. Methods: This analysis included 696 women (45% black, 55% white) enrolled in the CARDIA Study, a U.S. multi-center prospective cohort of young adults aged 18-30 at baseline (1985-86) who gave birth at least once during 30 years of follow up, reported GDM status and had fasting glucose and insulin measured before one or more post-baseline births. DI was defined as HOMA-B divided by HOMA-IR using standard formulas. Multinomial logistic regression models estimated odds ratios (OR) and 95%CI for GDM among pre-pregnancy DI tertiles (low, moderate, high) and fully adjusted for time to birth, race, age, parity, BMI, lifestyle behaviors and family history of diabetes, and also stratified by pre-pregnancy BMI. Results: 9% of women reported GDM (64/696) for 794 births. 55% of GDM and 30% of non-GDM were categorized as low DI. Low pre-pregnancy DI compared to moderate DI was associated with higher fully adjusted odds of GDM (OR=2.71, 95%CI:1.37-5.35) in the entire sample. In models stratified by pre-pregnancy BMI, low DI was associated with 4-fold higher odds of GDM among Overweight/Obese (OR=4.22, 95%CI:1.35-13.91) and somewhat attenuated higher odds of GDM among Normal BMI (OR=1.94, 95%CI:0.78−4.86); Table 1. Only family history of diabetes was strongly associated with GDM independent of DI. Conclusions: Inadequate beta cell compensation is present before pregnancy and discriminates greatest risk of GDM among high BMI, and may identify higher risk among women of normal BMI.

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MP71

Ten Year Predicted Cardiovascular Disease Risk in Young Women With Adverse Pregnancy Outcomes
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Introduction: Cardiovascular disease (CVD) is the leading cause of death among women. In stark contrast to mortality declines in other groups, CVD deaths to young women are increasing. CVD prediction in this group is imprecise, and how adverse pregnancy outcomes (APO) may unmask risk during the reproductive years is unknown. Hypothesis: Women with APO will have higher 10-year predicted CVD risk within 7 years following a first pregnancy compared to women with no APO. Study design: We enrolled 10,038 women at 8 sites in their first pregnancy and followed 4,500 through a CVD visit 2-7 years later. Presented here are results for the first 2,705 with lab results and no hypertension or diabetes before pregnancy. The Atherosclerotic CVD (ASCVD), American Health Association Healthy Heart, Pathobiological Determinants of Atherosclerosis in Youth (PDAY), and Reynolds risk scores were compared in women with preterm birth (PTB), preeclampsia/gestational hypertension (PE/GH), gestational diabetes (GDM), small for gestational age (SGA), and no adverse outcomes (no APO, referent). Results: As expected, 10-year predicted CVD risk was very low in women at a median age of 30, although differences at the tail of the distribution were detected based on APO history. Women with no APO had the lowest CVD risk. Women with PTB, PE/GH, GDM, or SGA had higher 10-year CVD risk as predicted by the ASCVD score compared to women with no APO (p<0.05 for PTB and PE/GH). Six to 10% of women with these APOs had ASCVD scores greater than 5%. The PDAY score that predicts risk of coronary artery calcification in young adults was also higher in women with PE/GH or GDM than in those with no APO. Risk factors perturbed after delivery in women with APOs were blood pressure, BMI, waist circumference, HDL-cholesterol, triglycerides, glucose, and HbA1c. Conclusion: While risk scores customized for women of reproductive age are needed, those with a first pregnancy complicated by PTB, PE/GH or GDM have modest but detectable predicted 10-year CVD risk as soon as 2-7 years after delivery.


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Feasibility, Safety and Acceptability of Soy-Based Diet for Pregnant Women: Preliminary Results From a Pilot Randomized Controlled Trial

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Introduction: Previous evidence suggests that soy containing foods may have beneficial effects on lipid and glycemic metabolism due to their biologically active components, including...
soy protein and isoflavones. Pregnancy is associated with changes in glucose and lipid metabolism, partially attributable to elevated estrogen concentrations. We have previously reported a significant, inverse association between urinary excretion of isoflavones and cardiometabolic risk markers in pregnant women, using data from the National Health and Nutrition Examination Survey (NHANES). Further studies are needed to determine the cardiometabolic health effects of soy intake in pregnant women. **Hypothesis:** We hypothesize that consumption of soy-based whole foods is safe and acceptable for pregnant women and has beneficial cardiometabolic health effects.

**Methods:** A pilot randomized controlled trial (RCT) was conducted in 30 pregnant women who received counseling to consume either a high-soy or low-soy foods containing diet. Assessments (physical and anthropometric measurements, food frequency questionnaires, fasting blood samples) were conducted at 14 and 28 weeks of pregnancy, and 6 weeks’ postpartum. Monthly follow-up calls were conducted by research team coordinator to assess safety and encourage adherence.

**Results:** Both the high-soy and low-soy groups demonstrated high adherence (80-90%), defined as consuming soy foods ≥ 15 days in the past four weeks for high-soy group and ≤ 5 days for low-soy group. Five subjects in the high-soy group reported adverse events (nausea, vomiting, diarrhea, itchy mouth); all were transient and resolved without sequelae. No adverse events were reported in the low-soy group. Skinfold thickness decreased (-4.8 mm) in the high-soy group and increased (+3.6 mm) in the low-soy group (p=0.04). There was a trend towards lower BMI in the high-soy compared to low-soy group at 28 weeks (+1.4 vs. +3.6 kg/m^2, respectively, p=0.15) and postpartum (-1.2 vs. +0.6 kg/m^2, respectively, p=0.14). This decrease in BMI was predominantly a loss of body fat and not lean mass. There were no significant differences between groups in fasting glucose, HDL-C, LDL-C, TG, or VLDL concentrations. **Conclusions:** In conclusion, results from this pilot RCT support the acceptability and safety of consuming soy-based whole foods during pregnancy. A larger-scale RCT is needed to further elucidate the effects of soy-based foods on cardiometabolic risk factors during pregnancy, as well as the transgenerational effects on their offspring.

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**Funding Component:**

**MP73**

**Emergency Call First Strategy versus Bystander Cardiopulmonary Resuscitation First Strategy for Out-of-Hospital Cardiac Arrest**

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**Introduction:** Lay rescuers have a crucial role in successful cardiopulmonary resuscitation (CPR), specifically the first three links in the chain of survival, for out-of-hospital cardiac arrest (OHCA). However, randomized controlled trials on the priority of emergency call (Call first) versus bystander CPR (CPR first) do not exist, and comparative data are very limited. We aimed to assess the association between the priority of bystander’s action (Call first vs. CPR first) and neurologic outcome after OHCA.

**Methods:** This nationwide population-based study of patients who experienced OHCA from January 2005 to December 2014 was based on the data from the Japanese government-managed registry of OHCA. Patients provided bystander’s action (both emergency call and bystander CPR) within 1 minute of witness were included, and Call first strategy was compared
with CPR first strategy. The primary outcome was one-month neurologically favorable survival, defined as a Glasgow-Pittsburgh cerebral performance category (CPC) score of 1 (good performance) or 2 (moderate disability). The secondary outcomes were prehospital return of spontaneous circulation (ROSC) and one-month overall survival. Results: A total of 25,840 patients were included; 4,430 (17.1%) were treated with Call first approach, and 21,410 (82.9%) were treated with CPR first approach. Among total cohort, 2,696 (10.4%) survived with neurologically favorable status one month after OHCA. In the propensity score-matched cohort, one-month neurologically favorable survival was lower among Call first group compared with CPR first group: 364 of 4,430 patients (8.2%) vs. 457 of 4,430 patients (10.3%), respectively (Risk ratio [RR], 0.80; 95% confidence interval [CI], 0.70-0.91). Similar associations were observed for one-month overall survival (RR, 0.90; 95%CI, 0.82-0.99), although there were no significant differences in prehospital ROSC (RR, 0.94; 95%CI, 0.86-1.02) between the Call first and CPR first groups. In subgroup analyses, the association between delayed bystander CPR and worse neurological outcome did not change regardless of subgroup characteristics. Conclusions: In witnessed OHCA, Call first approach was associated with a decreased chance of one-month neurologically favorable survival compared with CPR first approach. These observational findings warrant a randomized clinical trial to determine the priority of emergency call or bystander CPR for OHCA.


Funding: No

Funding Component:

It's Not Too Late to Improve Adherence: Association Between All-Cause Mortality and Statin Adherence Change After Acute Myocardial Infarction

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Introduction: Hospitalization for acute myocardial infarction (AMI) affects medication adherence in prevalent statin users. Our objective was to estimate the association between changes in statin adherence and all-cause mortality after AMI discharge. Hypothesis: Patients who are adherent both pre- and post-AMI have the lowest risk of all-cause mortality. Methods: Medicare administrative claims were used to identify AMI hospitalizations in 2008-2010. Patients were ≥66 years old, continuously enrolled ≥360 days pre-AMI with a statin prescription claim, discharged to home/self-care, and survived ≥180 days post-AMI with continuous enrollment. Statin adherence was measured in the 180 days pre- and post-AMI hospitalization using proportion of days covered and categorized as severely nonadherent, moderately nonadherent, and adherent. The exposure was categorical change in statin adherence from pre- to post-AMI (9 categories, see Figure); adherent/adherent was the reference group. Patients were followed for all-cause mortality from 180 days post-discharge for up to 18 months. A multivariable Cox proportional hazards model estimated hazard ratios (HRs).
**Results**: Of 101,011 eligible patients, 15% decreased, 20% increased, and 64% did not change statin adherence categories. Compared to patients who were adherent pre- and post-AMI, the adjusted HR (95% confidence intervals [CIs]) for patients who increased from severely nonadherent to adherent was 0.93 (95% CI: 0.85-1.02); other increases in adherence had similar HRs (see Figure). Compared to patients who were adherent pre- and post-AMI, the adjusted HR for patients who decreased from adherent to severely nonadherent was 1.22 (95% CI: 1.13-1.33); other decreases in adherence had similar HRs.

**Conclusions**: Although patients with decreased statin adherence had the worst mortality outcomes, those with increased adherence had similar or better outcomes than continuously adherent patients, showing that, even after an AMI, it is not too late to improve statin adherence.

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**MP75**

**Geographic Variation in Stroke Rates and Oral Anticoagulation Use among Medicare Beneficiaries with Atrial Fibrillation**

Inmaculada Hernandez, Samir Saba, Yuting Zhang, UNIVERSITY PITTSBURGH, Pittsburgh, PA

**Background**

Recent studies have shown strong geographic variation in oral anticoagulation (OAC) use in atrial fibrillation (AF); however, it remains unknown how this contributes to the geographic variation in ischemic stroke observed across the US. The objective of the present study was to evaluate the relationship between the geographic variation in the initiation of OAC and the incidence of ischemic stroke in a cohort of Medicare beneficiaries newly diagnosed with AF.

**Methods**

Using 2013-2014 claims data from a 5% random sample of Medicare beneficiaries, we identified patients newly diagnosed with AF in 2013-2014 and categorized them according to their initiation of OAC. Our sample included 21,226 OAC initiators and 20,068 patients who did not initiate OAC therapy. We assigned each patient to one of the 9 US Census Divisions using the zip code, and collected their medical claims with a diagnosis of ischemic stroke. We constructed logistic regression models to estimate the average adjusted probability of OAC initiation and Poisson models to estimate the average adjusted rate of ischemic stroke, in each Census Division. Both estimates were adjusted for demographics, eligibility for Medicaid coverage and for low-income subsidy, enrollment in a Medicare Advantage Part D plan, and a comprehensive list of clinical characteristics.

We computed the correlation between the average adjusted probability of OAC initiation and the average adjusted rate of ischemic stroke at the Census Division level.

**Results**

The probability of OAC initiation was lowest in the West South Central (0.47) and highest in the West North Central (0.54) and New England (0.54). The average adjusted rate of ischemic stroke was lowest in the West North Central (0.09) and highest in the South Atlantic (0.14) and South West Central (0.14). The average adjusted probability of OAC initiation at the Census Division level and the average adjusted rate of ischemic stroke were inversely correlated, with R=−0.576, p-value=0.10. This suggests that variation in OAC initiation likely explains at least a third of geographic variation.
Conclusions
Our results suggest that geographic variations in OAC initiation within the U.S. explain, in part, variations in the incidence of ischemic stroke among AF patients. Further mechanistic research using advanced causal mediation models is warranted.

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MP76

Trends in Adherence to Statin Therapy Among US Adults With Health Insurance Between 2007 and 2014

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Background: Statins are effective for the primary and secondary prevention of coronary heart disease (CHD) events. However, studies from the early 2000s have suggested that many patients have low adherence to statin therapy. Objective: To analyze trends in adherence among US adults initiating treatment with a statin. Methods: We identified US adults 21-64 years of age with commercial health insurance in Marketscan and ≥65 years of age with government health insurance through Medicare who initiated statin therapy in 2007-2014. Three populations were analyzed, those initiating statin therapy 1) following myocardial infarction (n=52,828 in Marketscan, n=148,745 in Medicare), 2) with diabetes without a history of CHD (n=565,573 in Marketscan, n=42,411 in Medicare), and 3) without diabetes or a history of CHD (n=2,134,501 in Marketscan, n=105,948 in Medicare). Adherence to statin therapy was defined by having a statin available to take for ≥80% of the 365 days following treatment initiation. Results: Adherence to statin therapy increased in each population analyzed (Figure). In 2014, 68.1% and 62.7% of patients initiating treatment following myocardial infarction in Marketscan and Medicare, respectively were adherent to their statin. Less than half of patients initiating treatment with diabetes without CHD and without diabetes or CHD in Marketscan and Medicare were adherent to their statin. Adherence to statin therapy in the overall Marketscan and Medicare populations was higher among men (relative risk [95% CI] 1.16 [1.15, 1.18] and 1.10 [1.08, 1.12], respectively), and those with cardiologist visits (1.22 [1.21, 1.24] and 1.27 [1.25, 1.30], respectively), and lower among those with kidney disease diagnosed after treatment initiation (0.89 [0.85, 0.94] and 0.92 [0.88, 0.96], respectively). Conclusion: Adherence to statins improved slightly between 2007 and 2014 but remains suboptimal. Management by a cardiologist is associated with better adherence to statins.

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Background

Recent research has shown strong provider-level variation in oral anticoagulation (OAC) use in atrial fibrillation (AF). The objective of the present study was to examine predictors of prescribing OAC to newly diagnosed AF patients, with special attention to prescribing low-dose direct oral anticoagulant agents (DOACs) to patients with no diagnosis of chronic kidney disease (CKD).

Methods

Using 2013-2014 Medicare claims data, we identified patients newly diagnosed with AF who had CHA2DS2-VASc score ≥2. Our sample included 19,390 patients who did not initiate OAC, and 22,299 OAC initiators, among whom 12,786 initiated warfarin, 5,984 high-dose DOACs and 3,529 low-dose DOACs. We constructed logistic regression models to estimate the effect of patient demographics, clinical characteristics, provider specialty, and insurance factors on OAC initiation and likelihood of prescribing low-dose DOAC in patients with no CKD.

Results

As shown in the table, age, gender, heart failure, and a history of bleeding affected the initiation of OAC as well as DOAC dosing. White patients were more likely to initiate OAC, but race did not affect DOAC dosing. Use of antiplatelet agents decreased the odds of OAC initiation by 27% (95%CI, 23%-31%), but did not impact DOAC dosing. The odds of OAC initiation decreased by 10% (95%CI, 6%-15%) for each point increase in the Geographic Practice Cost Index for malpractice. The odds of initiating low-dose DOACs were 30% (95%CI, 11%-38%) lower for patients seen by cardiologists than for those seen by internists or family practitioners.

Conclusions

In addition to demographics and clinical characteristics, provider and insurance factors have a strong impact on initiation and dosing of OAC.

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MP77

Patient, Provider, and Insurance Predictors of Oral Anticoagulation Initiation and Dosing in Atrial Fibrillation

Inmaculada Hernandez, Yuting Zhang, Samir Saba, UNIVERSITY PITTSBURGH, Pittsburgh, PA

Background

Recent research has shown strong provider-level variation in oral anticoagulation (OAC) use in atrial fibrillation (AF). The objective of the present study was to examine predictors of prescribing OAC to newly diagnosed AF patients, with special attention to prescribing low-dose direct oral anticoagulant agents (DOACs) to patients with no diagnosis of chronic kidney disease (CKD).

Methods

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Conclusions

In addition to demographics and clinical characteristics, provider and insurance factors have a strong impact on initiation and dosing of OAC.

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MP77

Long-term Antibiotic Use and Risks of All-Cause and Cause-Specific Mortality among Women: Prospective Cohort Study

Introduction: Antibiotic exposure is associated with a long-lasting alteration in gut microbiota, and may be related to subsequent major chronic diseases such as cardiovascular diseases and cancer. No previous prospective cohort study has investigated associations between duration of antibiotic use during adulthood with mortality from major chronic diseases among populations at usual risk.

Hypothesis: We investigated whether a longer duration of antibiotic use was associated with elevated risks of all-cause and cause-specific deaths among women.

Methods: This study included 37,510 women aged ≥60 y who were initially free of cardiovascular diseases or cancer from the Nurses’ Health Study. The present analysis included women who reported data on antibiotic use on the 2004 questionnaire when the information was first assessed. We calculated hazard ratios (HR) for all-cause mortality, and deaths from cardiovascular disease (ICD-8 [international classification of diseases, eighth revision, ICD-8], codes 390 to 458) and cancer (ICD-8, 140-209) according to total days of antibiotic use per year (none, less than 15 days, 15 days to less than 2 months, or ≥2 months) in late adulthood (age 60 or older). Follow-up time was calculated from the return date of the 2004 questionnaire until the date of death, or end of follow-up (June 30, 2012), whichever occurred first.

Results: During 287,474 person-years of follow-up, we documented 2908 deaths from any cause (including 474 cardiovascular deaths and 906 cancer deaths). Longer duration of antibiotic use was significantly associated with higher risk of death from any cause after adjusted for dietary intake, lifestyle factors, hypertension, hypercholesterolemia, diabetes ($P_{trend} <0.0001$), other medication use (such as aspirin, statin, H2 blockers, proton pump inhibitors) ($P_{trend} =0.001$), and other characteristics ($P_{trend} =0.038$). As compared to women who did not use antibiotics, those who used for ≥2 months in late adulthood had significantly increased risks of all-cause mortality (multivariate-adjusted HR 1.27; 95% CI, 1.07, 1.49) and cardiovascular mortality (HR 1.58; 95% CI, 1.02, 2.46), but not cancer mortality (HR=0.86; 95% CI, 0.63, 1.16). The association between long-term antibiotic use in late adulthood and an elevated risk of all-cause death was more evident among women who also used antibiotics in middle adulthood (during age 40-59) ($P_{trend}=0.002$) than among those who did not use during this life stage.

Conclusions: Long-term duration of antibiotic exposure especially in late adulthood was associated with increased all-cause and cardiovascular mortality in women.


Funding: No

Funding Component:

P001
LGB Health Disparities: Examining the Status of Ideal Cardiovascular Health From the 2011-2012 NHANES Survey

Anshul Saxena, Muni Rubens, Sankalp Das, Tanuja Rajan, Gowtham Grandhi, Lara Arias, Khurram Nasir, Emir Veledar, Baptist Health South Florida, Coral Gables, FL

Objectives. Extensive data suggests that lesbian, gay and bisexual (LGB) adults are more likely to experience adverse cardiovascular outcomes relative to heterosexuals. However, evidence regarding cardiovascular health (CVH) disparities and sexual orientation is scarce. The aim of this study was to examine the distribution of CVH metrics in a US nationally representative population of heterosexual (HT), and LGB adults.

Methods. This cross-sectional study analyzed 2445 participants (representing 115 million) adults aged 18 or over years in the 2011-2012 NHANES survey. The CVH factors of smoking, body mass index (BMI), physical activity (PA), diet, blood pressure (BP), total cholesterol (TC) and glucose (GLU) were measured. Each CVH factor was then classified as ideal; intermediate; or poor. Ideal CVH was defined as presence of >=5 ideal CVH metrics.

Results. 95.1% of the weighted sample self-identified as HT (95% CI: 93.5%, 96.6%) compared to 4.9% (95%: 3.3%, 6.5%) LGB. The figure illustrates the distribution of each of the 7 CVH categories according to sexual orientation. In age, gender, and race adjusted analysis, LGB individuals were 36% (AOR: 0.64; 95%: 0.29, 1.4; p > 0.05) less likely to have ideal CVH compared to HT. These proportions go higher after adjusting for age.

Conclusions. The results suggest that LGB individuals face a higher risk of being in the category for poor cardiovascular health compared to heterosexuals. Evidence suggests that there are sexual orientation disparities among adults. If confirmed in other studies, results point towards disproportionately higher risk for cardiovascular disease among sexual-minority populations.


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Funding Component:

P004

Higher Socioeconomic Position Strengthens Intergenerational Transmission of Ideal Health Behaviors

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Introduction: Promoting ideal health behaviors is an objective of the AHA 2020 goals. We assessed the hypothesis that ideal health behaviors transmit from one generation to the next and that higher socioeconomic position (SEP) in parents and their adult offspring promotes intergenerational transmission of ideal health behaviors.

Methods: Data were from the intergenerational Cardiovascular Risk in Young Finns Study. We included 1857 participants who had repeated measures of educational attainment (as a proxy
for SEP) and smoking status, BMI, physical activity and diet recorded in 2001, 2007 and 2011. Parental educational attainment and health behaviors were collected in 1980. We categorized data on health behaviors as ideal vs non-ideal (1/0) using AHA definitions of ideal cardiovascular health. The number of ideal health behaviors (0 to 4) was treated as a continuous outcome. The number of parental health behaviors (0 to 8; each parent contributing equally) was the primary exposure. Intergenerational associations and interactions with SEP were examined in linear multilevel regression with random intercepts applicable to longitudinal data, adjusting for sex, study year, age, single-parent family and parental education.

**Results:** Participants were 55% women; in 2001, mean age was 31.1 (SD, 5.0) and mean number of ideal health behaviors 2.0 (SD, 1.1). Overall, the adjusted mean number of ideal health behaviors increased with the number of parental ideal health behaviors, from 1.7 (95% CI, 1.6-1.7) to 2.1 (95% CI, 2.0-2.2) among participants with parents in the lowest vs highest 20% of ideal health behaviors. The increments were greater for those with higher levels of education (interaction p=.004) or those whose parents had higher levels of education (p=.007) (Figure).

**Conclusions:** In this prospective study, higher number of ideal health behaviors in parents was associated with higher number of ideal health behaviors in offspring. Higher SEP in either generation strengthened the protective intergenerational associations.

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**P005**

**Aspirin Use and Dementia: The Atherosclerosis Risk in Communities (ARIC) Study**

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**Background:** Aspirin may help to prevent dementia through its antiplatelet and anti-inflammatory effects, but findings from previous studies are mixed. Considering the length of the preclinical phase of dementia, early initiation of regular aspirin use may be more protective against dementia than later initiation. In this study, we explored the association of regular aspirin use initiated during and after midlife with the risk of dementia. **Methods:** Using data from 1996 to 2013 on 10,398 ARIC participants, we assessed the association of self-reported prior duration of regular aspirin use which was collected during 1996-1998 (as the baseline of this study) with incident dementia after the baseline. Dementia cases were identified based on: in-person dementia ascertainment from 2011 to 2013; the Telephone Interview for Cognitive Status (TICS) or informant interviews on dementia; and hospital discharge codes/death certificate code by surveillance through 2013. The relative hazards of dementia across categories of the duration of regular aspirin use prior to baseline (<2 years, 2 to <5 years, and ≥ 5 years) were compared to no regular use by
Cox proportional hazard models. We adjusted for potential confounders, including demographic variables and major dementia risk factors at baseline. In sensitivity analyses, propensity score weighting was applied. Subgroup analyses were conducted by age, gender, race, APOE, and diabetes status.

**Results:** Participants had a median age of 62 (IQR: 58, 67) at baseline. 55.8% (5,805 of 10,398) were female and 20.6% (2,147 of 10,398) were African American. Lower but non-significant relative hazards (HR) were observed among participants with regular aspirin use for < 2 years (HR: 0.85; 95% CI: 0.69 to 1.04) and ≥ 5 years (HR: 0.87; 95% CI: 0.68 to 1.11), but not for the 2-5 year interval. With propensity score weighting, regular aspirin use < 2 years achieved marginal significance (HR: 0.79; 95% CI: 0.63 to 0.99), while the effect of regular aspirin use ≥ 5 years changed towards null (HR: 1.04; 95% CI: 0.75 to 1.46). Without a prior hypothesis, an interaction was found for diabetes status (p = 0.016) with a significant protective association of ever regular aspirin use compared to no regular use among non-diabetic participants (HR: 0.82; 95%CI: 0.69 to 0.98). **Conclusions:** We found a non-significant protective association of regular aspirin use at late-middle life with onward incident dementia in a community-dwelling population. Data suggest persons with fewer comorbidities, specifically without diabetes, might be more susceptible to the preventive effect of aspirin use on dementia. Our results are subject to confounding by indication, suggesting the need for additional studies in populations which have different covariate structures than ARIC.

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Funding: No

Funding Component: P006

**Cardiovascular Disease Risk Factor Burden is Associated With Hearing Loss in Young Men: The Hispanic Community Health Study/Study of Latinos**

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**Introduction:** Over 30 million Americans suffer from hearing loss (HL). Studies suggest that established cardiovascular disease (CVD) risk factors may contribute to the pathophysiology of the inner ear. However, the aggregate effect of CVD risk factors on hearing is not well understood.

**Hypothesis:** We hypothesized that high CVD risk burden is associated with worse hearing.

**Methods:** We assessed younger (ages 18-34) and older (ages 55-64) Hispanic Community Health Study / Study of Latinos participants who underwent audiometry in 2008-11. After excluding those with conductive pathology and asymmetric HL, we randomly chose one ear for analysis. Puretone thresholds were obtained at 0.5-8 kHz; puretone average (PTA) was calculated using thresholds at 0.5, 1, 2, and 4 kHz. Low CVD risk burden was defined as having all of: blood pressure (BP) <120/<80 mmHg; total cholesterol <180 mg/dL; not currently smoking; and not having prevalent diabetes. High CVD risk burden was defined as ≥ 2 of: diabetes; currently smoking; BP >160/>100 mmHg (or antihypertensive use); and total cholesterol >240 mg/dL (or statin use). By age group and sex, we estimated hearing thresholds per frequency with linear regression models adjusted for noise exposure. Least squares estimates were calculated using strata-specific
means of covariates. Estimates were compared via t-tests. Data were weighted for all analyses and accounted for clustering.

**Results:** Among younger and older individuals in the target population (51.9% female), 28.8% had low and 5.5% had high CVD risk. Younger men with high CVD risk had worse PTA than young men with low risk (7.7 dB HL [7.0-8.4] vs. 10.5 dB HL [8.4-12.5], \( p = 0.02 \)), and had significantly worse thresholds at 1, 3, 4, 6 kHz than those with low risk (Figure). There was no difference in PTA or thresholds at any frequency by CVD risk burden in young women, older men, or older women.

**Conclusions:** CVD risk burden is associated with HL among young men, but not young women or older adults. CVD risk burden may be useful for identifying young men at risk for HL.

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Funding Component:

**P007**

**Arterial Stiffness is Associated With Increased Risk of Incident Dementia in the Older Elderly: The Cardiovascular Health Study Cognition Study**

Chendi Cui, Akira Sekikawa, Lewis Kuller, Oscar Lopez, Anne Newman, Allison Kuipers, Rachel Mackey, Univ of Pittsburgh, Pittsburgh, PA

**Introduction:** Arterial stiffness is related to aging, hypertension, and obesity, and higher carotid-femoral pulse wave velocity (PWV) is associated with brain amyloid deposition. We hypothesized that higher cfPWV was associated with incident dementia in older adults (mean age 78) of the Cardiovascular Health Study Cognition Study (CHS-CS).

**Methods:** Pittsburgh CHS-CS participants \( n = 532 \) without dementia at baseline (1998-99) had annual cognitive exams through 2013. CfPWV (m/sec) was measured from pulse velocity waveforms on 356 participants between 1996-2000, who were slightly younger, more educated, with less mild cognitive impairment (MCI) than those not included. Associations of cfPWV [continuous (transformed: \(-1/cfPWV\) and quartile] with time-to-event [cfPWV measurement to dementia or death (competing event), or end of follow-up] were assessed in Cox proportional hazards model with competing risk of death.

**Results:** Over 15-year follow-up, 212 (59.6%) dementia cases (median onset time=4 years) and 87 (24.4%) deaths occurred prior to dementia diagnosis. Adjusted for age and sex, incident dementia was related to higher cfPWV [hazard ratio (HR)=1.52 per \(-1/cfPWV\), 95%CI=1.04, 2.24] (Table). Results were similar when further adjusted for education, race, ApoE4, hypertension, diabetes, MCI, and abnormal white matter (WMG) or ventricular grade (VG). Results persisted in separate models that excluded those with ApoE4+ \( n = 79 \), diabetes \( n = 40 \), MCI \( n = 65 \) or abnormal WMG or VG \( n = 136 \). In stratified models, results were stronger for age \( \geq 80 \) vs. <80 and for hypertension vs. no hypertension. Pulse pressure (PP), another index of arterial stiffness, was not associated with incident dementia (age- and sex-adjusted HR=1.01 per mmHg PP, 95%CI=0.99, 1.01).

**Conclusions:** Higher cfPWV, but not higher PP, was significantly associated with incident dementia in the older adults. Interventions to slow arterial stiffness with aging may reduce the risk of dementia among older individuals.
Have Trends in Preventable Hospitalizations Related to Hypertension Decreased Among Elderly Americans? Results From National Inpatient Sample, 2005-2014

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Introduction: As number of elderly Americans is projected to double by 2050, population aged ≥65 years will have the highest impact on Medicare spending. The prevalence of elderly population with hypertension (HTN) is around 65% and if patients receive good primary care or an early intervention, these HTN related hospitalizations could be prevented saving millions in Medicare spending. Our objective was to examine the trends in hospitalizations related to HTN and total cost over 10 years among aged ≥65 years.

Methods: Using data from Nationwide Inpatient Sample database from 2005-2014, we explored the existence of trends in HTN admission rates and corresponding hospitalization costs among adults ≥65 years vs other age groups. Weighted estimates for rates and mean total cost were reported using SUDAAN after adjusting for complex survey design.

Results: Overall, hospitalizations due to HTN increased by 26% in 2014 from 2005. Hospitalizations were highest among patients ≥65 years (57.8%) followed by 40-64 (32.6%) and 18-39 years (9.6%). During 2005-2014, hospitalization rates among ≥65 years increased significantly (10.7%, p<0.001), where as a decreasing trend was observed in other age groups. The total cost of hospitalization significantly increased from $302M in 2005 to $472M in 2014 among ≥65 years (p<0.001). In general, highest change in total cost was observed among Medicare patients where it increased by 53% to $145 million in 2014 compared to 2005.

Conclusion: Hospitalizations and costs associated with HTN, especially Medicare, have increased over the past 10 years among elderly. Although these trends are alarming, these events could be prevented through symptom management at primary care, medication adherence, care coordination, or modifying care-seeking behavior resulting in potential savings of 851M over a year. This would reduce burden of Medicare spending, which is projected to surpass the rate of growth in federal revenues.

Association of MRI Signs With Development of Mild Cognitive Impairment and Dementia: The Atherosclerosis Risk in Communities (ARIC) Study

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Background: Brain infarcts, white matter hyperintensities (WMH), and brain atrophy appear to contribute to the development of
mild cognitive impairment (MCI) and dementia in selected populations, but few prospective studies are available in general populations.

**Methods:** The study included 732 black and white participants, sampled from the original ARIC cohort, who had 3T brain Magnetic Resonance Imaging (MRI) scans, were free of MCI and dementia during 2011-13 (Visit 5), and were evaluated for cognitive impairment during 2016-17 (Visit 6, about 90% complete). We assessed the associations of brain infarcts, WMH, and brain volumes measured on MRI from 2011-2013 with incident MCI and dementia (combined), diagnosed using a computer algorithm based on specified criteria and comprehensive assessment at Visit 6. We used logistic regression, incorporating sampling weights, to evaluate the risk for incident MCI/dementia with adjustment for demographic covariates, major dementia risk factors, and history of cardiovascular diseases.

**Results:** Participants had a median age of 75 (IQR: 71, 79) at Visit 5 (baseline); 62% (453) were female and 33% (242) were African American. There were 156 newly identified cases of MCI or dementia during a median follow-up time of 4.9 (IQR: 3.4, 5.2) years. The presence of any brain infarct was associated with a nonsignificantly higher risk of MCI/dementia (OR: 1.50; 95%CI: 0.87 to 2.58), but the only significant individual association was with cortical infarcts (OR: 1.99; 95%CI: 1.03 to 3.85). WMH volume above the median value was nonsignificantly associated with conversion to MCI/dementia. Smaller Alzheimer’s disease (AD) signature region was an independent predictor for greater risk of MCI/dementia (OR: 1.49; 95%CI: 1.00 to 2.22). A similar but nonsignificant association was observed for total brain volume. **Conclusions:** Brain infarcts (cortical infarcts) and lower brain volume (AD signature region), measured in community-based older residents, are risk factors for MCI and dementia incidence.


Funding: No

Funding Component:

**P010**

**Mid-life Vitamin D Levels and Later Life Performance on Neuropsychological Testing: The Atherosclerosis Risk in Communities (ARIC) Study**

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**Background:** Prior cross-sectional studies among older adults have found associations between low vitamin D (vitD) levels and reduced cognitive performance but were unable to distinguish the temporal order between vitD and the onset of dementia. We examined the association between mid-life vitD
levels, assessed by serum 25-hydroxyvitD, with later life performance on neuropsychological testing.

**Methods:** We conducted a non-concurrent cross-sectional analysis of 5,887 white and black participants enrolled in the ARIC Neurocognitive Study. We included participants who had serum vitD concentrations measured at visit 2 (1990-1992; age range 47-69 years) and who had neuropsychological and functional testing at visit 5 (2011-2013; age range 67-91 years). Neuropsychological tests were grouped into memory, language, and executive function domains and were standardized. We categorized vitD using clinical cut points as deficient (<20 ng/mL), intermediate (20-<30 ng/mL), or sufficient (≥ 30 ng/mL). We used Poisson and linear regression models adjusted for demographic and socioeconomic factors to examine the associations between vitD with prevalent dementia and performance on neuropsychological testing.

**Results:** In mid-life, the mean (SD) age of participants was 56 (5) years, 60% were female, and 22% black. Mean (SD) vitD was 24.6 (8.4) ng/mL; 30% had deficient, 46% intermediate, and 24% sufficient vitD levels. Compared to participants with sufficient vitD levels, the prevalence ratios (95% CI) of late-life dementia were 1.35 (0.99, 1.84) and 1.27 (0.90, 1.80) for participants with intermediate and deficient vitD levels, respectively. We found no significant association between mid-life vitD and late-life performance on neuropsychological testing (Table). Further adjustments for cardiovascular, genetic, and metabolic factors yielded similar results.

**Conclusion:** In this cohort, mid-life serum vitD levels were not associated with prevalent dementia or with performance on neuropsychological testing 20 years later.


**Funding:** No

**Funding Component:**

**P011**

**Cardiovascular Risk Factors and Longevity**

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Introduction: Cardiovascular disease is the leading cause of mortality in old age, yet there is limited research on the patterns of cardiovascular risk factors that predict survival to 90 years.

Hypothesis: The patterns of cardiovascular risk factors that portend longevity will differ from those that confer low cardiovascular risk.

Methods: We examined repeated measures of blood pressure, LDL-cholesterol, and BMI from age 67 and survival to 90 years in the Cardiovascular Health Study (CHS). CHS is a prospective study of 5,888 black and white adults in two waves (1989-90 and 1992-93) from Medicare eligibility lists in four counties in the U.S. We restricted to participants aged 67 to 75 years at baseline to control for birth cohort effects and examined repeated measures of cardiovascular risk factors throughout the late-life course. We fit logistic regression models to predict survival to age 90 using generalized estimating equations, and modeled the risk factors as linear, a linear spline, and clinically relevant categories. Models were adjusted for demographics and medication use, and we also
examined whether the association of each risk factor with longevity varied by the age of risk factor measurement. Best fit models are presented.

Results: Among 3,645 participants in the birth cohort, 1,160 (31.8%) survived to 90 by June 16th, 2015. Higher systolic blood pressure in early old age was associated with reduced odds for longevity, but there was an interaction with age such that the association crossed the null at 80 years. (Table) Among those with LDL-cholesterol <130 mg/dL, higher LDL-cholesterol was associated with greater longevity; at levels above 130 mg/dL there was no association between LDL-cholesterol and longevity. BMI had a u-shaped association with longevity. Conclusions: In summary, the patterns of risk factors that predict longevity differ from that considered to predict low cardiovascular risk. The risk of high systolic blood pressure appears to depend on the age of blood pressure measurement.


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Funding Component:

P012

The Effect of Vitamin D Supplementation on Epigenetic Aging: A Randomized Placebo-Controlled Clinical Trial

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Background: Vitamin D deficiency is associated with age-related diseases, such as cardiovascular disease, diabetes and cancer. We have previously shown that vitamin D plays a role in regulating human epigenome. Moreover, we have demonstrated that vitamin D supplementation increases telomerase activity, suggesting an anti-aging property. Epigenetic age acceleration, an emerging marker of biological aging, predicts cardiovascular mortality, morbidity and cancer. In this study, we tested the hypothesis that vitamin D supplementation would decelerate epigenetic aging. Methods: We have previously completed a 16 week randomized placebo-controlled clinical trial of vitamin D3 supplementation in overweight/obese African-Americans (NCT01583621). The participants were randomly assigned into four groups of placebo, 600 IU/day, 2000 IU/day, and 4000 IU/day of vitamin D supplements. A genome-wide methylation scan was performed using the Illumina Human Methylation 480K Bead Chip on peripheral blood mononuclear cell DNA. DNA methylation age of 52 participants was determined based on 353 CpG sites using the statistical pipeline developed by Horvath. Epigenetic aging, methylation-based age acceleration index (Δage) was defined as the difference between DNA methylation age and chronological age in years. Mixed-effects models were used to evaluate the treatment effects. Results: DNAm age was significantly correlated with chronological age (r=0.9082, p-value < 0.001). The correlation was higher at baseline (r=0.9281, p-value < 0.001) than at 16 weeks (r=0.8887, p-value < 0.001), which implies that the 16 week treatment may drive the DNAm age deviated from the chronological age. Compared with placebo, vitamin D supplementation was also associated with decreased Δage after adjustment for sex, BMI, lymphocyte percentage, month and baseline 25(OH)D concentration (600 IU/day: β = 0.90, p-value = 0.325; 2000 IU/day: β= -1.21, p-value = 0.118; 4000 IU/day: β= -1.70, p-value = 0.035), but only the treatment effect of 4000 IU/day supplementation was significant. Conclusion: Our results suggest that vitamin D supplementation might decelerate epigenetic aging, further supporting the anti-aging effect...
of vitamin D supplementation in overweight/obese African Americans. Larger studies are needed to replicate the findings.


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P013

Elevated Resting Heart Rate in Mid-Life is Associated With Cognitive Change Over 20-years: The Atherosclerosis Risk in Communities (ARIC) Study

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Background: Resting heart rate (RHR) is an easily measured marker that is independently associated with cardiovascular disease (CVD) risk. There are several potential mechanisms by which RHR could affect cognitive function, but little is known about the relation of RHR and cognitive decline. We examined the association of RHR with 20 year cognitive decline in a community-based cohort.

Methods: We studied 13,720 middle-aged white and black participants without a prior history of stroke or atrial fibrillation. RHR was obtained from a 12-lead resting electrocardiogram at baseline (1990-1992). Cognitive testing was measured at baseline and at up to two additional visits (1996-1998 and 2011-2013). A 3-test combined cognitive score was summed from these tests: delayed word recall, digit symbol substitution and word fluency. RHR was categorized into groups as <60 (reference), 60-69, 70-79 and ≥80 bpm. We examined the association of RHR with cognitive decline using linear mixed-effects models adjusted for demographic, socioeconomic, CVD risk factors, and AV nodal blockade use. ApoE genotype was included as a possible predictor. Imputation methods were used to account for attrition over follow-up.

Results: Mean (SD) age of participants at baseline was 58 (6) years; 56% were women, 24% black. Average (SD) RHR was 66 (10) bpm, with RHR distribution: <60 (28%), 60-69 (40%), 70-79 (23%), >80 (9%) bpm. Over a mean follow-up of 20 years, participants in each RHR group exhibited cognitive decline (Table Part A). However, there was relatively greater global cognitive decline for those with RHR 70-79 and >80 bpm compared to <60 bpm (Part B). Results were consistent when excluding participants on AV nodal blockade medications.

Conclusion: Elevated RHR is independently associated with greater cognitive decline over 20 years. Further studies are needed to determine whether the association is causal or secondary to another underlying process. If causal, future studies can determine whether modification of RHR can reduce cognitive decline.

Funding: No

Funding Component:

P014

Associations of Depression, and Perceived Stress With Telomere Length in African Americans: The Minority Health Genomics and Translational Research Bio-Repository Database Study

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Background: African Americans (AA) experience higher levels of psychological distress. Adverse psychological conditions and mental stress could be associated with accelerated cellular aging, evidenced by shortened leukocyte telomere length (TL), which could underlie this association. Hypothesis: In this study, we hypothesized that depressive symptoms and higher stress level would be associated with shorter telomere length in AA. We also hypothesized that the associations would be attenuated after adjusting for individual-level sociodemographic variable, various disease conditions, and lifestyle factors. Methods: The analysis included 225 women and 142 men aged 30-55 years from the Minority Health Genomics and Translational Research Bio-Repository Database Study. Relative TL (T/S ratio) was measured using quantitative polymerase chain reaction. The 20-item Center for Epidemiologic Studies Depression Scale and 14-item Perceived Stress Scale were used to assess the presence of depressive symptoms and perceived stress respectively. Summation of the scores and the Principal Component Analysis were performed for both the scales. Multivariable linear regression models were used to estimate mean differences in log T/S associated with depressive symptoms and perceived stress after adjusting for sociodemographic variable, various disease conditions, and lifestyle factors. Results: No evidence of association between stress and TL was observed. We found effect modification by hypertension affecting the association between depressive symptoms and log T/S. Depressive symptom, especially higher psychosomatic symptoms, was associated with increased TL in normotensive participants (β= 0.11 for mid-level psychosomatic symptoms and β= 0.12 for high-level psychosomatic symptoms; p value <0.05 for both). No association was observed in hypertensive participants. Conclusions: We found a positive association between psychosomatic depressive symptoms and TL, which do not support the hypothesis that depression is associated with shorter TL and aging in AA. Longitudinal studies with larger samples are needed to better understand and confirm this relationship.

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P015

Objectively Measured Step Counts Was Independently Associated With Higher Cognition in Apparently Healthy Japanese Men

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Introduction: A positive association between physical activity and cognition has been reported. However, very few pertinent studies have evaluated physical activity by objective measures. Hypothesis: In a community-based sample of non-demented men, objectively measured step count was positively associated with higher cognitive function. Methods: The Shiga Epidemiological Study of Subclinical Atherosclerosis (SESSA) randomly recruited community-dwelling apparently healthy men aged 40-79 years from Shiga, Japan, and measured their step counts over 7 consecutive days using a pedometer (DIGI-Walker, DW-200) at baseline (2006-08). Among 853 men who returned for follow-up (2010-12), we assessed their cognition using Cognitive Abilities Screening Instrument (CASI) score. The score can range from 0 to 100, and higher score indicates better cognition. We restricted our analyses to those with a valid 7-day average step count at baseline and who remained free of stroke (N=678). We calculated crude and adjusted mean CASI score according to quartile of average step count using linear regression models. All adjusting covariates used in models were assessed at baseline including age, educational attainment, smoking, and drinking.

Results: The mean [standard deviation] of age and unadjusted score were 63.8 [9.1] years and 90.8 [5.8]. Mean CASI score was higher in higher quartile of average step: 90.2, 90.4, 90.6, and 91.8 from the lowest to the highest quartile of average step ($P$ for trend =0.004) in a model adjusted for age and education. Further adjustment for smoking, drinking and other cardiovascular risk factors resulted in similar pattern of association (Table 1).

Conclusions: Apparently healthy Japanese men with greater 7-day average step count at baseline measured with pedometer was associated with a small but significantly higher CASI score than those with fewer step count. The finding is consistent with the hypothesis that physical activity is protective for cognition in non-demented individuals.


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P016

Physical Activity as Key Risk Factors for Incident Dementia in a Thai Population: Health Checks Ubon Ratchathani (HCUR) Study

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Introduction: There is little evidence to describe risk factors for dementia in a Thai general population. Hypothesis: This study was aimed to examine factors associated with the risk of developing dementia in a Thai general population in Ubon Ratchathani. Methods: Data on 761,935 men and women participating in the Health Check Ubon Ratchathani (HCUR) Project in 2006-7 were merged with diagnostic information from hospital’s electronic medical records in the following 5 years (2006-2012). Using a retrospective cohort study design, we examined the incidence of physician-diagnosed dementia in a Thai general population.
dementia over 5 years. Factors independently associated with the risk of developing dementia were examined using multivariate cox proportional hazard regression. **Results:** Over a total time at risk of 4,407,201 person-years, 519 individuals developed dementia, the incidence rate of dementia was 0.12 (95%CI 0.11-0.13) per 1,000 person-years. Factors independently associated with the risk of developing dementia in multivariate cox regression included increasing age, diabetes and lack of physical exercise. The risk of dementia rose by 9% for every one year of age older (Hazard ratio (HR) of 1.09 (1.08-1.09), p<0.001). Diabetes increased the risk of dementia by almost 2 times (HR 1.67 (1.26-2.23), p<0.05). Compared to no physical exercise, regular physical exercise of 3-5 days/week and >5 days/week reduced the risk of dementia by 36% and 57% (HR 0.64 (0.52-0.78) and 0.43 (0.28-0.67) respectively). These associations remained significant after controlling for sex, hypertension, systolic blood pressure, smoking, body mass index, waist circumference, high salt diet and alcohol drinking. **Discussion:** In this Thai general population, the incidence of dementia was modest and its independent risk factors included increasing age, diabetes and lack of physical exercise. Regular physical exercise may counter balance aging process, the main drive of dementia. The more physical exercise you do, the lower risk of dementia.


Funding: No

**Funding Component:**

**P017**

**Childhood Food Insufficiency and Adulthood Cardiometabolic Health Among a Population-based Sample of Elderly Adults in Puerto Rico**

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Objective: Childhood food insufficiency is associated with poor physical health and psychosocial development in children, but less is known about long-term health implications. The objective of this study was to elucidate the association of childhood food insufficiency with cardiometabolic risk factors and health outcomes in later life among a sample of elderly adults.

**Methods:** We conducted cross-sectional analysis of data from the Puerto Rican Elderly: Health Conditions Project (n=2,712), a longitudinal, population-based sample of elderly adults (>60 y) living in Puerto Rico. Participants reported childhood food insufficiency at wave 2. Prevalence of cardiometabolic health outcomes was self-reported at wave 1 or 2, and included hypertension, diabetes, and cardiovascular disease (heart attack, heart disease, and stroke). Obesity was assessed at wave 2 using objective measurements. Multivariate-adjusted complex survey logistic regression models tested the associations of childhood food insufficiency with each condition, as well as with total number of cardiometabolic conditions (0-6).

**Findings:** Nearly a third (31.8%) of the sample reported childhood food insufficiency; 71.0% reported hypertension, 33.0% reported diabetes, 34.3% reported cardiovascular disease, and 29.5% had obesity. Over half (55.2%) had two or more cardiometabolic conditions. In models adjusted for age, sex, childhood socioeconomics and health factors, and current socioeconomic status and smoking status (current/former/never), childhood food insufficiency was associated with increased odds of hypertension (Odds Ratio (OR), 95% Confidence Intervals (CI): 1.65 (1.03, 2.63)) and of having 1 (2.52 (1.36, 4.67)), 2 (2.38 (1.35, 4.20)), or 3 or more (2.36 (1.34, 4.17)) cardiometabolic conditions compared to no cardiometabolic conditions. Childhood food insufficiency was not significantly associated
with cardiovascular disease (1.19 (0.82, 1.74)),
diabetes (1.33 (0.92, 1.93)), or obesity (0.82
(0.54, 1.26)).
Conclusions: Childhood food insufficiency may
increase the likelihood of having hypertension
or multiple cardiometabolic conditions in
adulthood, independent from socioeconomic
factors. Creating strategies to prevent and
reduce food insufficiency in childhood may be a
way to prevent eventual cardiovascular-related
diseases.
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P018
Poincare Plot Asymmetry is Associated With
Sudden Cardiac Death in the Community: The
Atherosclerosis Risk in Community Study
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Introduction: Poincare plot asymmetry has
been associated with sustained ventricular
tachyarrrhythmias, implicating involvement of
the autonomic nervous system. An association
between sudden cardiac death (SCD) and
Poincare plot asymmetry has not previously
been studied in a general population cohort.
Porta index measures time asymmetry in heart
rate variability (HRV), corresponding to
disproportionate relative tachycardic
predominance.
Hypothesis: We hypothesized that increasing
tachycardic asymmetry as measured by Porta
Index is associated with SCD.
Methods: We analyzed 10-second ECG in
14,247 participants across 5 visits in the
Atherosclerosis Risk in Communities (ARIC)
cohort (mean age 54.1±5.87y; 6,380 [45%] men;
10,569 [74%] white, 1,582 [11%] with prevalent
cardiovascular disease (CVD)). Participants with
atrial fibrillation, premature contractions,
sinoatrial (SA) or atrioventricular (AV) blocks II-
III were excluded. Only normal sinus beats were
included in the semi-automated analysis.
Accuracy of automated R-peak detection was
manually validated. SCD, non-SCD, and non-
cardiac death served as competing outcomes in
a Fine and Gray competing risk model.
Results: Overall, there was larger variability in
Porta index within the same participant from
visit to visit (50.0±12.1) than between different
participants (50.0±8.4). Over median follow-up
of 24.4 years, there were 497 SCDs (incidence
1.66 [95% CI 1.52-1.82]), 742 non-SCD (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 time-updated analysis,
Porta index was independently associated with
increased risk of SCD (HR 1.13 [1.04-1.23]).
Neither non-sudden cardiac death nor non-
cardiac death are associated with Porta ndex.
Conclusion: Time-updated Poincare Plot
asymmetry as measured by Porta index,
reflecting tachycardic runs longer than
bradycardic runs, is independently associated
with SCD in the community. Poincare plot
asymmetry requires further study.
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P019

Insulin resistance indexes and lower heart rate variability in older adults: the Atherosclerosis Risk in Communities Study (ARIC)

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Introduction: Lower heart rate variability (HRV) is an indicator of cardiac autonomic dysfunction which is associated with cardiovascular disease in diabetes. Whether pre-diabetes insulin resistance contributes to lower HRV is not clear; insulin resistance (IR) indexes reflect different aspects of IR, including dysregulation of glucose, insulin, and lipids. We hypothesized that IR indexes are inversely associated with HRV.

Methods: We analyzed 48-hour ambulatory electrocardiograms on 759 adults in a sample of the ARIC Study, excluding diabetes, antiarrhythmic medications, and missing/poor quality recordings. Insulin resistance indexes were defined as quartiles for the homeostatic model assessment of insulin resistance (HOMA-IR), triglyceride to HDL-C ratio (TG/HDL-C), and triglyceride-glucose index (TyG). Low HRV was defined as <25th percentile for time domain measures -- including the standard deviation of all NN intervals (SDNN) and square root of the mean squared differences of successive NN intervals (RMSSD), and frequency domain measures -- including the high-frequency (HF) and low-frequency (LF) spectral components. Logistic regression with weights for sampling and nonresponse was used to estimate odds ratios and 95% confidence intervals (OR, 95% CI).

Results: Mean age was 75 years [993 (63%) women, 688 (43%) African American]. The following results are reported for TyG. For time domain measures, high IR indexes were significantly associated with low SDNN (OR 1.83, 95% CI 1.09, 3.07), but not with low RMSSD (OR 1.48, 95% CI 0.89, 2.46). For frequency domain measures, high IR indexes were not associated with low HF (OR 1.62, 95% CI 0.96, 2.74), but significantly associated with low LF (OR 1.95, 95% CI 1.15, 3.30). Although results for other indexes were in the same direction, most were not statistically significant.

Conclusions: Insulin resistance indexes may be inversely associated with HRV. An understanding of this relationship informs public health strategies for prevention of cardiovascular risk.


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P020

Atrial Fibrillation and White Matter Microstructural Integrity: The Atherosclerosis Risk in Communities Neurocognitive Study

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Background: Evidence suggests atrial fibrillation (AF) is associated with increased risk of cognitive decline and dementia, even in the absence of stroke. Pathways such as AF-induced brain hypoperfusion and small vessel disease resulting in white matter abnormalities may also compromise cerebrovasculature and brain tissue, which would lead to cognitive impairment and dementia. However, mechanisms responsible for the association between AF and cognitive impairment independent of stroke and cerebral infarcts remain relatively unexplored. The study aims to assess the cross-sectional association between prevalent AF and white matter microstructural integrity (WMMI) as a marker for cerebrovascular disease.

Methods: We performed a cross-sectional analysis of 1937 participants attending the ARIC-Neurocognitive Study (ARIC-NCS) in 2011-2013 that were either black or white and with brain magnetic resonance imaging (MRI). Prevalent AF was defined by a history of AF based on study ECG and hospitalization record. WMMI was defined using regional average fractional anisotropy and mean diffusivity from Diffusion Tensor Imaging measurements in the MRI. We excluded participants with a prior history of stroke or cerebral infarct. A multivariable regression model was used to assess the association between AF and WMMI measures.

Results: Among 1943 participants (mean age = 76 years, 28% black, 60% female), 7% (N= 133) had prevalent AF. After multivariable adjustment, prevalence of AF was not associated with WMMI measurements (Table). Conclusion: In a community-based study, prevalent AF was not independently associated with WMMI in the absence of stroke or cerebral infarct. Further longitudinal studies are needed to investigate prospectively the association of AF with early markers of white matter disease.


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P021

Oral Anticoagulant Use and Risk of Incident Dementia in Persons With Atrial Fibrillation

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Background

Current guidelines recommend oral anticoagulation for the prevention of stroke in most patients with atrial fibrillation (AF). Direct oral anticoagulants (DOACs) are associated with lower risk of ischemic stroke and intracranial bleeding than warfarin and, therefore, may reduce risk of dementia among patients with AF.

Hypothesis

AF patients initiating DOACs for stroke prevention will have lower risk of dementia than patients initiating warfarin.

Methods

We used data from two US healthcare claim databases, MarketScan (2007-2015) and Optum Clinformatics (2009-2015). Using validated algorithms, we identified patients with AF who
initiated oral anticoagulation. Dementia was defined as having an *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) code of 290.xx, 294.xx, or 331.0. Comorbidities and use of other medications were defined based on inpatient, outpatient, and pharmacy claims. We performed a series of head-to-head comparisons of different oral anticoagulants (warfarin, dabigatran, rivaroxaban, and apixaban) in propensity score-matched cohorts. In each database, multivariable-adjusted Cox regression models were used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) for incident dementia for each comparison of propensity score-matched cohorts, adjusting for age, sex, comorbidities, use of other medications, and markers of socioeconomic status (in the Optum database only). We meta-analyzed database-specific results using a random-effects model.

**Results**

The analysis included 307,099 AF patients from the MarketScan database and 161,346 from the Optum database, of which 6,572 and 4,391 respectively had a diagnosis of incident dementia. Mean follow up ranged between 0.7 to 2.3 years and incident of diagnosed dementia between 7 to 14 cases per 1000 person-years across different oral anticoagulant initiator groups. Patients initiating DOACs had a lower risk of incident dementia than those initiating warfarin (dabigatran: HR 0.85, 95%CI 0.71, 1.01; rivaroxaban: HR 0.85, 95%CI 0.76, 0.94; apixaban: HR 0.80, 95%CI 0.65, 0.97). There were no differences in risk of incident dementia comparing DOAC user groups (dabigatran vs. rivaroxaban: HR 1.02, 95%CI 0.79, 1.32; dabigatran vs. apixaban: HR 0.92, 95%CI 0.63, 1.36; apixaban vs. rivaroxaban: HR 1.01, 95%CI 0.86, 1.19).

**Conclusions**

Patients with AF initiating DOACs experienced lower rates of incident dementia than warfarin users. No obvious benefit was observed for any particular DOAC in relation to dementia rates.


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**P022**

The Association of Sleep Apnea With Atrial Fibrillation and Ectopy Using Ambulatory Electrocardiogram in the Atherosclerosis Risk in Communities (ARIC) Study

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**Introduction:** Sleep apnea (SA) is associated with burden of atrial fibrillation (AF), but studies of SA and ectopic beats, potential triggers of AF, are sparse. Our study contributes by examining the association of SA with AF, premature atrial contractions (PACs), and premature ventricular contractions (PVCs) from 48-hour continuous ambulatory electrocardiogram (aECG) monitoring.

**Methods:** The study population includes 716 black and 438 white participants from the ARIC 48-hour aECG ancillary study, after excluding those with a paced rhythm (n=43) or poor quality measures (n=8). SA was defined as self-reported physician diagnosis or hospital discharge records with ICD-9-CM codes for SA. Prevalent AF was defined using 48-hour aECG monitoring, study visit ECGs, or hospital discharge code (427.3) since study baseline in 1986-1987. PACs and PVCs were defined if ectopy was present 1-5% (occasional) and >5% (frequent) of the recording time versus <1% of
the recording time (referent). Multivariable logistic regression was used to examine this association with inverse variance weighting to account for the sampling and non-response. **Results:** Participants with SA (unweighted N=217) were more likely to be female (55%), white race (52%), current smokers (57%), have hypertension (82%), and be obese (57%). Participants with SA were 7.3 (95% CI: 3.7, 14.5) times more likely to have AF compared to those without SA after adjusting for covariates. Compared to participants without SA, the relative odds of occasional and frequent PACs versus the referent was increased by 20% and 50% respectively among participants with SA after adjusting for confounders, although not statistically significant. The association was similar and not statistically significant for frequent PVCs. **Conclusions:** In a community-based population using standardized 48-hour aECG monitoring, SA was associated with prevalent AF, but not significantly associated with PACs or PVCs. Further study is needed to establish mechanisms that link SA and cardiac arrhythmias.


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**P023**

**Lifetime Risk of Atrial Fibrillation by Race and Socioeconomic Status: The Atherosclerosis Risk in Communities (ARIC) Study**

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**Background:** The lifetime risk of atrial fibrillation (AF) has been previously reported in whites, but not in African Americans. Moreover, we lack current estimates of lifetime risk of AF that take into account recent trends in the incidence of this arrhythmia. Lifetime risk of AF by socioeconomic status has not been investigated before. **Methods:** We studied 15,343 whites and African Americans in the Atherosclerosis Risk in Communities study who were followed for an average of 21 years (maximum 27 years). Total family income was categorized as <$25,000, $25,000-$49,999, and ≥$50,000, and education as < high school graduate, high school graduate, and at least some college. Incident AF was ascertained from study electrocardiograms, hospital discharge records, and death certificates. Lifetime risk of AF was estimated by a modified Kaplan-Meier method that accounted for the competing risk of death. **Results:** We identified 2760 AF cases during follow-up. Lifetime risk of AF was 36% (95% CI: 32-38%) in white men, 30% (26-32%) in white women, 21% (13-24%) in African American men, and 22% (16-25%) in African American women (Figure). Regardless of race and sex, incidence rates of AF decreased from the lowest to highest categories of income and education. In contrast, lifetime risk of AF increased in individuals with higher income and education in most sex-race groups. Cumulative incidence of AF was lower in those with higher income and education compared to their low socioeconomic status counterparts through earlier life, but was reversed after age 80. **Conclusion:** Lifetime risk of AF in a contemporary cohort in the United States was approximately 1 in 3 among whites and 1 in 5 among African Americans. Socioeconomic
status was inversely associated with cumulative incidence of AF before the last decades of life.

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P024

Nonsustained Ventricular Tachycardia is Independently Associated With Lower Cognitive Function: The Atherosclerosis Risk in Communities (ARIC) Study

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Introduction -- Atrial fibrillation is associated with greater cognitive decline and increased risk of dementia. Little is known about whether other arrhythmias, such as nonsustained ventricular tachycardia (NSVT), are associated with cognition. We aimed to assess the cross-sectional association of NSVT with cognitive test scores in the Atherosclerosis Risk in Communities (ARIC) study. Methods - We included 1367 (mean age, 79 ± 5 years; 55% female; 19% non-white race) participants who underwent cognitive tests and ≥2 days of heart rhythm recording using the Zio Patch (a non-invasive, leadless, 2-week ambulatory continuous ECG recording device by iRhythm Technologies, Inc.) in July 2013-February 2017. NSVT was defined as a wide complex tachycardia >4 beats with a rate >100 beats per minute. Burden was calculated as the number of NSVT episodes divided by recording time and split on the median into higher burden and lower burden. Cognitive domain-specific factor scores consisted of tests of memory, executive function and language. We used multiple linear regression to assess the association of NSVT with standardized z-scores of each cognitive domain. Results - The mean recording time of the Zio Patch was 12.6 ± 2.5 days. There were 399 (29%) participants with NSVT recorded, ranging from 0.5-439 episodes per week (median = 0.59; interquartile range = 0.51-1.50). Presence of NSVT was associated with lower memory and lower executive function, but not impaired language (Table). The associations were restricted to participants with higher burden of NSVT compared to those without NSVT (-0.22 z-score units, 95% confidence interval (CI) -0.41, -0.04 for memory, and -0.23, 95%CI -0.41, -0.05 for executive function) (Table). Conclusion - Presence and higher burden of NSVT are independently associated with lower cognitive function, specifically executive function and memory. Further research is warranted to elucidate the underlying mechanism.

Disclosures:  

Left Atrial Dilatation Predicts The Incidence Of Persistent Atrial Fibrillation In Japanese General Population; The Suita Study

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(Objective) Atrial fibrillation (AF) is an important risk factor for cardiovascular disease (CVD). Left atrial (LA) dilatation detected by ultrasonic cardiography (UCG) has been reported to be associated with the incidence of AF in Western countries. However, the relationship between LA dilatation and the AF incidence has not been well investigated in Asian countries, with lower incidence of AF and obesity and with higher incidence of hypertension and stroke. To investigate the relationship between LA dilatation and the AF incidence in Japanese general population, we estimated the multivariate-adjusted hazard ratios (HR) of LA dilatation assessed by UCG for the incidence of AF.

(Methods) Participants were 1,585 individuals without AF (665 men, 920 women) who are the participants of a prospective cohort study for CVD incidence in urban Japanese general population (the Suita study). The mean±SD age of the participants were 67.8±7.0 years. Transthoracic UCG was performed from July in 2007 to June in 2013, and LA dimension was determined in accordance with American Society of Echocardiography recommendations by M-mode echocardiograms. After the UCG, the electrocardiograms (ECG) were repeatedly performed until March in 2016. The physicians coded the ECG using Minnesota Code (MC), and AF code is defined as 8-3-1. The HRs of LA dilatation for the incidence of AF with 95% confidence interval (CI) were estimated by Cox proportional hazard model with the adjustment for the followings at the UCG test; age, sex, systolic blood pressure, body mass index, the presence of heavy drinking (more than 2 drinks/day), non-HDL cholesterol, and the presence of the moderate or severe mitral or aortic valve abnormality detected by UCG.

(Results) The mean follow-up period from UCG to the last ECG was 4.6±1.8 years, and 19 AF incidences were detected. The multivariate-adjusted HR of the LA dilatation (>40 mm) for the incidence of AF was 8.19 (95% CI: 2.47-27.14). And the multivariate-adjusted HR of 5 mm increment of LA dimension was 2.95 (1.65-5.29), and that of the highest quartile of LA dimension compared to the lowest was 3.37 (0.64-17.78). Among 674 participants with left atrial volume index (LAVI) data (5 AF cases), the multivariate-adjusted HR of LAVI ≥ 32 (ml/m²) for AF incidence was 3.93 (95%CI: 0.34-45.86), and it showed the highest HR among the co-adjusted factors.

(Conclusion) LA diameter assessed by UCG is a simple and non-invasive clinical data, and could be a useful factor for the prediction of AF incidence among Japanese general population. Although the follow-up period was not enough compared to the previous studies in Western population, the present study might indicate that individuals with LA dilation detected by UCG are the important candidate for careful and continuous check-ups about CVD risk factors, ECG and UCG in Asian population.

Early Repolarization Pattern is Associated With Increased Left Ventricular Mass and Left Ventricular Hypertrophy: Results From the Dallas Heart Study

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Introduction: Recent studies have shown an association between early repolarization pattern (ERP) ECG morphology and sudden cardiac death. The role of left ventricular mass (LVM) as a potential mediator of ERP has not been well explored.

Methods: Participants in the Dallas Heart Study who underwent an ECG and cardiac MRI (CMR) were assessed for ERP, defined as J-point elevation ≥1 mm in any 2 contiguous leads. We compared participants with and without ERP by age, gender, race/ethnicity, established cardiovascular risk factors of diabetes, hypertension and hyperlipidemia, lean body mass and percent body fat, and CMR-derived LVM, LVM/body surface area, and LVH defined by standard criteria, using Student’s T-tests and chi-squared tests where appropriate.

Results: Of the 3,015 participants in our study, 276 (9.2%) had ERP. Participants with ERP were younger (43±9 vs 44±10 yrs, p=0.04), more prevalent in blacks than non-blacks (14 vs 5.0%, p<0.00001), and in men than women (18 vs 2.0%, p<0.00001). Baseline cardiovascular risk factors were not significantly different. Participants with ERP demonstrated higher lean body mass (59±10 vs 52±11 kg, p<0.00001) and lower percent body fat (27±8 vs 36±9%, p<0.00001). The presence of ERP was associated with greater LVM, increased LVM/body surface area, and the presence of LVH in the overall population and in analyses stratified by sex (Table 1).

Conclusion: In a large, multi-ethnic cohort, ERP is associated with increased total LVM, increased LVM/body surface area, and LVH. These novel associations may provide insight into the biology of ERP. Further studies investigating the relationship of LVM and LVH with ERP are warranted.

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Time-updated Premature Ventricular Contractions on 12-lead ECG Are Associated With the Risk of Sudden Cardiac Death: Atherosclerosis Risk in Communities Study and Cardiovascular Health Study

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Introduction: The association between premature ventricular contractions (PVCs) and sudden cardiac death (SCD) remains controversial. Hypothesis: We hypothesized that PVCs are associated with SCD. Methods: Presence of PVCs was detected on 12-lead ECG recorded at baseline or any of 4 follow-up visits
in 15,667 participants (pts) (mean age: 54.2 ± 5.8 Yrs; 55% female; 73% Whites) of the Atherosclerosis Risk in Communities (ARIC) study. For validation cohort, we included baseline and 9 follow-up visits ECG data in 5,846 pts (mean age: 72.8 ± 5.6 yrs; 57.7% female, 84.2% whites) from Cardiovascular Health Study (CHS). Competing risk analyses models were constructed to test the association between time-updated PVCs and SCD risk. Model 1 was adjusted for age, sex, race and study center. Model 2 in addition was adjusted for time-updated coronary heart disease, heart failure, atrial fibrillation, stroke, and hypertension. Results: In ARIC pts, across all study visits, PVCs were observed in 2.6% of the ECGs; 99.7% of pts were PVC-free at least once; 8.8% of pts had PVC at least once. 97.7% of pts without PVCs remained PVC-free at the next visit; 19.1% of pts with detected PVC had PVC at the next visit; 2.4% of pts who were PVC-free on previous ECG, transitioned to having PVC on subsequent visit ECG. In CHS, across all 10 yearly study visits, on average, PVC was observed on 4.85% of ECG recordings; 99.4% of participants were PVC-free at least once; 21.9% of pts had PVC at least once. 96.4% of PVC-free pts remained free from PVC at the next visit. 30.6% of pts with detected PVC on a given ECG had PVC at the next visit. 3.6% of pts who did not have PVC on previous ECG, transitioned to having PVC at the next visit. 69.4% of pts with PVC on a given ECG transitioned to being PVC-free next year. In adjusted competing risk analysis PVC was associated with SCD, but not with non-sudden cardiac death or non-cardiac death (Table). Conclusions: Time-updated presence of PVC on a short 10-sec resting 12-lead ECG is associated with SCD.

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P028

High Framingham General Cardiovascular Disease Risk Scores in Victims of Out of Hospital Sudden Death

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Introduction: Individuals with a history of cardiovascular disease (CVD) have a high risk of out-of-hospital sudden unexpected death (OHSUD). However, most OHSUDs occur in victims without a prior history of CVD. Information on CVD risk in these victims is scarce.

Hypothesis: We hypothesized that OHSUD victims who had no prior diagnosis of CVD have higher 10-year CVD risk compared to a matched living control population.

Methods: OHSUD cases were adjudicated from all emergency medical service attended out-of-hospital deaths aged 30-64 in Wake County, NC between 2013-2015. Age group and gender-matched controls were randomly selected from
Wake County residents who visited a local healthcare facility over the same period (~3:1 match ratio). We obtained two years of medical records prior to death (cases) or last visit (controls). After excluding individuals with a history of CVD, we calculated the 10-year risk of CVD for each subject using the published general CVD algorithms by D’Agostino et al. Risk was classified into low (<6%), moderate (6%-20%), and high (>20%).

**Results**: Among subjects without CVD, we included 106 cases and 414 controls who had sufficient data for calculating Framingham risk score. Gender distribution was similar in both case and control groups. The average 10-year risk of CVD was higher for OHSUDs than controls (29% vs. 16%, p=<0.0001). Similar results were found in both men (34% vs. 19%, p=<0.0001) and women (11% vs. 7.3%, p=0.0005). A larger proportion of OHSUDs were considered “high risk” compared to controls (57% (60 of 106) vs. 28% (114 of 414), p=<0.001). This finding remained significant when stratified by gender (Figure).

**Conclusion**: The majority of out of hospital sudden death victims without known CVD are at high risk of cardiovascular disease. This finding bolsters the essential role of office-based risk assessment tools in identifying high risk patients antemortem. Targeted interventions for intensive CVD risk reduction may lead to a decrease in sudden deaths.


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**Racial Differences in Sudden Cardiac Death: Findings From the Atherosclerosis Risk in Communities Study (ARIC)**

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**Background**: In hospital-based studies and in studies of participants with pre-existing conditions, African Americans have a higher risk of in- and out-of-hospital sudden cardiac death (SCD) compared with Whites. However, the risk of SCD of African Americans and Whites has never been compared in large-scale community-based cohort studies.

**Objective**: To compare the risk of SCD among African Americans and Whites, and to evaluate the risk factors that may explain racial differences in incidence.

**Methods**: Cohort study of 3,838 African Americans and 11,245 Whites participating in ARIC. Race was self-reported. SCD cases were defined as a sudden pulseless condition from a cardiac cause in a previously stable individual and adjudicated by an expert committee. Mediation effect of covariates was calculated using boot-strapping method. Cox proportional hazards models were adjusted for demographics, social economic status, cardiovascular (CVD), and electrocardiographic risk factors.

**Results**: The mean (SD) age was 53.6 (5.8) for African Americans and 54.4 (5.7) years for Whites. During 25.3 years of follow-up, 215 African Americans and 332 Whites experienced SCD. In multivariable-adjusted models, the HRs (95% CI) for SCD comparing African Americans and Whites were 1.70 (1.37, 2.10) overall, 2.00 (1.40, 2.84) in women, and 1.46 (1.10, 1.92) in men (p-value for race by sex interaction 0.02; Table). CVD and electrocardiographic risk factors explained 36.6% (21.4, 51.8%) of the excess risk of SCD in African Americans, with a large proportion of racial differences.
unexplained.  

**Conclusions:** The risk of SCD in community-dwelling African Americans was significantly higher than in Whites, particularly among women. CVD risk factors, including higher prevalence of obesity, diabetes, hypertension and LV hypertrophy in African Americans, explained only a small fraction of this difference. Further research is needed to identify factors responsible for race differences in SCD and to implement prevention strategies in high-risk minorities.

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**P030**

**A Weight Loss Intervention Using a Commercial Mobile Application in Latino Americans - Adelgaza Trial**

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**Background:** Latinos have the highest prevalence of overweight or obesity (77.1%) when compared with other racial/ethnic groups in the United States. More than half of Latino adults living in the United States are expected to develop type 2 diabetes in their lifetime. Despite the growing interest in smartphone use for weight-loss and diabetes prevention, relatively few clinical trials have evaluated the efficacy of mobile app-based interventions in Latino populations. **Purpose:** To evaluate the potential efficacy of an in-person weight loss intervention in conjunction with a commercially available Fitbit app in a Latino sample at risk for type 2 diabetes and explore significant predictors associated with weight loss.

**Methods:** After the run-in period, 54 self-identified Latinos with Body Mass Index (BMI) > 24.9 kg/m² were enrolled in an 8-week uncontrolled pilot study, and received a Fitbit Zip, its app and two in-person weight loss sessions adapted from the Diabetes Prevention Program. **Results:** Mean age was 45.3 (SD ± 10.8) years, 61.1% were born in the U.S, and mean BMI was 31.4 (SD ± 4.1) kg/m². Overall, participants lost an average of 3.3 (SD ± 3.4) % of their body weight (p < .0005), corresponding to an average change of -2.4 kg (-5.3 lb) (p<.0005), respectively. We also observed statistically significant reductions in hip and waist circumferences, and systolic and diastolic blood pressure (p < 0.001). After controlling for demographic factors, use of the mobile app weight diary at least twice a week (p = 0.01) and change in the International Physical Activity Questionnaire score (P=0.033) were associated with change in percent body weight. **Conclusions:** The intervention showed the potential efficacy of this intervention, which should be formally evaluated in a randomized controlled trial.

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**P031**

**Effect of Exercise on Function and Differentiation of Adipose Tissue Derived Mesenchymal Stromal Cells (MSCs)**
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Approximately 422 million people have diabetes worldwide (2014) and it is predicted that diabetes will rise by nearly 54% by 2030. Aerobic exercise is known to show positive effect on health of diabetic and pre diabetic patients. The effect of exercise has been studied extensively using plasma biochemistry but cellular data is scarce. Previously, we have shown endothelial progenitor cells (EPCs) can act as a strong cellular biomarker of endothelial function following aerobic exercise as an intervention. In this study, we are examining the effect of aerobic exercise on adipocyte derived MSCs to study stromal cell differentiation and as a cellular surrogate of fat metabolism. **Methods:** Overweight and obese subjects (n=5) were enrolled in a 12 week exercise intervention study. The biweekly exercise sessions were supervised by a trained exercise physiologist and consisted of a 1 hour sessions that included warm-up and cool-down and 30 min of combined aerobic and resistance training at an exercise intensity of 50-80% of heart rate reserve. Physical and biochemical parameters were tested pre and post exercise. Subcutaneous abdominal fat biopsies were obtained and fat derived stromal cells were cultured in vitro for 2-3 weeks. MSCs were analyzed for mRNA gene expression (qRT-PCR) and cellular oxygen consumption rate (OCR), pre and post 12 week exercise. **Results:** With exercise, A1C reduced significantly. An increase of METs was also noticed post exercise. Both basal and maximal respiration increased significantly post exercise when compared with commercially obtained MSCs. Simultaneously, mitochondrial genes COX4 and ATP5B (p= 0.03, 2.7 fold) BGLAP and RUNX2 (1.3 and 1.2 fold) and also for collagen marker COL2 (2.4 fold) expression. For adipogenic differentiation potential PPARG mRNA expression was reduced. Interestingly, serum value of osteocalcin increased significantly from 15.0 (5.5) to 16.3(6.1) ng/ml (9% increase, p=0.03) with 1% increase in bone alkaline phosphatase level, post exercise. **Conclusion:** We conclude that exercise augments cellular glucose transporters (GLUT1), anti-oxidants and reduce MSC inflammation and up-regulates mitochondrial function and gene expression profile of MSCs. Increased serum value of osteocalcin complement increased gene expression of bone formation markers indicating a cross talk between fat derived MSCs and bone formation, post exercise.


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P032

Feasibility, safety and efficacy of a modified Dietary Approaches to Stop Hypertension diet for Japanese population

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**Introduction:** The Dietary Approaches to Stop Hypertension (DASH) eating pattern is widely...
used for lowering blood pressure in the United States. Food preference and intake volume are quite different among American and Japanese diet; therefore, it is necessary to develop a modified version of DASH dietary pattern for Japanese people (JDASH).

**Hypothesis:** The JDASH is feasible, safe and effective among Japanese people.

**Methods:** This crossover pilot study recruited Japanese men and women aged 30 years and over. Participants were randomized to a three week JDASH diet followed by a three week control diet, or the reverse sequence. Intervention periods were separated by two weeks’ washout in which participants returned to their usual diet. The JDASH dietary pattern consisted of higher potassium, magnesium, calcium, dietary fiber, and n-3 fatty acid and lower sodium than Japanese typical diet. The nutrient balance of the control diet was average Japanese diet based on the National Health and Nutrition Survey in Japan. Primary outcome of this trial was a change in 24 hour urine sodium-to-potassium (Na/K) ratios and secondary outcomes were changes in home and office blood pressure values, lipoprotein profiles and body mass index. These outcomes were from 24 hour urine and blood specimens taken measured before and on the last day of each experimental period. The impact on these measurements was calculated with generalized estimating equation model in consideration of the sequences of intervention.

**Results:** The JDASH diet was well tolerated and with no dropouts. No participant reported any adverse effect regarding this intervention diet and no adverse effects were also observed in biological measures. There were no differences in biological measurements between two diets before intervention. A significant difference in 24 hour urine Na/K ratio was observed (-4.33 mol/mol, p<0.001) between the JDASH diet and the control diet. The differences of systolic blood pressure were -2.1 mmHg (p=0.396) at the office and -0.1 mmHg (p=0.956) at home, respectively. Significant differences in body mass index and low density lipoprotein were -0.4 kg/m² (p=0.002) and -11.0 mg/dl (p=0.038), respectively.

**Conclusion:** Developed modified DASH dietary pattern for Japanese were significantly decrease 24 hour urine Na/K ratio. In conclusion, the results of this pilot study showed the feasibility, safety and efficacy.

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**P033**

**Impact of Empathetic Touch Therapy on Reducing Feelings of Stress, Anxiety, Pain and Depression**

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**Introduction:** The association between post-traumatic stress disorder (PTSD) and cardiovascular disease has been established. Complementary and integrative medicine (CAM) modalities are commonly underutilized due to their mixed results and need further evaluation. Empathetic Touch therapy is a holistic healing tool, which incorporates integrative medicine techniques such as energy healing, acupressure, craniosacral therapy, shamanic healing, aspects of Chinese medicine and spiritual care to promote wholeness in the body, mind, and spirit. The purpose of this study is to analyze symptoms of stress, anxiety, pain, and depression in a primarily veterans affairs population suffering from PTSD and
voluntarily undergoing Empathetic Touch therapy sessions at a non-profit organization called the Forgotten Soldier Program.

**Hypothesis:** We assessed the hypothesis that Empathetic Touch therapy will reduce feelings of anxiety, stress, pain, and depression.

**Methods:** This is a retrospective analysis of 424 participants from the Forgotten Soldier Program who completed surveys before and after an approximately 1-hour session of Empathetic Touch therapy (November 7, 2013 through August 11, 2017). Self-reported scores on a scale of 0 to 10 for feelings of stress, anxiety, pain, and depression were collected before and after every therapy session. The change from baseline was determined and analyzed using a paired t-test. **Results:** Across a cohort of 424 individual patients, a total of 1,359 individual sessions were included for analysis. Self-reported feelings of stress (n=1267), anxiety (n=1223), pain (n=1275), and depression (n=416) were reduced by 3.27±3.34, 2.98±3.53, 2.44±3.66 and 1.46±3.7 (all p-values <0.001), respectively. No significant adverse events related to Empathetic Touch therapy were reported. **Conclusion:** Empathetic Touch therapy significantly reduces feelings of stress, anxiety, pain, and depression. Alternative and integrative modalities need to be further incorporated in a holistic treatment of patients. Assessing the impact of Empathetic Touch therapy on cardiovascular endpoints is warranted.

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P034

**The Effectiveness of 12-week Tai Chi Training on the Migraine Attack Days, Body Composition, and Blood Pressure in Chinese Women With Episodic Migraine: A Randomized Controlled Trial**

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**Background:** Tai Chi is a body-mind exercise. Its prophylactic efficacy on migraine attack remains largely unknown. The purpose of this study was to examine the effect of a 12-week Tai Chi training on the migraine attack days per month, body composition, and blood pressure (BP) in a sample of Chinese women with episodic migraine. **Method:** A two-arm randomized controlled trial was designed. Eighty-two local women aged 18 to 65 years and diagnosed with episodic migraine were randomized to the Tai Chi group or the waiting list control group. A modified 32-short form Yang-style Tai Chi training with 1 hour per day, 5 days per week for 12 weeks was adopted as intervention. An additional 12 weeks follow was conducted. The control group received a “delayed” Tai Chi training at the end of the trial. The difference in migraine days between 1 month before baseline, 3rd month (12nd week) and 6th month (24th week) after the randomization were examined. The changes in weight, body fat, and BP before and after the intervention were also analyzed. **Results:** Of 189 women screened, 82 eligible women completed the baseline assessment. After randomization, 9 women withdrew immediately, finally 40 in Tai Chi group and 33 in control group were involved in the analysis. On average, women in Tai Chi group had 3.6 (95% CI: -4.7 to -2.5, P<0.01) days reduction of migraine attack. Compared with control group, the difference was statistically significant (P<0.001). Tai Chi group also lost 0.6 kg of body weight and 0.6% of body fat at the 3rd month, and 10.8 mmHg systolic BP at the 6th month, respectively (all p<0.001). The between-group difference of systolic BP was -6.9 mmHg (95% CI: -11.6 mmHg to -2.1 mmHg,
p<0.05), whereas no significant differences were observed regarding weight and body fat at the 3rd month (all p>0.05). Among Tai Chi group, change in systolic BP was significantly correlated to the change in migraine days (P<0.05). Conclusion: The 12-week Tai Chi training significantly decreased the frequency of migraine attack and improved the systolic BP. The association between migraine attack reduction and BP improvement needs further investigations.

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P035

Feasibility of Stretching Exercise for Prevention of Late-Onset Preeclampsia: A Pilot Trial

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Background: Preeclampsia is a leading cause of maternal morbidity and perinatal mortality. Manifestations include hypertension, proteinuria, and end-organ dysfunction in the latter half of pregnancy. The United States Preventive Services Task Force recommends low-dose aspirin as a modestly effective preventive treatment; however, no conclusive prevention is currently available. Moderate to vigorous physical activity is reported to reduce preeclampsia risk, but is increasingly difficult by the 3rd trimester. Further, intense exercise may stimulate sympathetic overactivation, a precursor of late-onset (≥34 weeks gestation) preeclampsia associated with maternal obesity. Stretching exercise may be a feasible alternative to intense exercise, and more readily adopted by obese women at risk of late-onset preeclampsia. We hypothesized that stretching exercise would suppress sympathetic overactivity and enhance parasympathetic tone in pregnant women.

Methods: Gravid women were recruited with informed consent for stretching exercise and cardiovascular testing during the 2nd to 3rd trimester of pregnancy. Exercises were standardized by video demonstration, and targeted 14 major muscle groups in the lower and upper extremities. Each muscle group was stretched for 20 seconds in 3 repetitions. Blood pressure, carotid-femoral pulse wave velocity (PWV), and heart rate variability (HRV) were acquired before and after stretching, with baseline values preceded by a 15 minute rest. Heart rate and HRV were averaged over 10 minute acquisitions. Total HRV variance was stratified into low frequency (LF; < 0.15 Hz) and high frequency (HF; ≥ 0.15 Hz) domains, with HF reflecting parasympathetic nerve activity and LF dominated by sympathetic activity. Sympathovagal balance was estimated by the LF/HF ratio. Pre- and post-exercise measurements were compared by paired t-tests.

Results: A total of 20 women consented to enrollment; all completed stretching exercise and cardiovascular testing without complications. On average, study participants were 32 years old, 27 weeks pregnant, and had a BMI of 29 kg/m². Over a third (35%) had a BMI > 30 kg/m². Significant reductions between pre- and post-exercise were observed for mean diastolic blood pressure (60 vs. 57 mmHg; p=0.02) and heart rate (78 vs. 75 bpm; p<0.0001). However, mean systolic blood pressure was not significantly changed (104 vs. 105 mmHg; p=0.2), nor was mean PWV (5.3 vs. 5.2 m/s; p=0.4). Although non-significant, the mean LF/HF ratio decreased (2.4 vs. 1.7 Hz; p=0.3), suggesting parasympathetic dominance post-exercise.

Conclusion: This pilot study demonstrates stretching exercise is well-tolerated by pregnant women in the 2nd or 3rd trimester, and may be a feasible prevention for obese women at risk of late-onset preeclampsia. A randomized controlled trial investigating outcomes of routine stretching exercise in pregnancy is warranted.
**Introduction:** Previous studies have shown that lipoprotein particle size and lipoprotein subclasses are associated with cardiovascular and type 2 diabetes risk, and have independent prognostic value above traditional lipid concentrations. The impact of exercise training and increasing non-exercise physical activity on lipoprotein subclasses and size has not been previously investigated. **Methods:** In this pilot study, 35 obese adults were randomized to aerobic exercise training (50-75% of VO2 max) (AERO, n=11), aerobic training and increasing non-exercise physical activity (AERO-PA, n=10, ~3,000 steps above baseline levels), or a non-exercise control group (n=14) for 6 months. Baseline and follow-up blood samples were analyzed for lipoprotein subclass, size, and lipoprotein insulin resistance score (LP-IR) using nuclear magnetic resonance spectroscopy (Liposcience, NC). Analysis of covariance was used to evaluate the change in outcome variables following the intervention across groups with adjustment for baseline value and age. Participants who changed lipid medications during the intervention (n=2) or who were non-adherent to exercise training (n=2) were excluded from the analysis. **Results:** Significant reductions were observed for mean VLDL size in the AERO-PA group (-4.7 nm, CI: -8.7 to -0.8) compared to control group (0.7 nm, CI: -2.7 to 4.4) and the AERO group (1.1 nm, CI: -2.9 to 5.0). Reductions in triglyceride concentrations were observed in the AERO-PA group (-28.3 mg/dL, CI: -50.3 to -6.4) compared to control (4.1 mg/dL, CI: -14.6 to 22.8). Additionally, we observed a trend for LP-IR index (p=0.055) and the concentration of small HDL particles (p=0.093) to decrease in the AERO-PA group compared to controls, with no differences compared to the AERO group (p>0.10). No significant changes were observed for other notable lipoprotein measures, such as LDL size, HDL size, concentration of small LDL particles, or chylomicron measures (p>0.05). In the AERO-PA group, the change in steps was associated with the change in LP-IR index (r= -0.71, p=0.013), but not with change in VLDL size (r= -0.24, p=0.463) or triglyceride concentrations (r=-0.28, p=0.388). **Conclusions:** Aerobic training combined with increasing non-exercise physical activity leads to favorable changes in the lipoprotein profile, specifically reductions in VLDL size and triglycerides, and may have promise for other lipoprotein traits (reductions in LP-IR and small HDL particles) that were not observed with aerobic training alone.
Background: Morbid thoughts are a dangerous cognitive problem that can lead to suicide. It has been documented that educational lifestyle programs can improve metabolic markers, we study the effect in the psychological realm. This study documents the response of an 8-week lifestyle program on depression levels and morbid thoughts. Methods: Participants from 5 continents who finished a depression program were studied. 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 followed by a small group discussion, work assignments were given at every session. This program focused on educating participants on healthy behaviors such as exercise, plant-based diets, sleep hygiene, thought control and others. Cooking classes and practical exercises helped teach the principles. Each participant answered at the beginning of the program and at the end of the program the Depression and Anxiety Assessment Test. It assessed depression level based on DSM-5 [The Diagnostic and Statistical Manual of Mental Disorders Volume 5]. No questions were asked about individuals' treatment of depression. The depression was classified according to DSM-5 into 4 categories as none (0-6), mild (7-10), moderate (11-19) or severe (20 or more). The test also inquired the frequency of morbid thoughts, which were defined as thinking about death often, considering harming yourself or others. The degree of morbid thoughts were ranked from A-D ([A] having none or rare; [B] having them 1/4 of the days; [C] being 1/2 of the days; [D] being almost every day in a period of 2 weeks).

Results: From 5997 participants that finished the 8 week program the mean age was 52.3, SD 15.1, and n= 4209 (70.1%) were female. From this group, n=1924 (32%) participants reported some level of morbid thoughts. Of the morbid thought group, the depression average before the program was 17.7, SD 6.2, median 19, mode 22. At the end of the 8 week program, the depression average of the same group was 9.6, SD 6.5, median 9, mode 5. The pair t-test of depression scores was significant with a t=50.26, p<.001. The levels of morbid thoughts at the beginning was A n=4073, B n=919, C n=587, D=418, and by the end A n=5180, B n=478, C n=236 and D n=103. Conclusion: The educational intervention effectively improves this worrisome symptom decreasing even the everyday morbid thoughts therefore decreasing the risk of suicide. The emphasis of the program is to make the lifestyle changes permanent. A long term study is being planned to investigate how the changes continue on the long term.

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P038

The Association Between Thyroid Function and Cardiac Structure and Function in Older Adults: The Atherosclerosis Risk in Communities (ARIC) Study

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Background: Most prior studies evaluating thyroid function and cardiac structure and function have been small and have not included the full spectrum of thyroid function hormones. Methods: Among 5122 ARIC participants (aged 66-90 at the visit 5, 2011-2013) we evaluated the cross-sectional associations of clinical categories of thyroid function and thyroid hormone levels (triiodothyronine [T3], thyroxine [T4], and thyroid-stimulating hormone [TSH]) with left ventricular structure, systolic function,
and diastolic function based on echocardiogram after accounting for potential confounders including prevalent coronary heart disease and heart failure.

Results: There were 417 participants (9.4%) with hypothyroidism and 155 participants (3.5%) with hyperthyroidism. Hypothyroidism tended to be associated with more echocardiographic parameters compared to hyperthyroidism. Among individual thyroid hormones, T3 was most robustly associated with left ventricular structure and function. Specifically, lower T3 level was associated with higher left ventricular mass and diameter and reduced systolic and diastolic dysfunction (Figure).

Conclusions: In community-dwelling older adults, hypothyroidism was more evidently associated with altered left ventricular structure and function than hyperthyroidism. Among T3, T4, and TSH, lower T3 demonstrated most robust associations. Our findings highlight the importance of recognizing hypothyroidism for cardiac health and assessing T3 in addition to T4 and TSH for thyroid function assessment among older adults.


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Funding Component: P039

Longitudinal measures of serial plasma phospholipid de novo lipogenesis fatty acids and incident congestive heart failure in older adults: The Cardiovascular Health Study

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INTRODUCTION De novo lipogenesis (DNL) is an endogenous pathway for converting excess carbohydrates and proteins into fatty acids (FAs). While elevated DNL is linked to several metabolic abnormalities, little is known about associations of longitudinal changes in DNL FAs with incident congestive heart failure (CHF), a growing condition in older adults. METHODS We investigated relations of longitudinal changes in DNL FAs, measured at year 0, year 6, and year 13, with incident CHF using serial measures of plasma phospholipid myristic acid (14:0), palmitic acid (16:0), 7-hexadecenoic acid (16:1n-9), palmitoleic acid (16:1n-7), stearic acid (18:0), oleic acid (18:1n-9), and cis-vaccenic acid (18:1n-7). Time-varying covariates were measured using standardized methods in 2,005 older adults with two or more FA measures and free of CHF at baseline. Incident CHF was centrally adjudicated using medical records. Risk was assessed by multivariable-adjusted Cox proportional hazards. RESULTS During 14,628 person-years, 553 CHF events occurred. After multivariate adjustment, serial changes in 16:0, 16:1n-9, and 18:1n-7 were positively associated with incident CHF, with HRs (95% CI) for each 30% change in levels of 2.84 (1.50, 5.37), 1.16 (1.00, 1.33), and 1.42 (1.15, 1.77), respectively (Table). Findings were similar in sensitivity analyses excluding individuals with prevalent coronary heart disease (not shown). In analyses evaluating absolute, rather than changes in, DNL FA levels, the associations of 16:0, 16:1n-9, and 18:1n-7 with incident CHF were no longer statistically significant although with consistent directions of association (not shown). Neither changes nor absolute levels of 14:0, 16:1n-7, 18:0, and 18:1n-9 were associated with CHF.

CONCLUSION Serial changes in plasma...
phospholipid 16:0, 16:1n-9, and 18:1n-7 were associated with an elevated risk of CHF in older adults. These results indicate that potential mechanisms of risk, especially related to DNL, deserve further investigation.

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P040

**GlycA, a Novel Inflammatory Marker, and Subclinical Coronary Atherosclerosis in the Multicenter AIDS Cohort Study (MACS)**


**Background:** Inflammation may link HIV infection to cardiovascular disease (CVD). GlycA, a novel nuclear magnetic resonance (NMR) biomarker of systemic inflammation, has been associated with incident CVD events in the general population. The relation between GlycA and the presence, extent and composition of subclinical coronary plaque in men with HIV infection (HIV+) or at risk for HIV (HIV-) is unknown.

**Methods:** This is a cross-sectional analysis of 935 men enrolled in MACS with plasma measurement of GlycA and non-contrast cardiac CT and/or coronary CT angiography. We used multivariable adjusted Poisson and linear regression to assess associations of GlycA with prevalent coronary atherosclerosis and plaque extent, respectively.

**Results:** Mean ± SD age was 54 ± 7 yrs; 31% were black, and 63% HIV+ with 81% having undetectable viral load (VL). GlycA levels were higher in HIV+ compared to HIV- men (397 ± 68 vs 380 ± 60 µmol/L, p=0.0001), and higher for those with detectable VL vs. undetectable (413 ± 79 vs 393 ± 65 µmol/L, p=0.004). After adjusting for demographic and CVD risk factors, every 1 SD increment in GlycA was associated with an increased prevalence of coronary artery calcium (CAC>0) (prevalence ratio: 1.09, 95% CI: 1.03-1.15), coronary stenosis ≥ 50% (1.20, 1.02-1.41), and calcified plaque (1.12, 1.02-1.23); p for all < 0.03. These associations remained significant after adjusting for other inflammatory markers and did not differ by HIV status. Among men with plaque, GlycA was positively associated with the extent of CAC, total plaque and mixed plaque (Table). Associations were weaker in HIV+ men for total
and mixed plaque ($P_{interaction} = 0.003$ and 0.03, respectively). GlycA was not associated with non-calcified plaque.

**Conclusion:** HIV+ men have higher levels of GlycA than HIV- men. Higher GlycA is positively and independently associated with subclinical coronary atherosclerosis. Whether modification of GlycA through lifestyle or pharmacotherapy can reduce coronary plaque burden and future CVD events requires further study.

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**P041**

**Serum Magnesium and the Incidence of Coronary Heart Disease Over 20 Years of Follow-up: The Atherosclerosis Risk in Communities (ARIC) Study**

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**INTRODUCTION:** Low serum magnesium (Mg) levels have been associated with increased coronary heart disease (CHD) risk, likely acting through pathways such as hypertension, hyperglycemia or inflammation. An early (1998) ARIC paper evaluated this association, based on 319 events, and identified a sex-interaction whereby the inverse Mg-CHD association was stronger among women than men. Nearly 2,000 events have occurred since the prior publication. Hence, we sought to update the analysis. **HYPOTHESIS:** We hypothesized serum Mg would be inversely and independently associated with long-term risk of CHD.

**METHODS:** A total of 14,465 ARIC study participants without CHD at visit 1 (baseline) were included. Serum Mg was measured at visit 1 (1987-89) and visit 2 (1990-92). Incident CHD events were identified through 2014 using annual telephone calls, hospital discharge lists and death certificates, and were adjudicated by physician review. Multivariable Cox proportional hazards regression models were used. Serum Mg was categorized into quintiles based on mean visit 1 and 2 concentrations. Based on prior findings in ARIC suggesting an interaction, we decided a priori to provide sex-stratified results. **RESULTS:** Participants at baseline were mean±SD age 54±6y, 57% were women and 27% black. Serum Mg was 1.62±0.14 mEq/L overall, 1.62±0.14 mEq/L among women and 1.63±0.14 mEq/L among men. Over a median follow-up of 25 years, 1,939 CHD cases were identified. Overall, serum Mg was inversely and monotonically associated with CHD risk after adjustment for demographics, lifestyle factors and other CHD risk factors (Table, p-trend<0.001). The association was stronger among women (HR Q5 vs Q1=0.63) than men (HR=0.83), but the sex-interaction was not statistically significant (p>0.05). **CONCLUSIONS:** In this large community-based cohort, serum Mg was inversely associated with CHD risk. This association was slightly stronger among women than men. Further research is needed to understand if increasing Mg levels is a useful target for CHD prevention.

Funding: No

Funding Component:

P042

Association of Epigenetic Age Acceleration and Adverse Cardiac Mechanics: The Coronary Artery Risk Development in Young Adults (CARDIA) Study


Background: Prevalence of diastolic dysfunction increases significantly with aging and becomes more prevalent in middle-age to older adulthood. DNA methylation markers of aging have been identified and integrated into an epigenetic age (EA) score, which has been demonstrated to be associated with cardiovascular morbidity and mortality. Epigenetic age acceleration (EAA) is the residual value of EA methylation markers regressed on chronologic age (CA), and is thus independent of CA. Therefore, we sought to examine the association of a previously identified DNA methylation molecular signature in blood (EAA) with cardiac mechanics. Methods: A subset of participants in the CARDIA cohort (n=1200) randomly selected (balanced on race and sex) underwent genome-wide DNA methylation profiling with the Illumina EPIC array from exam year 15 (2000-01 [age 33-45 years]) for calculation of EA and EAA. Echocardiography was completed at exam year 25 (2010-11 [age 43-55]). We used linear regression to examine the association of EA and EAA with parameters of cardiac mechanics. Models were adjusted for age, race, sex, education, study center, and Y15 cardiovascular risk factors (heart rate, body mass index, hypertension, hyperlipidemia, diabetes, and smoking). Results: Mean age of participant was 45.4±3.5 years, 52% female, and 41% black. DNA methylation markers of aging (EA and EAA) were associated with tissue Doppler measures of diastolic function, but not with parameters of left ventricular structure and systolic function (Table). Conclusions: EA and EAA are associated with changes in cardiac structure and function. Abnormalities in cardiac structure and function are an important intermediate phenotype prior to the development of symptomatic heart failure, and additional longitudinal research should examine DNA methylation markers as potential mediator of or novel biomarker for incident heart failure in young to middle-age adults.


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P043

Erythrocyte Long-Chain Omega-3 Fatty Acid Levels Are Inversely Associated With Mortality and With and Incident Cardiovascular Disease: The Framingham Heart Study
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Background: The extent to which omega-3 fatty acid (FA) status is related to risk for death from any cause and for incident cardiovascular disease (CVD) remains controversial. Objective: To examine this association in the Framingham Heart Study (FHS). Design: Prospective and observational. Setting: FHS Offspring cohort. Measurements: The primary exposure marker was red blood cell (RBC) levels of eicosapentaenoic and docosahexaenoic acids (EPA and DHA; the Omega-3 Index) which was measured at baseline. Secondary markers included RBC EPA, DHA, alpha-linolenic and docosapentaenoic (n-3) acids. Outcomes included mortality (total, CVD, cancer, and other) and total CVD events. Median follow-up was 7.3 years. Cox proportional hazards models were adjusted for 18 demographic characteristics, clinical status, therapies and other CVD risk factors including C-reactive protein levels. Results: Among the 2500 participants (mean age 66 years, 54% women; all free of CVD at baseline) there were 350 deaths (58 from CVD, 146 from cancer, 128 from other known causes, and 18 from unknown causes). There were 245 CVD events. In multivariable-adjusted analyses, a higher Omega-3 Index was associated with significantly lower risks (p-values for trends across quintiles) for total mortality (p=0.02) and non-CVD, non-cancer mortality (p = 0.009; Figure), and for total CVD events (p=0.008). Those in the highest versus the lowest Omega-3 Index quintiles (i.e., >6.8% vs. <4.2%) had a 34% lower risk for death from any cause and a 39% lower risk for incident CVD. Associations were generally stronger for DHA than for EPA. When total cholesterol was compared with the Omega-3 Index in the same models, the latter was significantly related with these outcomes, but the former was not. Substituting the omega-6:omega-3 ratio for the Omega-3 Index did not alter the outcomes. Limitations: Relatively short follow-up time and a single exposure assessment. Conclusions: A higher Omega-3 Index was associated with reduced risk of both CVD and all-cause mortality.

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P044

Plasma Phospholipid Very Long Chain Saturated Fatty Acids and Healthy Aging in Older Adults: The Cardiovascular Health Study

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INTRODUCTION. Circulating very long-chain saturated fatty acids (VLSFA) are biomarkers of diet and metabolism which impart different biological activities to sphingolipids and may influence physiological pathways relevant to aging. Higher levels of circulating VLSFAs have been associated with lower risk of all-cause mortality, cardiovascular outcomes, and diabetes. Apart from these associations, it is unknown whether these biomarkers are related to the maintenance of healthy aging.
HYPOTHESIS. Higher levels of circulating VLSFA are associated with lower risk of unhealthy aging.

METHODS. Phospholipid fatty acids were measured in serial plasma samples collected among participants of the Cardiovascular Health Study (CHS) in 1992-93, 1998-99, and 2005-06. Incident unhealthy aging was defined as the onset of cardiovascular disease (CVD), cancer, lung disease, severe chronic kidney disease, ≥1 difficulties with activities of daily living (ADL), or reduced cognitive function (Mini-Mental State Examination<80). We assessed the associations of arachidic acid (20:0), behenic acid (22:0) and lignoceric acid (24:0), with risk of incident unhealthy aging using Cox regression with time-updated fatty acid levels and covariates.

RESULTS. Among 2,183 CHS participants with one or more fatty acid measure and healthy aging up to the time of their first VLSFA measurement, mean age at baseline was 75 years, 62% were female, and 12% were black. During median follow-up of 8 years, all but 198 participants failed to age successfully. The most common conditions marking the first occurrence of unhealthy aging were ADL difficulties and CVD (27% each). In analyses adjusted for major risk factors, higher levels of 22:0 and 24:0 were associated with lower risk of unhealthy aging (Table).

CONCLUSIONS. Higher levels of two circulating VLSFA, 22:0 and 24:0, are associated with lower risk of unhealthy aging. These findings open a new avenue of research into these saturated fatty acids and their possible beneficial role in promoting better aging.


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P045

Trajectory of Fasting Blood Glucose From Childhood to Adulthood and the Risk of Hypertension: The Bogalusa Heart Study

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Background: Hyperglycemia in children or adults has been related to an increased risk of hypertension; however, no study has assessed whether life course trajectory of circulating fasting glucose levels, from childhood to adulthood, is related to hypertension risk.

Objective: In the present study, we aim to characterize trajectories of fasting blood glucose (FBG) from childhood to adulthood, and assess their associations with risk of hypertension in the Bogalusa Heart Study.

Design: Prospective analysis of 1747 children with >= 4 FBG measurements, of which at least 1 measurement was in childhood (from 4-19 years) and at least 1 measurement in adulthood, during an average of 23.5 years of follow-up. Mixed models were used to test the effect of FBG trajectories on the risk of hypertension.

Result: Four distinct trajectories of FBG from childhood to adulthood were identified: constant low, low to high, high to low, and constant high (Figure 1). In multivariate model adjusting for baseline age, race, sex, BMI, adulthood blood pressure, smoking, drinking, physical activity, education, and lipids, the risk of hypertension was 1.12 (95% CI: 1.04 to 1.20; p=0.002) in the low to high group compared to constant low group, 1.02 (95% CI: 0.97 to 1.08; p=0.255) in the high to low group, and 1.10 (95% CI: 1.03 to 1.18; p=0.004) in the constant high group. After further controlling for one-time FBG, especially the adulthood FBG, the effect of trajectories still persist.

Conclusion: We identified four different trajectories of FBG from childhood to adulthood, which shows having diverse relationships with hypertension in adulthood.
Sex Hormone Levels and 10-Year Change in N-Terminal Pro-Brain Natriuretic Peptide Among Men and Post-Menopausal Women: The Multi-Ethnic Study of Atherosclerosis (MESA)

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Background: The risk of cardiovascular disease (CVD) differs between men and women, and sex hormones are thought to play a key role. N-terminal pro-brain natriuretic peptide (NT-proBNP) is a sensitive biomarker of ventricular wall stress and a strong predictor of incident cardiovascular disease (CVD) and heart failure (HF). It can thus be seen as an early marker of CVD. We evaluated whether sex hormones levels were associated with change in NT-proBNP concentrations over 10 years in MESA.

Methods: We studied 2348 men and 2041 post-menopausal women. Serum testosterone (T), estradiol, dehydroepiandrosterone (DHEA), and sex hormone binding globulin (SHBG) were measured at Exam 1 (2000-02); free T and bioavailable T were calculated. NT-proBNP was measured by Roche assay at Exam 1, plus Exam 3 (2004-05) and/or Exam 5 (2010-12). Multivariable-adjusted linear mixed effects models were used to study associations between sex hormone levels and change in NT-proBNP over an approximately 10-year period.

Results: Mean (SD) age (years) at baseline was 65 (9) for women and 62 (10) for men. Women had higher NT-proBNP than men (median 76.6 vs 37.1 pg/ml). Among women, after adjusting for demographic, socioeconomic, and CVD risk factors, higher total T, bioavailable T, and free T were independently associated with a greater increase in NT-proBNP over 10 years, whereas estradiol and SHBG were inversely associated with change in NT-proBNP (Table). When sex hormones were analyzed together in the same model, total T was positively associated and SHBG was inversely associated with change in NT-proBNP. In men, higher estradiol was associated with greater 10-year increase in NT-proBNP. These associations were preserved after excluding individuals with ejection fraction <50%.

Conclusion: A more androgenic sex hormone profile in post-menopausal women and a more estrogenic profile in men were independently associated with 10-year change in NT-proBNP levels. Sex hormone patterns may thus explain in part sex differences in the development of CVD and HF.

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Ideal Cardiovascular Health Score and Oxidative Stress

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Introduction: Ideal cardiovascular health (CVH) promotion is effective for cardiovascular disease prevention. Whether increased CVH score improves oxidative stress is less clear. Our study examined the correlation between changes in ideal CVH status and oxidative stress.

Hypothesis: Improvement in CVH score is correlated with changes in oxidative stress.

Methods: A total of 569 actively working adult employees (51±11 years, 64% women, 21% Black) underwent a health partner-mediated lifestyle intervention. Serial counseling was delivered by a trained HP focused on promoting clinical self-knowledge and adoption of a healthier lifestyle, based on the subject’s personal schedule. Anthropometric, dietary and laboratory measurements were obtained at baseline and 1- and 2-year follow-up visits. Plasma levels of reduced (glutathione) and oxidized (cystine) aminothiols were measured by high performance liquid chromatography at baseline and follow-up to assess oxidative stress. Ratios of oxidized to reduced aminothiols (cystine/glutathione) were calculated. Linear mixed-effects model was used to examine the correlation between the changes in CVH score and changes in oxidative stress metrics overall 2 years follow-up.

Results: Over 2-years, cystine (p=0.01) improved while cystine/glutathione (p=0.03) and glutathione (p<0.001) decreased in the entire cohort. At baseline, CVH score was significantly associated with improvement in cystine by -0.39 μM (95% CI, -0.45, -0.32), glutathione by 0.22 μM (95% CI, 0.14, 0.29) and cystine/glutathione by -0.40 (95% CI, -0.46, -0.33). Overall, one unit increase in the CVH score was associated with a decrease of -0.33 μM (95% CI, -0.42, -0.24) in cystine and -0.38 (95% CI, -0.46, -0.29) in the cystine/glutathione ratio over 2 years. Similarly, an improvement in CVH score by one unit at 2 years was associated with improvement in glutathione by 0.30 μM (95% CI, 0.21, 0.39). Furthermore, reduction in BMI, systolic blood pressure and fasting glucose level was significantly associated with improvement in cystine (all p<0.01), glutathione (all p<0.01) and cystine/glutathione (all p<0.01) over 2 years.

Conclusion: Improvement in CVH with a lifestyle intervention was associated with early and sustained improvement in oxidative stress. Whether the impact of changes in CVH metrics on oxidative stress improves long-term morbidity and mortality needs further investigation in a controlled design.

**Background:** Pulse wave velocity (PWV) independently predicts cardiovascular disease. However, few studies simultaneously explored the associations of segment-specific PWV measures with markers of both cardiac overload (natriuretic peptide [NT-proBNP]) and damage (high-sensitivity cardiac troponin T [hs-cTnT]) among adults without cardiac disease.

**Methods:** We examined 2,845 whites and blacks (67-90 years) without clinical history of cardiac disease during ARIC visit 5 (2011-13). The association of PWV quartiles (cf [carotid-femoral], hc [heart-carotid], hf [heart-femoral], ha [heart-ankle], ba [brachial-ankle], and fa [femoral-ankle]) with log-transformed NT-proBNP and hs-cTnT was evaluated using linear and logistic regression models to adjust for potential confounders.

**Results:** Most PWV measures demonstrated J- or U-shaped associations with NTpro-BNP and hs-cTnT [Figure]. The highest vs. the second lowest quartile of central PWV measures (cfPWV, hfPWV, and hcPWV) was associated with higher levels of NT-proBNP independently of demographic characteristics. The associations were weaker for hs-cTnT. These associations were attenuated after further adjustment, but hcPWV and NT-proBNP remained borderline significant (p=0.069). haPWV, baPWV, and faPWV including peripheral elements had less evident positive associations after adjusting for traditional risk.

**Conclusion:** The positive associations between PWV and cardiac biomarkers were stronger for central vs. peripheral arterial stiffness and for NT-proBNP vs. hs-cTnT among older adults without prevalent cardiac disease. Our findings indicate the relative importance of central arterial stiffness behind subclinical cardiac overload.
**Introduction:** Serum uric acid (sUA), a known inflammosome-inducer, is associated with prospective risk of coronary artery disease in a dose-dependent fashion. Psoriasis (PSO), a chronic inflammatory disease associated with elevated burden of systemic inflammation and subclinical coronary artery disease, provides a reliable human model to study how sUA may relate to non-calcified coronary plaque burden (NCB) measured by computed coronary tomography angiography (CCTA). **Hypothesis:** We hypothesized that sUA would directly associate with NCB beyond traditional cardiovascular (CV) risk factors. **Methods:** 103 consecutive PSO patients and 47 healthy volunteers (HV) underwent CCTA (320 detector row, Toshiba) for coronary plaque burden quantification using QAngio (Medis). PSO severity was assessed by Psoriasis Area Severity Score (PASI) and divided into severe PSO (PASI>10) and mild-moderate PSO (PASI<10). All patients had fasting blood draws for the measurement of sUA at a certified clinical lab. **Results:** PSO patients were older than HV and had a higher CV risk by Framingham risk score (FRS) (Table 1). We observed a significant trend towards increase in sUA among severe PSO, mild-moderate PSO, and HV groups (mean 6.4, 5.9, 5.4 respectively, p=0.02 for trend). A positive association was observed between sUA and NCB, which was stronger in severe PSO after adjustment for traditional CV risk, alcohol, statins, and systemic/biologic PSO treatment (Severe PSO: β=0.27, p<0.001; Mild-moderate PSO: β=0.18, p=0.03), not significant in HV (β=0.18, p=0.12). **Conclusions:** sUA is independently associated with NCB in states of chronic inflammation such as PSO, and as such, may potentially serve as a biomarker for subclinical coronary atherosclerosis. However, larger prospective studies of CV outcomes in chronic inflammatory diseases are needed to confirm these results.


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**P050**

**Correlates of Serum Cortisol and its Prognostic Value in the Community**

**Introduction:** Community-based data on correlates of serum cortisol are scarce. We investigated the sources of variability in morning serum cortisol, and its relation to cardiometabolic outcomes in a large biracial sample. **Hypothesis:** Serum cortisol is monotonically associated with cardiometabolic outcomes, an effect that is potentiated by aldosterone. **Methods:** We included 2896 whites (Framingham Heart Study [Generation 3], 53% women, mean age 44 years) and 2479
blacks (Jackson Heart Study, 52% women, mean age 53 years). Cohort- and sex-specific linear regression was used to identify cortisol correlates. Heritability was derived using the variance-components method. Cohort- and sex-specific logistic regression was used to relate cortisol to progression in blood pressure (BP) or fasting blood glucose (FBG) categories, and incidence of hypertension (HTN), diabetes (DM) or metabolic syndrome (MetS).

**Results:** Serum cortisol was higher in blacks compared to whites (age-adjusted mean: 13.1 vs 10.2 µg/dL in men \((P<0.001)\) and 12.7 vs. 8.1 µg/dL in women \((P<0.001)\)). Serum cortisol was positively related to age and smoking in blacks, DM, menopausal status and use of hormonal therapy (replacement or contraception) in both racial groups \((P<0.005)\). Body mass index and glomerular filtration rate were inversely associated with cortisol in whites and blacks \((P<0.01)\). The age- and sex-adjusted heritability of serum cortisol was 0.20 in whites and 0.11 in blacks \((P<0.005)\). Serum cortisol was not associated with outcomes (Table). In blacks, concomitantly high cortisol (>median) and high aldosterone (>median) was associated with incident HTN (odd ratio [OR]: 1.90 [95%CI: 1.14, 3.16]) and DM (1.75 [1.17, 2.62]) compared to normal aldosterone and cortisol; ORs in whites were 1.15 (0.81, 1.63) for HTN and 0.95 (0.52, 1.74) for DM. **Conclusions:** Serum cortisol is a heritable trait influenced by clinical factors. Conjointly high aldosterone and cortisol levels in blacks is associated with increased risk of HTN and DM in blacks, not in whites.

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**P051**

Circulating Beta-2-microglobulin Predicts Cardiovascular, Cancer, and All-cause Mortality: The Framingham Heart Study

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Beta-2-microglobulin (β2M), a multifunctional protein involved in immune function, is a filtration marker that has been reported to predict renal failure, cancer, cardiovascular disease (CVD), and all-cause mortality. Previous studies of β2M and mortality were limited to select study samples (elderly or patient-based) lacking information on cancer or kidney function. We examined plasma β2M as a predictor of all-cause and cause-specific mortality in those with and without chronic kidney disease (CKD). The study sample consisted of Framingham Heart Study participants from the 2nd \((n=3196)\) and 3rd \((n=3911)\) generations who attended an on-site examination (2001-2007). Plasma β2M concentration was measured using a Luminex bead-based immunoassay. Mortality events were adjudicated by a physician committee. Proportional hazard models were conducted based on standardized values of β2M, adjusted for CVD risk factors, prevalent CVD, cancer, and family structure. We additionally analyzed subgroups stratified for CKD (defined as GFR_{ckdepi} < 60 mL/min/1.73 m²). The study sample included 7107 individuals [mean age 50
years, 54% female, 4% with prevalent CKD, mean length of follow-up: 13 years]. In the overall sample, β2M concentrations were associated with increased risk of CVD death (HR=1.42 [CI=1.17-1.72]), cancer death (HR=1.27 [CI=1.07-1.5]), and all-cause mortality (HR=1.27 [CI=1.16-1.4]). β2M performed better in participants with prevalent CKD than in those free of CKD. Adjusting for cystatin C, a filtration biomarker, did not affect the results. For all-cause mortality, including plasma β2M yielded a relative integrated discrimination improvement of 3% (p-value 0.03) beyond the covariate-only model. The net reclassification improvements (NRI) for all-cause mortality was 4% that was not statistically significant (p-value 0.26). We conclude that among middle-aged adults, plasma β2M is a predictor of all-cause and cause-specific mortality. Much of the risk associated with β2M is concentrated in those with CKD.

**Introduction:** Clinically, natural killer (NK) cells are important in inflammatory and autoimmune diseases. As part of innate immunity, NK cells produce chemokines and inflammatory cytokines, potentially linking them to cardiovascular disease (CVD) development and progression as well. However, their role in human CVD is not clear. **Hypothesis:** NK cells are proatherogenic in humans and are associated with CVD risk factors and subclinical CVD measures. **Methods:** We examined cross-sectional associations of circulating NK cell levels with CVD risk factors, subclinical CVD measures and coronary artery calcium (CAC) in 891 White, Black, Chinese and Hispanic men and women (mean age 66 y) in the Multi-Ethnic Study of Atherosclerosis (MESA) at Exam 4 (2005-07). NK cell percent, percent of circulating lymphocytes that were CD3-CD56+CD16+, was measured in whole blood by flow cytometry. CAC presence was defined as Agatston score > 0. **Results:** Mean (standard deviation) NK percent differed by race/ethnicity; 8.2% (4.7) in Whites, 11.3% (7.5) in Chinese (p<0.001 compared to Whites), 7.1 (4.2) in Blacks (p=0.007) and 8.4 (5.2) in Hispanics (p=0.6). NK cell percent was positively associated with age (p<0.001) and systolic blood pressure (P=0.003) in the full group. However, NK cell percent was lower in current smokers than in never smokers (p=0.002). Adjusting for age, sex, race/ethnicity, smoking, body mass index, systolic blood pressure, diabetes and dyslipidemia, NK cell percent was negatively associated with common carotid intima media thickness (IMT; β coefficient -0.01; 95% confidence interval -0.03, -0.003) but was not associated with internal carotid IMT (-0.002; -0.037, 0.033). Likewise, NK cell percent was not associated with the presence of CAC (compared those with no detectable CAC; relative risk 1.02; 95% confidence interval 0.96, 1.08) or continuous Agatston score in those with a positive score (β coefficient 0.16, 95%
confidence interval (-0.003, 0.32) in the full group (models adjusted as above). Results were similar across race/ethnic groups. **Conclusions:** Of clinical interest, CD3-CD56+CD16+ NK cell percent varied significantly by race/ethnicity in these men and women from MESA. However, NK cell percent was inconsistently associated with CVD risk factors; positively with age and systolic blood pressure, and negatively with smoking. NK cell percent was also negatively associated with common carotid IMT. Larger sample sizes and longitudinal analyses will be required to clarify the potential relationship between NK cells and atherosclerosis in humans.

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**P053**

**Cardiovascular Health is Associated With Incidence of Elevated C-Reactive Protein Over 18 Years of Follow-up: The Coronary Artery Risk Development in Young Adults Study**

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**Introduction:** In 2010, the American Heart Association (AHA) established “Life’s Simple 7” a composite of metrics aimed at defining cardiovascular health (CVH). Seven positive health factors (blood cholesterol, blood pressure, and fasting plasma glucose) and behaviors (diet quality, physical activity, smoking, and body mass index) are emphasized within the construct, each being scored into ideal, intermediate, or poor categories. While multiple studies have explored the association between the individual components of CVH and markers of inflammation and atherogenesis, none have examined total CVH score as a predictor of elevated C-reactive protein (CRP) levels.

**Purpose:** To assess the hypothesis that CVH score is inversely associated with future elevated CRP levels.

**Methods:** Black and White men and women (N=1096) from the Coronary Artery Risk Development in young Adults (CARDIA) study were examined at 4 different examinations across 18 years (1992, 2000, 2005, 2010). At each examination, CRP and the components of CVH were measured. A 14-point CVH score was determined by summing points for each CVH metric at ideal (2 points), intermediate (1 point), and poor (0 points) levels. Three categories of CVH score were created: low (0-7), moderate (8-11), and high (12-14). Multivariable Cox proportional hazards regression models were used to test the association of both categorical and continuous CVH score with incidence of elevated CRP (>3.0 mg/L) over up to 18 years of follow-up. All models were adjusted for sex and race, and the following time-varying covariates: age, and current level of education.

**Results:** Over the 18-year period, the incidence of elevated CRP was 33.6 per 1000 person years. Baseline CVH was associated with lower risk (hazard ratio (HR): 0.83; 95% CI: 0.80 to 0.86) of elevated CRP per 1-point increment in CVH. When compared to the high CVH group at baseline, both low (HR: 2.80; 95% CI: 2.16 to 3.65) and moderate (HR: 1.63; 95% CI: 1.35 to 1.96) CVH groups had elevated risk of elevated CRP. Time-varying CVH was associated with a lower risk (HR: 0.88; 95% CI: 0.85 to 0.91) of elevated CRP per increment in CVH score. In models that entered CVH category as a time-varying covariate, both low (HR: 2.84; 95% CI: 2.08 to 3.87) and moderate (HR: 2.09; 95% CI: 2.08 to 3.87)
1.56 to 2.79) CVH categories were associated with over twice the risk of elevated CRP compared to the optimal CVH group. 

**Conclusions:** Lower CVH is associated with elevated risk of elevated CRP during the transition from young adulthood to middle age.


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P054

**Endogenous Sex Hormone Levels and Endothelial Function Among Men and Post-Menopausal Women in the Multi-Ethnic Study of Atherosclerosis (MESA)**

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**Background:** Sex is a major determinant of cardiovascular disease (CVD). Endogenous sex hormones exert a variety of effects on the vascular endothelium, and changes in sex hormone levels after menopause may play a role in CVD risk in women. We hypothesized that a more androgenic sex hormone profile among post-menopausal women, but not among men, would be associated with reduced blood flow-mediated vasodilation (FMD) of the brachial artery, a marker of worse endothelial function. **Methods:** We examined 1396 post-menopausal women and 1707 men participating in MESA, who were free of clinical CVD at baseline. Sex hormone levels [total testosterone (T), sex hormone binding globulin (SHBG), estradiol (E2)] were measured at Exam 1 (2000-02); free T and T/E2 ratio were calculated. FMD was measured by high-resolution ultrasound. Using multivariable adjusted Poisson and linear regression methods, we tested the cross-sectional associations of sex hormones (log transformed) with FMD. **Results:** The mean age of men and women was 61 and 64 years, respectively. Of women, 34% were using hormone therapy (HT). Among women, after adjusting for demographics, CVD risk factors, and HT use, higher SHBG was associated with higher FMD, whereas higher free T was associated with lower FMD (Table, Model 2). In women, when examining the “best FMD response” (top decile vs. bottom 9 deciles), higher E2 was positively associated with a prevalent best response, whereas higher free T was inversely associated. Among men, a higher T/E2 ratio was marginally associated with lower FMD. **Conclusion:** The association between sex hormones and FMD differs in men and women. Higher E2 and SHBG and lower free T levels were associated with better FMD in post-menopausal women but not in men. Higher T/E2 ratio was associated with lower FMD in men. Further studies are needed to assess longitudinal changes in sex hormone levels and their association with vascular aging. Sex hormone levels may help identify individuals at increased CVD risk who may benefit from other risk reduction strategies.

Background: Growth differentiation factor-15 (GDF-15) is positively associated with the risk of mortality from acute coronary syndrome and chronic heart failure. A prior study reported decreased methylation at four promising GDF-15 related CpG sites tended to be associated with myocardial infarction, however, little is known of the association of methylation levels at these sites with the risk for cardiovascular disease (CVD) death.

Objective: To evaluate whether methylation levels at the four GDF-15 CpG sites (site A: cg13033585, site B: cg16936953, site C: cg17150809, and site D: cg18608055) are associated with death from CVD, independent of genes and shared environmental factors.

Method: We included 19 male monozygotic twin pairs discordant for death from CVD through December 31, 2014 from the National Heart, Lung, and Blood Institute (NHLBI) Twin Study initiated in 1969-1973. Buffy coat DNA samples were collected in exam 3 (1986-87). The vital status was followed up through December 31, 2014. Genome wide DNA methylation levels were quantified using the Illumina Infinium HumanMethylation450 (450K) BeadChip. Conditional logistic models were used to estimate hazard ratio (HR). Known baseline CVD risk factors were adjusted.

Results: The twins’ mean baseline age was 50.4 years with standard deviation of 2.4. The crude HR was 0.01 (95% CI: 0.00, 2854.46), 2038.89 (95%CI: 0.01, 3.84 X 10^8), 0.12 (95% CI: 0.00, 55.99), and 2.08 (95% CI: 0.00, 1.26 X 10^6) for sites A, B, C, and D, respectively, suggesting that our sample size was small to test these sites. After adjustment for body mass index, years of education, and Framingham risk scores, HR was 0.03 (95% CI: 0.00, 45281.06) for site A, 700.96 (95% CI: 0.00, 2.32 X10^8) for site B, 0.00 (95% CI: 0.00, 7.35) for site C, and 0.81 (95% CI: 0.00, 1.44 X 10^6) for site D. Further adjustment for white blood cell subtypes dramatically changed HRs and/or largely widened 95% CIs, suggesting potential overadjustment bias: 0.01 (95% CI:0.00, 1.89 X 10^10) for site A, 2.78 X 10^8 (95% CI: 0.00, 7.84 X 10^21) for site B, 0.00 (95% CI: 0.00, 620.94) for site C, and 1.69 (95% CI: 0.00, 4.18 X 10^13) for site D.

Conclusion: DNA methylation levels at the GDF-15 CpG sites are not associated with death risk from cardiovascular disease independent of genes and shared environment.

Background: Prediabetes are often characterized by various measurements of elevated but non-diabetic glucose values, including impaired fasting glucose (IFG), 2-hour impaired glucose tolerance (IGT), and glycosylated hemoglobin A1c (HbA1c), and represent increased risk for cardiovascular disease (CVD) morbidity and mortality. However, it remains unclear how each glucose measurement differs in their abilities to predict risk for CVD outcomes. Currently, the World Health Organization (WHO) and the American Diabetes Association (ADA) also differ in their IFG definitions, and there has been debate as to which definition best predicts future CVD risk.

Objectives: In this systematic review and meta-analysis, we sought to evaluate the prognostic value of different cut-points of non-diabetic glucose measurements (IFG, IGT, and HbA1c) for predicting CVD morbidity and mortality in individuals at increased risk.

Methods: We searched the MEDLINE, PubMed, Embase, Clinicaltrials.gov, World Health Organization (WHO) International Clinical Trials Registry Platform, and Cochrane database. We searched prospective cohort studies in adults without diabetes aged 18 years or older, or control groups in clinical trials, with a minimum follow-up of 3 years. We included studies that reported an association between any of the glucose measurements with CVD morbidity, including non-fatal myocardial infarction, non-fatal stroke, peripheral artery disease, a composite measure of any CVD outcomes, and CVD mortality. Retrospective cohort studies will only be investigated if there are not at least two prospective cohort studies for a given outcome. Data from eligible studies were pooled to synthesize results for each glucose measurement. Random effect model was used to calculate pooled hazard ratio or relative risk data.

Results: We screened over 4,000 abstracts and identified 170 eligible prospective cohort studies with 2,826,296 individuals, with a mean follow-up of 10.2 years. Compared to individuals with normal glycaemia, individuals with IFG defined by the WHO criteria had 1.11 and 1.21 times increased risk for CVD morbidity and mortality, respectively. There was no significant increase in risk among those with IFG diagnosed by the ADA criteria compared to those with normal glycaemia. Compared to those with normal glycaemia, individuals with IGT had 1.15 and 1.24 times higher risk for CVD morbidity and mortality, respectively. HbA1c as low as 5.5% was associated with an increased risk of CVD outcomes.

Conclusions: The WHO criteria for IFG seems to be a better predictor of CVD outcomes than the ADA criteria. The current criteria for IGT is a slightly strong predictor for CVD events and mortality than IFG. HbA1c levels as low as 5.5% could be used as a predictor for adverse health outcomes in non-diabetic individuals.

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P057

The Association Between Diabetes and Risk of Abdominal Aortic Aneurysm: A Meta-Analysis

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Objectives: Data regarding the relationship between diabetes and abdominal aortic aneurysm (AAA) are inconsistent across studies: some studies showed an inverse relationship while others did not show an association. We conducted a meta-analysis to examine the association between diabetes and AAA based
on published data from case-control and cohort studies. **Methods:** We searched literature in English from online databases including MEDLINE (1966-), EMBASE and Web of Science as of July 2017, plus a manual examination of references in selected articles. The eligibility criteria included (1) a case-control or cohort study conducted in adults; (2) diabetes is the exposure variable and AAA risk is the outcome variable; and (3) association estimates (hazard ratios, odds ratios or relative risks) and measurement of variance (P value, confidence interval, or standard error) were available. The literature review and data abstraction were conducted in duplicate by independent investigators. A DerSimonian and Laird random effects model was used to pool association estimates and their 95% confidence intervals from studies using STATA 13. The Cochran's Q test was used to assess the presence of heterogeneity and the I-square index to quantify the extent of heterogeneity. **Results:** We included in the meta-analyses a total of 10 cohorts with 10,771 AAAs in 2,625,318 participants and 4 case-control studies with 1,065 AAAs and 11,009 controls that met the pre-determined eligibility criteria. The samples were predominantly white (88%). Study-specific relative risk and pooled relative risk as well as heterogeneity test results were shown in Figure. Diabetes was inversely associated with AAA risk (pooled relative risk: 0.55; 95%CI: 0.49 - 0.61, Figure). Results were overall consistent by sex, study design and setting (hospital- vs community-based). **Conclusions:** The findings suggest that diabetes is strongly and inversely associated with the risk of AAA. Future studies are warranted to investigate the potential mechanisms.

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**P058**

**Diabetes, Frequency of Exercise, and Mortality Over 12 Years**

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The goal of this study was to analyze the relationship between exercise frequency and all-cause mortality for individuals diagnosed with and without diabetes mellitus (DM). We analyzed data for 505,677 participants (53.9% men) in the National Health Insurance Service - National Health Screening (NHIS-HEALS) cohort. The study endpoint variable was all-cause mortality. Frequency of exercise and covariates including age, sex, smoking status, household income, blood pressure, fasting glucose, body mass index, total cholesterol, and Charlson Comorbidity Index were determined at baseline. Cox's proportional hazard regression models were developed to assess the effects of exercise frequency (0, 1-2, 3-4, 5-6, and 7 days per week) on mortality, separately in individuals with and without DM. We found a U-shaped association between exercise frequency and mortality in individuals with and without DM. However, the frequency of exercise associated with the lowest risk of all-cause mortality was 3-4 times per week (hazard ratio [HR] 0.69; 95% confidence interval [CI]: 0.65-0.73) in individuals without DM, and 5-6 times per week in those with DM (HR 0.93; 95%: CI 0.78-1.10). A moderate frequency of exercise may reduce mortality regardless of the presence or absence of DM; however, when compared to those...
without the condition, people with DM may need to exercise more often.

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P059

Utilizing Electronic Health Records to Evaluate Racial Disparities in Metabolic Syndrome

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Purpose: Metabolic syndrome is defined as a clustering of clinical metabolic conditions (increased blood pressure, high blood sugar, increased body fat, abnormal cholesterol or triglycerides) and has been associated with an increased risk for several chronic diseases, such as cardiovascular disease. The aim of this project was to identify individuals presenting with metabolic syndrome using a computational patient phenotype definition derived from electronic medical records (EHR) clinical outcomes data. Secondly, this project evaluated racial disparities in metabolic syndrome across Southeast Louisiana.

Methods: Data was obtained through Research Action for Health Network (REACHnet). Using the National Patient-Centered Clinical Research Network Common Data Model, REACHnet has standardized and made usable EHR data for patient-centered research across Louisiana and Texas. The computational patient phenotype definition for metabolic syndrome was developed based on the National Cholesterol Education Program Expert Panel in Adult Treatment Panel III (NCEP III) guidelines. The presence of metabolic conditions was established using ICD9 Diagnosis codes, patient vitals and lab results that are routinely available in EHR data. Logistic regression models to assess racial disparities were executed using SAS 9.4.

Results: We analyzed 18,664 patient EHRs for individuals 18 years or older with complete clinical data spanning the years 2013 to 2014. The sample was 43.28% male (n=8,077) and 29.35% black (n=5,477). Based on the patient phenotype definition, the prevalence of metabolic syndrome in the sample was 39.09%. Controlling for age, the odds of metabolic syndrome were twice as high for black women than for white women (OR= 2 (1.83, 2.18)), while the odds were 15% greater for black men than for white men (OR: 1.15 (1.04, 1.28)).

Conclusion: We observed significant disparities in the prevalence of clinically evident metabolic syndrome in southeast Louisiana. Racial disparities were greatest among women. It has been increasingly recognized that differential exposure to chronic social and nutritive stress from living in a disadvantaged neighborhood may be contributing to racial health disparities. Further research in this sample will link ancillary sources of neighborhood data to the successfully developed metabolic syndrome phenotype to explore potential mechanisms for racial disparities in cardiovascular disease among a clinically-rich, state-wide sample.

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P060
Poorer Lung Function Associated With Higher Risk of Type II Diabetes (DM) Among Chinese Adults With Silicosis

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Background: Development of silicosis is a global occupational hazard, characterized by progressive and irreversible deterioration of lung function. Established associations between the decreased lung function and low-grade systemic inflammation place adults with silicosis at extreme risk of developing DM, but little is known about the prevalence of DM and potential risk factors of DM among adults with silicosis.

Methods: We enrolled 390 Chinese adults (mean age=68.7±7.8, men=99.5%) with confirmed silicosis by the Pneumoconiosis Medical Board. The Compensation Ordinance determines the degree of incapacity (DOI), according to lung function loss based on the forced vital capacity. Diagnosed DM by a medical practitioner/physician. Occupational information included job type and duration of dust exposure. Validated questionnaires were used to measure respiratory symptoms, activity limitation and physical activity level. Insulin resistance, fasting glucose, high sensitivity C-reactive protein (hs-CRP), lipid profiles, and vitamin C were via 8-hour fasting venous sample. Body mass index, waist circumference, body fat mass percentage and blood pressure were measured. Logistic regression model was used to adjust covariates of DM.

Results: The prevalence of DM among adults with silicosis was 18.5% (n=72), which is higher than the general Chinese male population (Hong Kong=11.4%; China=12.1%). Participant characteristics according to DOI are presented in Table 1. After adjusting for hs-CRP, age, education and physical activity level, body fat mass percentage, medication use for lipid and blood pressure control, higher DOI was significantly associated with higher odds of DM (OR=1.65, 95%CI=1.08-2.53).

Conclusion: Adults with longer duration of silicosis have an intensifying risk of DM development. Rehabilitation programs for this vulnerable group with impaired lung function need to target cardiometabolic risk factors to reduce development of CVD.

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P061

Determinants of Incident Metabolic Syndrome and Type 2 Diabetes in Normal Weight: The Jackson Heart Study

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New evidence suggests that individuals with normal weight at diagnosis of type 2 diabetes (T2D) are at higher risk for all-cause mortality than those who were overweight or obese at diagnosis. While investigation of the determinants of different diabetes risk categories among those with obesity has become more common, explanations beyond genetic predisposition for the heterogeneity in risk among those without obesity are lacking. We hypothesized that visceral fat and insulin resistance would be associated with incident metabolic syndrome (MetS) and T2D among African American individuals with normal weight.

In 1,032 participants of the Jackson Heart Study with normal weight (BMI 18.5 – 24.9 kg/m²), we used logistic regression to investigate the determinants of incident MetS and T2D, separately. T2D and MetS were assessed at study visit 3 for the CT scan variables, and visits 2 and 3 for all other variables. We used the harmonized International Diabetes Federation criteria to define MetS. We excluded participants with prevalent MetS or T2D, and those with missing exposure or outcome data. Normal weight participants with MetS or T2D were more likely to be older, male, have lower socioeconomic status, caloric, fiber, saturated fat intake, and higher CRP and visceral fat. Higher HOMA-IR and subcutaneous fat were seen only in those with MetS. Higher visceral fat, subcutaneous fat, BMI, and HOMA-IR were significantly associated with incident MetS after adjustment for age, sex, education, and income (Figure). Only visceral fat and HOMA-IR were significantly associated with incident T2D.

Estimates for BMI, but not visceral fat, were strongly attenuated with mutual adjustment. Physical activity was not associated with MetS or T2D in any model.

In conclusion, visceral fat is more strongly associated with incident MetS and T2D than subcutaneous fat or physical activity, even in normal weight individuals, suggesting that adiposity plays a role in the development of cardiometabolic dysfunction even in the absence of obesity.


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P062

The Impact of High Fasting Plasma Glucose on Cardiovascular Health at the State-level in the United States

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Introduction: High fasting plasma glucose (FPG) is an established risk factor for cardiovascular disease (CVD). However, the impact of FPG on CVD mortality and morbidity at the state-level in the US has not been systematically evaluated.

Objective: To quantify the number of CVD deaths and disability adjusted life years (DALYs) attributable to high FPG by age, sex, year and state among US adults from 1990 to 2016.

Methods: We used a spatio-temporal Gaussian process regression (ST-GPR) to estimate the mean FPG level by age, sex, year and state. The inputs to the ST-GPR model included data from National Health and Nutrition Examination Survey, state-specific prevalence of obesity, and per-capita lag-distributed income in each state. Using the mean FPG and prevalence of diabetes
in each state, we characterized the distribution of the FPG at the state-level. Then, we used the Global Burden of Disease study comparative risk assessment framework to estimate the CVD deaths and DALYs attributable to high FPG. **Results:** In 2016, there were 180,440 CVD deaths attributable to high FPG in the United States: 77% due to ischemic stroke, 21% due to cerebrovascular disease, and <1% due to peripheral artery disease. Alaska had the lowest attributable death rate for both males and females (66.9 per 100,000 and 55.4 per 100,000, respectively) and West Virginia had the highest attributable death rate for both males and females (227.3 per 100,000 and 186.4 per 100,000, respectively). This is contrasted to DALYS, where Colorado had the lowest attributable DALYS rate for both males and females (1,732 DALYS per 100,000, 1,379 DALYS per 100,000, respectively) and West Virginia had the highest attributable DALY rate for both males and females (5,219 DALYS per 100,000 and 3,965 DALYS per 100,000, respectively). (Figure) **Conclusions:** Our results highlight the need for evidence-based intervention to control FPG to effectively prevent CVD.

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**P063**

**The Association Between Physical Activity and Fasting and 2-Hour Glucose in US Adults: NHANES 2013-2014**

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**Background:** Glucose concentrations in a fasted and during a glucose challenged state rely on different mechanisms for regulation. In a fasted state, hepatic regulation of glucose is important; while in a glucose challenged state, muscle glucose disposal becomes more important. Evidence suggests that physical activity of moderate or higher intensities can increase muscle glucose disposal during an insulin-stimulated state, but has less effect on hepatic insulin sensitivity. The purpose of this study was to examine the associations between glucose concentrations (fasting and after an oral glucose ingestion) and minutes of physical activity at moderate- and vigorous-intensity in a large population. **Methods:** The sample included 2,807 adults (47.4% male and 52.6% female) aged 18-80 years who participated in the National Health and Nutritional Examination Surveys (NHANES) from 2013-2014 and who did not take any diabetic medications. Minutes being physically active at moderate- and vigorous-intensities during work, and recreationally, were collected using the Physical Activity Questionnaire, which was based on the Global Physical Activity Questionnaire. Moderate-intensity physical activity was defined as any activity that caused a small increase in breathing or heart rate, while vigorous-intensity physical activity was defined as large increases in breathing or heart rate. Both intensities had to be performed for a minimum of 10 continuous minutes. Plasma glucose concentrations at fasting and 2 hours after consumption of a drink containing 75g glucose (2-hour glucose) were determined. Pearson product correlations were performed for analysis. **Results:** The population had 141±133 (mean±SD) minutes of moderate-intensity physical activity during work and 63±56 minutes recreationally, as well as 174±156 minutes of vigorous-intensity physical activity during work and 77±56 minutes recreationally. Minutes of vigorous-intensity physical activity performed during work was associated with 2-hour plasma glucose concentrations (r=0.15; p=0.045); this association was not affected after adjusting for
age, race, and sex (p=0.049), but was no longer significant after BMI was also adjusted (p=0.059). Recreational or total minutes of vigorous-intensity physical activity, and moderate-intensity physical activity was not associated with 2-hour glucose (p>0.20). Additionally, none of the physical activity minutes was associated with fasting glucose (p>0.27).

**Conclusion:** Self-reported vigorous-intensity physical activity during work was positively associated with 2-hour glucose, but not fasting glucose. The results are surprising. Further studies with objective physical activity measures are needed to examine the associations with fasting and 2-hour glucose.

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P064

**Progression From Prediabetes to Diabetes in Hispanics/Latinos. Results From the Hispanic Community Health Study / Study of Latinos (HCHS/SOL)**

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**Introduction:** There is limited data on longitudinal assessments of diabetes incidence according to baseline glycemic status among Hispanics/Latinos in the US. **Hypothesis:** We hypothesized that diabetes risk in Hispanics/Latino adults varies by baseline glycemic status. **Methods:** We examined the progression to diabetes among Hispanic/Latinos enrolled in HCHS/SOL; a population-based longitudinal study of 16,415 individuals of varying Hispanic/Latino background aged 18 - 74. We used Poisson regression models that accounted for the complex sampling strategy in HCHS/SOL to compare the rates of diabetes incidence by baseline prediabetes criteria [impaired glycated hemoglobin (IA1c, 5.7-6.4%), impaired fasting glucose (IFG, 100-125 mg/dl), and impaired glucose tolerance (IGT, 140-199 mg/dl on OGTT)], as well as any of these two criteria, or all prediabetes criteria, compared to normoglycemia. **Results:** A total of 8014 individuals attended both Visit 1 (2008-2011) and Visit 2 (2014-2017) and were free of diabetes at Visit 1. Persons who developed diabetes were older, had lower education and had higher blood pressure, adiposity (waist circumference, BMI), dyslipidemia, HOMA-IR, and C-reactive protein (all p<0.001). The proportion of participants who developed diabetes on visit 2 varied significantly according to baseline prediabetes categories (IFG 7.4±1.5%, IGT=10.6±2.0%, impaired A1c=9.0±1.1%, two criteria=23.9±1.8%, all prediabetes criteria=43.1±3.7%). After adjusting for potential confounders, including demographics and risk factors for diabetes, meeting more prediabetes criteria was associated with a significantly higher risk of diabetes compared to baseline normoglycemic status, (Table). **Conclusions:** Diabetes incidence among Hispanic/Latino adults varied markedly by glycemic category at baseline. Each additional criterion of prediabetes magnified in a dose-response relationship the risk of diabetes in this population.
Lifetime Risk of Developing Type 2 Diabetes by Levels of Adiposity in the US Population

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Introduction: Prior estimates of lifetime risk (LTR) for developing type 2 diabetes (diabetes) among US adults have been derived using Markov modeling, thus were not based on longitudinal data. We use pooled data from several US community-based cohorts to estimate the LTR of diabetes according to age, sex and body mass index (BMI). Hypothesis: Higher BMI is associated with higher LTR of diabetes irrespective of the index age; and men have a higher LTR of diabetes compared to women. Methods: We pooled individual-level data from 7 US-based cohorts: Framingham Heart Study; Framingham Offspring Heart Study; Coronary Artery Risk Development in Young Adults (CARDIA); Atherosclerosis Risk in Communities (ARIC); Cardiovascular Health

Results: Our sample consisted of 14139 Black and White participants (56% female). At index age 55 years, the 25-year adjusted risk for diabetes was 5.3% (95% confidence interval: 4.1-6.6%) in men and 2.8% (2.2-3.5%) in women with normal weight (Figure). The corresponding risks for diabetes among overweight participants were 11.0% (9.7-12.3%) in men and 8.5% (7.3-9.7%) in women. In obese individuals, the 25-year risk for diabetes was 24.3% (21.9-26.6%) in men, and 20.4% (18.6-22.2%) in women. Conclusions: In this sample of middle-aged US adults, long-term risk for diabetes was substantially higher in overweight and obese participants. These data strongly suggest that lowering the population burden of obesity is critical for lowering the population burden of diabetes.
Longitudinal Study of Adult Health (ELSA-Brasil)

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Background: Although HDL-C is known to be inversely associated with cardiovascular risk, no causal relationship has been demonstrated. Since HDL-C comprises a group of different subfractions, they might have different effects on atherosclerosis, and its effects may be modified by the presence of diabetes mellitus.

Background: Although High-Density Lipoprotein (HDL-C) is known to be inversely associated with cardiovascular risk, no causal relationship has been demonstrated. Since HDL-C comprises different subfractions, they might have different effects on atherosclerosis associated with other risk factors. In another hand, the presence of diabetes has been described either as a mediator or as a moderator of cardiovascular risk factors. Hypothesis: HDL-C subfractions have different atherogenic effects on subclinical atherosclerosis according to diabetes status. Methods: We evaluated 3,930 individuals enrolled at the baseline of the Brazilian Longitudinal Study of Adult Health aged 35 to 74 years (45.6% men) without previous cardiovascular disease and not in use of lipid-lowering agents. HDL2-C and HDL3-C were obtained by vertical auto profile method (Atherotech). Diabetes was defined as a previous medical history of diabetes or a fasting blood glucose > 126 mg/dl or a 2-hour post-load glucose test > 200 mg/dl or a glycated hemoglobin > 6.5%. Multiple linear regression models analyzed the relationship between each HDL-C subfraction and the common carotid artery intima-media thickness (cIMT). Results: The proportion of participants with the diagnosis of diabetes was 19.8%. The mean (± standard deviation) values obtained were cIMT (0.796±0.195 mm), total HDL-C (55.1±14.4 mg/dl), HDL2-C (14.9±6.7), and HDL3 (40.1±8.4 mg/dl). Total HDL-C and subfractions, as well as HDL2-C/HDL3-C ratio, were negatively associated with cIMT after adjustment for age, sex, and race (all p<0.001) and further for smoking habit, alcohol use, physical activity, LDL-C, body-mass index, waist circumference, fasting plasma glucose, triglycerides, systolic blood pressure and use of antihypertensive drugs (HDL-C: p = 0.003, HDL2-C: p = 0.01; HDL3-C: p = 0.003; HDL2-C/HDL3-C ratio: p = 0.02). When stratified by diabetes status, both HDL2-C (p= 0.03) and HDL2-C/HDL3-C ratio (p= 0.01) showed a negative association with cIMT in people with diabetes after adjusting for confounding variables. This association did not occur in individuals without diabetes (p = 0.11 and p = 0.30, respectively). Conclusion HDL2-C and HDL3-C subfractions, as well as the HDL2/HDL3-C ratio, are inversely associated with cIMT after adjustment for traditional risk factors. This association of HDL2-C/HDL3-C ratio and HDL2-C is modified by the presence of diabetes, where it is more pronounced.


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P067

Long-term Exposure to Ambient Air Pollution and Type 2 Diabetes Incidence: A Time Series Analysis
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**Introduction:** Epidemiological evidence on long-term exposure to ambient air pollution and type 2 diabetes (T2D) incidence are sparse, and the results are contradictory.

**Hypothesis:** We performed a time-series analysis to investigate potential association between long-term exposure to ambient air pollution and T2D incidence in the Chinese population.

**Methods:** Monthly time-series data between 2008-2015 on ambient air pollutants and incident T2D were obtained from the Environment Monitoring Center of Ningbo and the Chronic Disease Surveillance System of Ningbo. Relative risks (RRs) and 95% confidence intervals (95%CIs) of incident T2D per 10 μg/m$^3$ increase in ambient air pollutants were estimated from Poisson generalized additive models and adjusted for month, temperature, relative humidity, air pressure and wind speed. This model was combined with a distributed lag non-linear model to determine the relative risks.

**Main Outcome Measures:** The main outcome measure was T2D incidence.

**Results:** Long-term exposure to particulate matter <10 μm (PM10) and Sulphur dioxide (SO2) were associated with increased T2D incidence. The relative risks (RRs) of each increment in 10 μg/m$^3$ of PM10 and SO2 were 1.62 (95%CI, 1.16 to 2.28) and 1.63 (95%CI, 1.12 to 2.38) for overall participants, 1.56 (95%CI, 1.12 to 2.17) and 1.59 (95%CI, 1.14 to 2.23) for males, 1.68 (95%CI, 1.15 to 2.44) and 1.76 (95%CI, 1.21 to 2.56) for females, respectively. Whereas for ozone (O3) exposure, the RRs were 0.78 (95%CI, 0.68 to 0.90) for overall participants, 0.78 (95%CI, 0.69 to 0.90) for males, and 0.78 (95%CI, 0.67 to 0.91) for females, respectively. Female participants were more prone to develop T2D after long-term exposed to ambient air pollutants than male counterparts. No statistically significant associations were observed for PM2.5, NO2, and CO exposures, nor in the two- and three-pollutant models.

**Conclusions:** Long-term exposure to PM10 and SO2 is positively associated with T2D incidence, whereas O3 is negatively associated with T2D incidence.


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**P068**


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**Background:** Diabetic nephropathy is the most common cause of chronic kidney disease in the developed countries. Clinical characteristics do not fully predict development of diabetic
nephropathy in diabetic patients. There have been few genome-wide association studies (GWAS). **Methods:** We conducted a GWAS to identify common genetic variations that affected renal function in a Japanese population of 1,117 patients with type 2 diabetes mellitus (T2D) extracted from 14,091 participants appropriate for GWAS as a part of the Japan Multi-Institutional Collaborative Cohort (J-MICC) study. Genotyping was performed at a central laboratory using a HumanOmniExpressExome-8 v1.2 BeadChip array. Genotype imputation was performed using SHAPEIT and Minimac3 software based on the 1000 Genomes reference panel (phase 3). Estimated glomerular filtration rate (eGFR) was calculated according to Matsuo et al. for each patient. The association for the imputed variants with eGFR was performed by a linear regression analysis adjusted for age and sex. **Results:** We found that rs869312667 at NBEA (β=1.23, P=1.03E-08) and rs8523 at ELOVL2 (β=24.4, P=1.64E-08) were significantly associated with eGFR. These genes have been reported to participate in several metabolic functions and were associated with some disease conditions. However, no previous reports have implied that these genes were related to diabetic nephropathy. **Conclusions:** rs869312667 at NBEA and rs8523 at ELOVL2 were significantly associated with eGFR in patients with T2D in Japanese.

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**P069**

**Serum Uric Acid Trajectories and Type 2 Diabetes and Hypertension in Middle Age**

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**Objective:** To identify SUA level trajectories throughout 12 years and to examine their associations with incident diabetes and hypertension among middle-aged men and women. **Methods:** A total of 7187 participants from the Mudanjiang Chronic Non-communicable Diseases Study, who were aged 30-60 years and without diabetes or hypertension at baseline, were included. The participants were followed for an average of 10.5 years by annual examinations. Latent mixture modeling was used to identify trajectories of SUA over time. **Results:** Consistently among women and men, five distinct trajectories of SUA were identified: low-stable, low-increasing, moderate-stable, moderate-increasing, and high-stable. In multivariate models, compared with low-stable group, for women, the adjusted hazards ratio of diabetes was 2.11 (95%CI 1.08-4.23) in the low-increasing group, 1.78 (0.81-3.92) in the moderate-stable group, 2.01 (1.02-3.97) in the moderate-increasing group, 3.00 (1.55-5.83) in the high-stable group, whereas no association was found among men. In addition, compared with low-stable group, all other trajectory groups had an increased risk of hypertension in both men and women, except for moderate-stable group in women. Participants in the moderate-increasing group exhibited the highest risk of hypertension (for women, 2.42 [1.72-3.39], for men, 2.57 [2.05-3.24]). Further adjustment for weight change during follow-up period completely ablated the trajectories-diabetes associations, except for the high-stable group in women, but the trajectories-hypertension associations remained significant in each group. **Conclusions:** We found that a persistent elevated or an increasing trend of SUA levels was significant associated with an increased risk of hypertension among middle-
Risk of All-cause Mortality in Women versus Men With Type 2 Diabetes: A Systematic Review and Meta-analysis

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Introduction: Previous studies have shown sex differences in the all cause mortality rate associated with type 2 diabetes.

Hypothesis: We did a meta-analysis to provide reliable and comprehensive estimates of type 2 diabetes on risk of all-cause mortality in women versus men.

Methods: We systematically searched PubMed, Embase, and Web of science for studies published from their starting dates to October 10, 2017. Studies were selected only if they reported sex-specific estimates of the standardized mortality ratio (SMR) or hazard ratios associated with type 2 diabetes for all-cause mortality. We used random effects meta-analyses with inverse-variance weighting to obtain sex-specific SMRs and their pooled ratio (women to men) for all-cause mortality. Study quality was assessed using the Newcastle–Ottawa scale.

Results: Data from 30 studies including 2,307,694 individuals and 252,491 deaths occurred were included. The pooled women-to-men ratio of the SMR for all-cause mortality was 1.14 (95% CI 1.09-1.19, p<0.001; I^2=81.6%). Compared with healthy counterparts, the pooled SMR for all-cause mortality in patients with T2D was 2.30 (95%CI 1.97-2.68) in women, and 1.94 (95%CI 1.73-2.18) in men, respectively. Sensitivity analysis with omission of one study at a time did not change the results of this meta-analysis.

Conclusions: Women with type 2 diabetes have a roughly 14% greater excess risk of all-cause mortality compared with men counterparts. This meta-analysis was registered at the International Prospective Register of Systematic Reviews (Prospero) (http://www.crd.york.ac.uk/PROSPERO; registration number: CRD42017074187).

Figure 1. Pooled women-to-men ratios of SMRs for all-cause mortality, comparing people with type 2 diabetes versus healthy counterparts.
Hispanic Community Health Study/Study of Latinos

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Background: Among Hispanics/Latinos, there is substantial heterogeneity in the prevalence of depressive symptoms and diabetes by background. This study aimed to examine the association between depressive symptoms and incident diabetes among Hispanic/Latino adults of diverse backgrounds.

Methods: The Hispanic Community Health Study/Study of Latinos (HCHS/SOL) is a prospective, community-based study of 16,415 self-identified Hispanic/Latino adults aged 18-74 years at Visit 1 (2008-2011) and 10,914 who have also completed the Visit 2 examination by August 2017. This analysis includes 8,804 participants who were free from diabetes at baseline and attended both Visits. Baseline depressive symptoms were assessed using the CES-D 10-item depression scale and divided into quartiles. Incident diabetes was defined by fasting glucose ≥126mg/dL, 2-hour postload glucose 140-199mg/dL, HbA1c ≥6.5%, or self-report. Accounting for HCHS/SOL complex survey design, we used Poisson regression models to estimate diabetes incidence density ratios (Table).

Results: Baseline BMI was associated with both depressive symptoms and incident diabetes. Overall, 876 participants developed diabetes. In analyses stratified by Hispanic/Latino background, the association between baseline depressive symptoms and incident diabetes was significant for South Americans, Central Americans, and Mexicans. No significant associations between depressive symptoms and diabetes were seen among Hispanics/Latinos of Dominican, Cuban, or Puerto Rican backgrounds.

Conclusions: These findings suggest that the association between depressive symptoms and incident diabetes in Hispanics/Latinos may differ by their background, with South and Central Americans at the highest risk. This difference may be partly explained by variation in participants’ understanding of CES-D questions by Hispanic/Latino background. Future research is needed to understand these novel findings fully and explore their implications for practice and policy.


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P072

Circulating Phylloquinone Concentrations and Type 2 Diabetes Incidence: A Mendelian Randomization Study

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Introduction: This study aims to investigate the causal relation of genetically conferred circulating phylloquinone levels and the risk of type 2 diabetes (T2D) via a Mendelian Randomization approach. Methods: We used data from the European Prospective Investigation into Cancer and Nutrition (EPIC)-InterAct case-cohort study comprising 10,071 diabetes cases and 13,309 subcohort members from eight European countries. We calculated a weighted genetic risk score (wGRS) including four SNPs (rs2192574, rs6862071, rs4645543 and rs2108622) likely to be related to circulating phylloquinone levels from a genome wide association study. Inverse-variance weighted (IVW) analysis was used to obtain a Hazard Ratio (HR) for the unconfounded relation between circulating phylloquinone levels and T2D incidence. All analyses were adjusted for sex, center, principal components of ancestry, genetic platform, triglycerides and hours fasting. Furthermore, we assessed the robustness of our results with a MR Egger analyses. In follow-up analyses, we have included data from the Diabetes Genetics Replication And Meta-analysis (DIAGRAM) consortium, increasing our dataset to 21,571 participants with diabetes. Results: The median follow-up time was 10.9 years. In IVW analysis, genetically conferred higher circulating phylloquinone levels were associated with a reduced risk of T2D with a HR of 0.87 (0.78;0.97) for every ln-nmol/L increase in circulating phylloquinone. The MR Egger method resulted in a HR of 0.88 (0.72;1.08). Adding DIAGRAM data resulted in a summary odds ratio of 0.90 (0.81;1.00). Conclusion: Our study suggests that the association between higher circulating phylloquinone levels and lower T2D incidence may be causal.


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P073

Diabetes and All Cause and Cause-specific Mortality in 111,300 Mexican Women With Healthcare Coverage

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Introduction: In high-income countries, mortality rates have a twofold increment in subjects with diabetes compared to the general population. Few prospective studies have evaluated the impact of diabetes on mortality in low- and middle-income countries. In Mexico, a five-fold higher mortality due to diabetes was recently reported. Limited access to medical care could explain this poor prognosis. Hypothesis: Among women with healthcare coverage in Mexico, diabetes confers a mortality risk similar to what is observed in high-income countries. Methods: We evaluated diabetes in relation to all cause and cause-specific mortality in a prospective cohort of 111,300 disease-free women (except for diabetes) with healthcare coverage in the Mexican Teachers’ Cohort. We identified 5,514 (5%) participants who self-reported a diagnosis of diabetes at baseline in 2006-08. Between 2006 and 2015 we identified deaths using the employer’s database and next of kin reports and obtained date and cause of death of 802 women from national mortality databases. In multivariable Cox models we adjusted for sociodemographic factors, healthcare
institution, use of preventive health services, body mass index, hypertension, smoking, and physical activity. **Results:** Among participants (42 ± 7.5 years), age-adjusted mortality rate was 4.59 per 1000 person-years (95%CI 3.27, 5.92) for women with diabetes and 1.28 per 1000 person-years (95%CI 1.01, 1.54) for women without diabetes. In multivariable models comparing diabetics versus non diabetics, the hazard ratio (HR) for all-cause mortality was 3.27 (95%CI 2.73, 3.90). The HR for cardiovascular mortality was 3.78 (95%CI 2.46, 5.54), for renal disease mortality 16.89 (95%CI 9.78, 29.4), and for death from infections 7.55 (95%CI 3.58, 15.3). **Conclusions:** In women with healthcare coverage in Mexico, diabetes was associated with a worse prognosis than what is observed in high-income countries, particularly for deaths due to renal disease and infections.

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P074

**Racial Differences in the Association Between Hemoglobin A1c and Hypoglycemic Events**

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**Background:** Rates of severe hypoglycemia are higher in African Americans than in whites. We hypothesize that the elevated rate of hypoglycemic events observed in African Americans is a result of treating African Americans and whites to the same target hemoglobin A1c (hbA1c) despite established racial differences in the association between hbA1c and glucose measures. **Methods:** Using de-identified patient clinical data from 2011-2017 on 22,554 self-identified African American or white patients with type 2 diabetes from UCSF Health, we examined racial differences in the association between hbA1c and hypoglycemic events. **Results:** Of the 22,554 patients (17% African American; 54% male; mean age 59.6), 275 experienced a hypoglycemic event requiring medical care; 2.20% of African Americans experienced a hypoglycemic event compared to 1.02% of whites (p<0.001). Of the 275 patients experiencing a hypoglycemic event, 102 had a last recorded hbA1c value within 90 days prior to the event. The mean hbA1c value preceding a hypoglycemic event was 7.50% for African Americans compared to 6.91% in whites (mean difference= 0.59%, 95% confidence interval: -0.38%, 1.56%, p=0.24). In models adjusted for age, sex, and duration of diabetes, the difference in hbA1c was slightly attenuated (mean difference= 0.56%, 95%CI: -0.41%, 1.52%, p=0.26). **Conclusion:** In this population, African Americans were significantly more likely to experience a hypoglycemic event than whites. HbA1c values preceding the event were slightly higher in African Americans than whites; this finding was not statistically significant but statistical power was potentially limited by sample size.

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P076
Genetic Predisposition to Hemoglobin A1c, Postpartum Weight Reduction, and Glycemic Changes: A Longitudinal Study in Women With Prior Gestational Diabetes

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Introduction: Hemoglobin A1c (HbA1c) is a common marker for glycemic control and a major risk factor for diabetes and cardiovascular disease.

Hypothesis: We examined whether the genetic variation predisposing to HbA1c affected glycemic changes in women with prior gestational diabetes mellitus (GDM) and whether such an effect was modified by changes in body adiposity, especially during and after pregnancy.

Methods: This is a longitudinal study in Tianjin, China. We genotyped 10 genome-wide association study-identified HbA1c single nucleotide polymorphisms and assessed weight at 1 to 5 years postpartum and changes in glycemic traits in 1156 women with prior GDM. The genetic risk score was calculated based on 10 HbA1c-associated loci.

Main Outcome Measures: The main outcome measure was postpartum glycemic changes.

Results: The HbA1c genetic risk score significantly interacted with postpartum weight reduction on changes in 2-h glucose and HbA1c (P for interaction = 0.02 and 0.03; respectively) after multivariable adjustment. In women with postpartum weight reduction of ≥8kg/y, the genetic risk score was associated with decreased HbA1c. The association between postpartum weight reduction and glycemic improvement was more significant among women with a lower genetic risk score.

Conclusions: In a large cohort of Chinese women with a history of GDM, our data for the first time indicate that the genetic predisposition to HbA1c may interact with postpartum weight reduction on long-term glycemic changes.

Figure 1. Changes in glycemic traits according to weight reduction and HbA1c genetic risk score tertiles.


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P078

Gestational Weight Gain Modifies the Effect of the Circadian Rhythms Related MTNR1B Genotype on Postpartum Glycemic Changes: A Longitudinal Study in Women With Prior Gestational Diabetes

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Context: Gestational diabetes mellitus (GDM) affects postpartum glucose metabolism and future risk of type 2 diabetes. Pregnancy and GDM are related to disturbed circadian rhythms and sleeping, which are determined by genetic variations in genes such as Melatonin receptor 1B (MTNR1B).

Objective: We prospectively assessed whether the circadian rhythms related MTNR1B genotype was related to on 1-5 years of postpartum glycemic changes among women with a history of GDM, and whether gestational weight gain modified such associations.

Design: The established circadian rhythms-associated MTNR1B genetic variant (rs10830963) was genotyped in 1025 Chinese women with a history of GDM. Body weight and glycemic traits during and after pregnancy were longitudinally collected.

Results: The frequency of MTNR1B rs10830963 was not different among the three categories of gestational weight gain (inadequate, adequate, and excessive). We found women carrying different MTNR1B genotype showed distinct postpartum changes in 2-h glucose (OGTT) −0.36, 0.20, and -0.19 mmol/L per additional copy of the G allele in women with inadequate, adequate, and excessive gestational weight gain, respectively (p for interaction=0.028). The corresponding changes in fasting glucose were 0.14, 0.13, and 0.01, though the modification effects of gestational weight gain on the genetic association was marginal (p for interaction= 0.067).

Conclusions: Our findings suggest that gestational weight gain may modify the circadian rhythms related MTNR1B genetic variant on long term glycemic changes, highlighting the significance of gestational weight management in diabetes prevention among women with GDM.

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P079

Alcohol Consumption and Risk of Diabetes in the Atherosclerosis Risk in Communities (ARIC) Study

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Background: Moderate alcohol consumption has been reported to be associated with lower risk for diabetes with some studies showing a U-shaped association. Whether and how the association might differ by gender or obesity status is controversial.

Objective: To evaluate the prospective association between alcohol consumption and the long-term risk of diabetes in the Atherosclerosis Risk in Communities (ARIC) Study.

Methods: A prospective analysis of 11,263 ARIC participants without prevalent diabetes (55% women, 81%white, mean age 54 years). Alcohol consumption was assessed at visit 1 (1987-
Participants were followed-up for incident diabetes defined by fasting glucose more than 126 mg/dL, non-fasting glucose more than 200 mg/dL, self-reported diagnosis of diabetes or use of diabetic medication. We used Cox models to estimate hazard ratios of diabetes risk by drinking categories in women and men, respectively.

**Results:** During a median follow-up of 21 years, there were 3518 incident diabetes cases. In the fully adjusted model, compared to never drinkers, among women, 7-14 drinks/week was associated with a significantly lower risk of diabetes; whereas among men, 14-21 drinks/week was associated with a significantly lower risk. There was a significant interaction between drinking categories and smoking status or between drinking categories and body mass index in women. Among women, a U-shaped association was mainly present among non-smokers, and significant decreasing risk is only found among normal-weight and overweight participants, but not obese participants.

**Conclusion:** Low levels of alcohol intake (1-2 drinks per day for women and 2-3 drinks per day for men) are inversely associated with diabetes risk. The association is modified by smoking and body mass index in women.

**Glucose Homeostasis, Diabetes, and Orthostatic Hypotension in a Community-based Population: The ARIC Study**

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**Background** Although orthostatic hypotension (OH) screening is recommended for adults with diabetes, the extent to which blood glucose (BG) levels are associated with OH has not been characterized.

**Hypothesis** Higher BG levels are associated with having OH, while low levels of BG are not associated with OH.

**Methods** We examined the cross-sectional association of OH with BG and diabetes status in middle-aged (range 44 to 66 yrs) ARIC participants (1987-1989). OH was defined as a drop in blood pressure (systolic ≥20 mm Hg or diastolic ≥10 mm Hg) within 2 min of standing, when transitioning from the supine to standing position. Using logistic regression, we examined the association of the following 5 categories of BG without diabetes or diabetes and OH: (1) low-normal BG (fasting BG <80 or non-fasting BG <100 mg/dL), (2) high-normal BG (fasting BG of 80-99 or non-fasting BG of 100-139 mg/dL), (3) pre-diabetes (fasting BG of 100-125 or non-fasting BG of 140-199 mg/dL), (4) undiagnosed diabetes (fasting BG ≥126 or non-fasting BG ≥200 mg/dL), or (5) diabetes (self-reported diagnosis or current medication use). We also modeled BG as a continuous variable by diabetes status, using restricted cubic splines to characterize the association between BG level and OH.

**Results** In 12,636 participants (mean age 54.6 ± 5.7 yrs, 55% women, 26% black), 4.3% had OH at baseline. The mean BG was 108 ± 38 mg/dL; 7% had diabetes (self-reported diagnosis or diabetes medications). After adjustment, adults with low BG (group 1) or diabetes (group 5) were both more likely to have OH compared to the normal BG group (group 2) with ORs of 2.15 (95% CI: 1.26, 3.65) and 2.20 (95% CI: 1.65, 2.97).
2.92), respectively. Continuous characterization of the relationship between BG and OH was U-shaped for participants with or without diabetes (Figure, panels A&B).

**Conclusions** Low BG in adults without diabetes, diabetes, and high BG in adults with diabetes were associated with OH. This suggests a more prominent role for BG homeostasis in blood pressure stabilization with standing.

![Prevalence Odds Ratios for Orthostatic Hypotension](image)

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**P081**

**Psychosocial Resources Are Protective of Diabetes Among African Americans in the Jackson Heart Study**

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**Introduction:** African Americans (AAs) have among the highest prevalence of type 2 diabetes in the U.S. Research has shown that positive affect and supportive networks are associated with better health outcomes and may improve regulation of physiological processes. We examined the extent to which psychosocial resources were protective of diabetes outcomes among a sample of 5,306 AAs.

**Hypothesis:** Psychosocial resource measures are inversely associated with prediabetes and diabetes [defined by hemoglobin (Hb)A1c categories] and prevalent diabetes (defined by self-report diabetes status and medication use).

**Methods:** Using data from the Jackson Heart Study (JHS), we evaluated the cross-sectional associations of four psychosocial-resource indicators (social support, optimism, religiosity, social networks) with two diabetes outcomes [1) HbA1c categories: normal (HbA1c ≤ 5.7%), at risk/pre-diabetic (5.7% < HbA1c < 6.5%), diabetic (HbA1c ≥ 6.5%) and 2) prevalent diabetes (vs. no diabetes)]. For each psychosocial-resource measure, we created high vs. low categories (median split) and continuous standard deviation (SD) units. Associations with HbA1c categories were examined using multinomial logistic regression to estimate odds ratios (OR 95% confidence interval-CI) of pre-diabetes (vs. normal) and diabetes (vs. normal). Associations with prevalent diabetes were examined using Poisson regression to estimate prevalence ratios (PR 95% CI) of diabetes (vs. no diabetes). Models adjusted for demographics, SES, waist circumference, health behaviors, and depression.

**Results:** Participants with diabetes reported fewer psychosocial resources than those with pre-diabetes and normal HbA1c (p<0.01). After full adjustment, 1-SD unit increase in social support was associated with an 11% lower odds of pre-diabetes (vs. normal HbA1c) (OR 0.89, 95% CI 0.81-0.99). High vs. low religiosity was associated with an increased odds of diabetes vs. normal HbA1c (OR 1.29, 95% CI 1.01-1.64) after full adjustment. Optimism and social networks were only associated with lower diabetes prevalence after adjustment for
Conclusion: With the exception of religiosity, psychosocial-resource measures were inversely associated with diabetes. Social support and social networks, especially, should be considered when addressing the reduction of diabetes burden among AAs.


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P082


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With increasing diabetes prevalence in the US general population, many nutritional supplements are taken as alternative medicine by diabetic patients. However, serial trends or patterns in their dietary supplement use are unknown. Using the nationally representative data from the National Health and Nutrition Examination Survey (NHANES) collected between 1999 and 2014, we evaluated prevalence and trends of use of any supplements, multi-vitamins/multi-minerals (MVMM), individual vitamins, minerals, and non-vitamin, non-mineral supplements. Information on supplement use in the preceding 30 days was collected during the interview over 8 continuous 2-year waves. Analyses were conducted among 6,348 US diabetic adults aged 20 to 85 years (pregnant women excluded) and also stratified by age, race/ethnicity, gender, educational backgrounds, comorbidity status, and comorbidity status. Overall, the prevalence of use of any supplement (52%-59%; P for trend=.09) and that of any mineral (47%-51%; P for trend=.24) seemed stable. Use of MVMM decreased from 36% of reported use in 1999-2000 to 32% in 2013-2014 (P for trend=.008). Use of any vitamin products increased from 47% to 53% (P for trend=.04). Use of a few individual supplements including lycopene, vitamin D, and vitamin B12 significantly increased. The trend of supplement use varied by sex and race/ethnicity. In conclusion, among diabetic patients in the United States, use of any dietary supplements or any minerals remained stable, use of MVMM slightly decreased, and use of any vitamins and several individual supplements increased over the past 16 years.

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Diabetes Sub-Phenotypes Determined by Nutritional, Environmental, and Inflammatory Biomarkers and All-Cause Mortality in US Adults: The Third National Health and Nutrition Examination Surveys, 1988-1994

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Due to phenotypic heterogeneity in diabetes, it is important to examine different sub-phenotypes of diabetes based on biomarkers and evaluate their associations with all-cause mortality. We utilized the nationally representative sample in the NHANES III (The Third National Health and Nutrition Examination Survey, 1988-1994) to explore possible sub-phenotypes of diabetes determined based on tertile levels of 50 nutritional, environmental, and inflammatory biomarkers, respectively. Weighted logistic regression analyses were performed among
2,130 diabetic patients aged 20 to 90 years with adjustment for age, sex, race, BMI, smoking status, drinking status, physical activity, and educational background. We observed an increased risk of all-cause mortality associated with higher level of serum C-reactive protein \( (P \text{ for trend=.01}) \), serum thyroid stimulating hormone \( (P \text{ for trend=.01}) \), and urine albumin \( (P \text{ for trend<.0001}) \), respectively. In contrast, higher levels of serum sodium \( (P \text{ for trend=.01}) \) and alpha carotene \( (P \text{ for trend=.003}) \) are associated with a decreased risk of all-cause mortality. In addition, these significant associations were not modified by age, sex, and race. In conclusion, our results indicate that some biomarkers are reliable predictors of diabetes-related mortality and have potential clinical values for improving risk stratification in diabetic patients, though further validation of their respective and joint predictive values is needed.

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P084

Food for Thought: Patient Perspectives on Medically Tailored Meal Delivery for Patients With Diabetes Who Experience Food Insecurity

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Introduction: Food insecurity, limited or uncertain access to nutritious food owing to cost, is a major impediment to dietary adherence in diabetes management. Medically tailored meal (MTM) programs, which deliver ready-to-eat meals prepared under the supervision of a dietitian tailored to specific nutritional needs, are potentially transformative interventions for food insecure diabetes patients. However, mechanisms whereby MTM might improve diabetes management are understudied. Hypothesis: We hypothesized that MTM may improve diabetes management by overcoming financial barriers to following a healthy diet and modeling healthy meals. Methods: This qualitative study included 20 participants in a randomized crossover trial of MTM for patients with suboptimally controlled type 2 diabetes (Hemoglobin A1c > 8.0%) and food insecurity (assessed using USDA Food Security Household Survey Module). The goal was to investigate mechanisms whereby MTM affects diabetes management using semi-structured interviews, until saturation was achieved. Participants were asked to give their perceptions regarding how the meals influenced diabetes management and awareness. Interviews were recorded, transcribed verbatim, and coded independently by two investigators. Using qualitative analysis following the immersion-crystallization approach, we evaluated how receiving medically tailored meals influenced diabetes management for patients who are food insecure. Results: Many participants reported that the meals helped with managing their diabetes and increased their understanding about diabetes (example quotation: “When I started my A1c level was so high. And when I started this program they had to teach me how much food I have to eat and all the protein I have to get. And then through the program my A1c went down.”). Participants also noted that the program taught them about healthier food options and portion control, with many suggesting that the meals served as a model for their diet and meal preparation after the study (example quotations: “It gave me a couple of ideas as far as using let’s say barley or bulgur wheat. It also gave me an idea of the kinds of things, the range of things that were acceptable, and the portion size was helpful too.” “I used to eat a lot of Italian macaroni and sauce, and eat bread, and dunk my bread in sauce. I don't do that anymore.”). Finally, participants noted that meal delivery relieved financial barriers to eating more healthily
(example quotations: “Financially, it saved me a real lot of money. I would not have been able to afford those kinds of meals myself.” “It’s actually helped me out a lot because they cut me down on food stamps, so I was actually unable at the time to be able to eat the foods I was supposed to.”). Conclusions: Medically tailored meal delivery is a promising intervention that may help vulnerable patients with diabetes overcome several barriers to improving health.


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P086

A Population-based Study of the Bidirectional Association Between Sleep Apnea and Diabetes in Three Prospective US Cohorts

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Introduction: Both sleep apnea and diabetes are strong cardiovascular disease (CVD) risk factors with substantial healthcare burden. It is hypothesized that intermittent hypoxemia and sleep fragmentation resulting from sleep apnea may contribute to diabetes through inflammation, insulin resistance and glucose intolerance. Conversely, pre-existing diabetes may promote sleep apnea development through increased abnormalities in autonomic nervous system activity and ventilatory control due to peripheral neuropathy, or through effects on inflammatory pathways. However, no population-based study has simultaneously evaluated the potential bidirectional association between these two highly prevalent disorders.

Methods: We followed 161,824 participants from the Nurses' Health Study (NHS; 2002-2012), NHSII (1995-2013), and the Health Professional Follow-up Study (1996-2012) who were free of diabetes, CVD and cancer at baseline. Cox proportional hazards model was used to estimate hazard ratios (HR) for developing diabetes according to sleep apnea status. In parallel, we used similar approaches to estimate risk of developing sleep apnea according to diabetes status among 167,277 participants free of sleep apnea, CVD and cancer at baseline. In all 3 cohorts, diagnoses of diabetes or sleep apnea were identified by validated self-reports.

Results: Similar results were observed across 3 cohorts. In the pooled analysis, 9,370 incident diabetes cases were identified during follow-up. After adjusting for age, sex, menopausal status in women, smoking, alcohol drinking, diet quality, physical activity, sleep duration, regular physical exams, and hypertension, the HR (95% CI) for diabetes was 2.28 (2.07, 2.51) comparing those with versus without sleep apnea. The association was attenuated but remained statistically significant after accounting for waist circumference (WC) and BMI (HR: 1.57; 95% CI: 1.42, 1.73). By contrast, we documented 9,409 incident sleep apnea cases during follow-up. Compared with those without diabetes, the multivariable HR (95% CI) for sleep apnea prior to adjustment for BMI and WC was 1.44 (1.25, 1.67) in individuals with diabetes. Although there was no overall association after the adjustment (HR: 1.04; 95% CI: 0.95, 1.14), an increased risk was observed among those with diabetes who used insulin compared with those without diabetes (HR: 1.38; 95% CI: 1.11, 1.72).

Conclusions: Sleep apnea is independently associated with an increased risk of diabetes, whereas insulin-dependent diabetes is associated with a higher risk of sleep apnea. Clinical awareness of this bidirectional association may improve prevention and treatment of both diseases and reduce their adverse impact on CVD. Future research aimed
at elucidating the mechanisms that underlie each association may identify novel intervention targets.

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**P087**

**Youth Tobacco Users Perceive Less E-Cig Harm**

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**Introduction**: In Appalachia, youth tobacco use rates exceed the national average, and youth in these rural areas are increasingly aware of new and emerging tobacco products, such as e-cigarettes. Given that e-cigarettes are a commonly used tobacco product by youth, additional inquiry is needed to better understand both youth product perceptions and use patterns, especially in communities with entrenched acceptance of tobacco. **Study Aim and Hypothesis**: Our aim is to examine the prevalence of conventional tobacco and e-cigarette use among Appalachian youth and to examine associations between use and tobacco harm perceptions. We hypothesized that conventional tobacco users would be less likely than non-users to perceive e-cigarette use as harmful and that e-cigarette users would be less likely than non-users to perceive e-cigarette use as harmful. **Methods**: A survey of middle and high school students (n=1,008) was conducted in rural Appalachia. The primary outcome in this analysis, tobacco use, was categorized as never user, conventional tobacco only user (cigarettes or smokeless), or e-cigarette only user. Descriptive characteristics were compared among the three use groups. Relationships between harm perceptions and tobacco product use were assessed using multinomial logistic regression models adjusted for age, race, gender, and grade level. **Results**: Nearly one-fourth (23%) of the participants had tried e-cigarettes. Compared to never users, conventional users were more likely to indicate that e-cigarettes did not cause: (1) health problems (OR: 1.65; CI: 1.075-2.521) or (2) addiction (OR: 1.63; CI: 1.064-2.496). Youth who indicated e-cigarettes do not cause health problems were more likely to be e-cigarette users than non-e-cigarette users (OR: 2.04, CI: 1.460-2.838), and youth who indicated smoking does not cause addiction were more likely to be conventional users than never or e-cigarette only users (OR: 1.96; CI: 1.181-3.262).

**Conclusions**: In summary, youth who use conventional tobacco products or e-cigarettes are less likely to perceive e-cigarettes as harmful. These findings reinforce the need for vigilance in restricting youth access to tobacco products, increased emphasis on health campaigns that clarify scientific uncertainty surrounding tobacco safety, and regulation of e-cigarette marketing that targets youth.

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**P088**

**Trends in Serum Lipids in US Youth Ages 6 to 19 Years: National Health and Nutrition Examination Survey 2003 to 2014**

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**Introduction:** Between 1988-94 and 2007-10, total cholesterol (TC), non-HDL-C, HDL-C, LDL-C, and triglycerides (TG) showed favorable trends in US youth. We tested the hypotheses that these favorable trends continued in the more recent period 2003-14 and that favorable trends were also seen in apolipoprotein B (apoB).

**Methods:** We analyzed cross-sectional data in 15,712 youths aged 6-19 years from 6 NHANES surveys: 2003-04, 2005-06, 2007-08, 2009-10, 2011-12, and 2013-14. We applied survey weights to generate US population-level estimates and used multivariate linear regression to test for time-dependent trends in lipid levels, separately by sex and age group (6-11 vs. 12-19 years). Fasting LDL-C, TG and apoB were available only at ages ≥12 years; pubertal stage was not available.

**Results:** See Figure. TC and non-HDL-C generally showed significant decreasing linear trends in mean levels and favorable linear trends in the prevalence of ideal versus adverse levels, but these improvements were smaller and not significant in 12-19 year-old females. Conversely, HDL-C generally showed an unfavorable downward trend over time, a finding that reached borderline significance in 12-19 year-old females (β=−0.3 mg/dL per year, p=0.054), and the prevalence of HDL-C <40 mg/dL increased significantly in this group (β=0.6%, p=0.02). Despite the unfavorable HDL-C trend, TG showed significant favorable linear trends in mean levels and patterns of ideal versus adverse levels in both male and female 12-19 year-olds. LDL-C and apoB showed neutral to favorable patterns, with significant linear trends for an increase in the prevalence of LDL-C<110 mg/dL (β=0.5%, p=0.02) and a decrease in the prevalence of apoB ≥110 mg/dL (β=−0.9%, p=0.03) for 12-19 year-old females.

**Conclusions:** Favorable trends in lipids were generally seen in US youth from 2003-14, with a notable exception for HDL-C. It will be important to understand factors contributing to these trends.

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**P089**

**Fitness and Fatness Are Both Associated With Cardiometabolic Health in 8-10 Year Old New Zealand Children**

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**Introduction:** In adults, low cardiorespiratory fitness (CRF) and overweight-obesity are associated with greater cardiometabolic disease risk. However, the association between measures of CRF and overweight-obesity upon cardiometabolic risk in youth, particularly pre-adolescents, is less clear. Further, previous studies in children have predominantly examined the relationships between CRF and overweight-obesity upon individual cardiometabolic risk factors. The clustering of cardiometabolic risk factors has been recognized for over two decades, including in young children. **Hypothesis:** We tested the null hypothesis of no association between clustered cardiometabolic risk factors and high CRF or overweight-obesity. **Methods:** This cross-
sectional study recruited 392 children (50% F) aged 8-10 years from three representative sample sites across New Zealand. Overweight-obesity was classified according to 2007 WHO criteria for Body Mass Index. CRF was estimated using a shuttle run test, and high CRF was categorized as a maximum oxygen uptake exceeding 35 ml/kg/min in girls, and 42 ml/kg/min in boys. Eleven traditional and novel cardiometabolic risk factors were measured: peripheral blood pressures, central systolic blood pressure, heart rate, augmentation index, fasting total cholesterol, high density lipoproteins, low density lipoproteins, triglycerides, serum glucose, and glycosylated haemoglobin. Principal component analysis identified underlying cardio-metabolic factors, and a 2-way (high fitness, overweight-obese) analysis of co-variance was used to determine associations between cardio-metabolic risk factors with fitness and overweight-obesity. Covariates were: age, sex, ethnicity, socio-economic status. Results: Principle component analysis revealed four underlying factors: blood pressure, cholesterol, vascular, and carbohydrate-metabolism. Using these factors, a cumulative risk score was also calculated. Only high CRF (P=0.001, Eta=0.028) was significantly associated with the blood pressure factor. Only overweight-obesity associated with vascular (P=0.010, Eta=0.018) and carbohydrate-metabolism (P=0.005, Eta=0.021) factors. Neither high fitness (p=0.728) nor overweight-obesity (P=0.121) significantly associated with cholesterol. For the cumulative risk score, there was an interaction effect (P=0.038, Eta=0.012). High CRF improved cardiometabolic risk in overweight-obese children (P=0.006, Eta=0.02), but not in normal weight children. Conversely, being overweight-obese increased cardiometabolic health risk in children with low fat levels (P<0.001, Eta=0.039), but not in high fit children. Conclusions: In pre-adolescent children, fitness and fatness associate with different cardiometabolic risk. With regards to overall cardiometabolic risk, high fitness may protect against overweight-obesity.


Funding: No

Funding Component:

P090

Health Informatics Approach to Investigation of Hyperlipidemia in Families

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INTRODUCTION: West Virginia exhibits pervasive cardiovascular disease (CVD) that may relate to a combination of ancestry and shared environment in families, including vulnerabilities related to diet, physical activity and tobacco use. Coronary Artery Risk Detection in Appalachian Communities (CARDIAC) is a school-based child risk factor screening program that has evaluated over 90,000 WV fifth graders in the past 20 years. Reverse Cascade screening for Familial Hypercholesterolemia (FH) has been difficult with the CARDIAC population. The WVU CTSI Integrated Data Repository (IDR) includes over 2 million records.

HYPOTHESIS: Linkage of child CARDIAC data to parent IDR data will allow new information discovery to inform management of CVD.

METHODS: We used direct demographic data linkage via Oracle with Soundex conversion of names, in the IDR, to find parents of the CARDIAC participants. Data was analyzed in the VMWare SSL environment.

RESULTS: 4759 children have a parent(s) identified. 959 mothers and 524 fathers have an LDL level from IDR. Race, BMI and gender was recorded from CARDIAC. 6.8 % of children, 40% of mothers and 44.8% of fathers have an abnormal LDL level >130 mg/dl in IDR. Positive predictive value of the abnormal child lipid level
(≥130 mg/dl) is 17% for some parent (56/325) to be abnormal. 4 parents had LDL >190 mg/dl with child > 160, indicating likely FH in the pair (2.7% of pairs or 1 in 371 pairs).

CONCLUSION: Formation of a virtual cohort of CARDIAC children and parents allows Virtual Reverse Cascade Screening to find FH. This project highlights the importance of familial tendency to hyperlipidemia that can aid detection of early lipid abnormality and cardiovascular risk in children and their young parents to promote wellness and potentially avoid early coronary artery disease. We are constructing a virtual longitudinal cohort to study CVD in WV as a part of a Learning Health System in which data management is at the forefront of healthcare improvement.


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P091

Early Life Stressors and Adult Cardiovascular Health in the REasons for Geographic and Racial Differences in Stroke (REGARDS) Study

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Introduction: Prior research suggests early life stressors (ELS) influence development of cardiovascular (CV) risk over the lifecourse, but few national studies have evaluated this. We examined the association of ELS with adult CV defined by Life’s Simple 7 (LS7) score within a national US population-based cohort. Methods: We used data on 7,469 REGARDS participants (black and white adults, aged ≥ 45 in 2003-2007), with clinical and behavioral risk factor data from questionnaires and direct measurement. Levels of LS7 components (blood pressure, total cholesterol, fasting glucose, physical activity, smoking, diet, body mass index) were coded as poor (0 points), intermediate (1 point) or ideal (2 points); the primary outcome, LS7 score, was the sum of the components. In 2012-2013, 7 ELS (death of parent, parents separated/divorced, family serious illness, witnessed family violence, family substance abuse, parent’s loss of job and parent incarcerated) were retrospectively assessed by mail questionnaire to active participants. Linear regression was used to characterize the relationship between each ELS and LS7 after adjustment for demographics and region of birth. Mediation by adult income and education was examined. Results: ELS were common, ranging from 3% for parent incarcerated to 29% for family serious illness. Lower LS7 was associated with each ELS, with significant association with witnessing family violence (-0.15; 95% CI: -0.29 to -0.02) (see figure.) Additional adjustment for adult education partially attenuated the effect estimates for witnessed family violence by 20.6% (95% CI: 2.0%, 39.1%); adjustment for adult income and education mediated the non-significant estimates for parental death, family illness and separation/divorce. Conclusions: Exposure to ELS was associated worse adult cardiovascular health; these associations were partially but not
fully mediated by adult socioeconomic status. Further work is needed in categorization of ELS and examination of pathways underlying the associations.


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P092

Adolescent and Young Adult Women Have Low Cardiovascular Disease Awareness

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Introduction: The American Heart Association (AHA) Go Red for Women campaign has substantially improved awareness of heart disease among adult women over the past fifteen years, as demonstrated by triennial surveys of women ages 25 years and older. Little is known about awareness among younger women, who represent a key time in the life course for primordial prevention. We hypothesized that adolescent and young adult women 15 to 24 years of age would have lower rates of heart disease awareness than women 25 years of age and older. Methods: We assessed awareness of heart disease and prevention efforts among young women ages 15-24 years using the AHA National Women’s Health Study survey. Participants were a random convenience sample of 103 women recruited from the waiting rooms of two clinical practices (one community health center and one academic medical center). We performed statistical comparisons of this cohort to responses from the 2012 AHA National Women’s Health Study survey of 168 women ages 25-34 years using the chi-square test (binary responses). Results: Only 13 (13%) adolescent and young adult women correctly identified heart disease as the leading cause of death in women. This was significantly lower than the rate of awareness of adult women overall in 2012 (56% of 2432) and of women ages 25-34 years (44% of 168) (p<0.001 for both comparisons). Almost half of the young women surveyed in the current study [(n= 44 (43%)] said they were not at all informed about heart disease. While physicians emerged as the preferred source of information about heart disease among participants, the majority [n=64 (62%)] had never spoken to a health care professional about their risk of heart disease. Most young women surveyed worried little [n = 44 (43%)] or not at all [n = 40 (39%)] about heart disease; mood disorders were the most common concern in this age group, followed by sexual health issues. Despite a lack of general awareness about heart disease, many young women did report engaging in activities known to reduce the risk of heart disease, including getting regular exercise [n = 81 (79%)], maintaining healthy blood pressure [n = 76 (74%)], reducing sugar intake [n = 48 (47%)], and losing weight [n = 48 (47%)]. A significantly higher proportion of women ages 15-24 years aimed to maintain a healthy blood pressure and get regular exercise compared to those ages 24-34 (p<0.02), whereas a similar proportion aimed to lose weight and reduce sugar intake (p>0.7). Conclusions: Adolescent and young adult women are largely unaware of heart disease as the leading cause of death in women. As the antecedents of heart disease begin in childhood and adolescence, these findings demonstrate a
major unmet need. Given most young women are not worried about heart disease at this life stage, campaigns to promote heart healthy behaviors should underscore the benefits of these prevention behaviors to mood and emotional health.

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**P093**

**Correlates of Vascular Health in Children and Adolescents With Dyslipidemia**

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**Introduction:** Impaired vascular function and structure has been associated with cardiovascular risk factors such as elevated levels of Low Density Lipoprotein cholesterol (LDL-C) and triglycerides, depressed High Density Lipoprotein cholesterol (HDL-C), elevated blood pressure (BP) and body mass index (BMI) in children and young adults. These changes can result in premature coronary artery disease. The degree to which these measures predict vascular damage in children and adolescents is less clear. **Hypothesis:** We hypothesized that commonly used clinical and laboratory measures will predict vascular health as assessed by measures of carotid artery intima-media thickness (CIMT), pulse wave velocity (PWV), and augmentation index (Aix) in at risk youth. **Methods:** Children and adolescents with dyslipidemia (n=120, 13.1 ± 1.9 years old, 49% female (59 of 120)) were recruited from a pediatric preventive cardiology clinic. Non-fasting total cholesterol, HDL cholesterol, and triglycerides were obtained prior to the clinic visit. LDL-C and non-HDL-C were calculated with the Martin equation. Remnant particles were calculated as: total cholesterol minus (HDL-C + LDL-C). BP, height, weight, and waist circumference (WC) were measured at the clinic visit. WC was measured 2cm above the iliac crest by a single observer. Tobacco smoke exposure history was obtained using a parent questionnaire. PWV and Aix were measured using a SphygmoCor XCEL combined oscillometric and tonometric device. CIMT was measured via B mode ultrasound on the far wall of the left and right common carotid arteries using a semi-automated edge detection software. Multiple linear regression with backwards selection was used to identify the strongest predictors of CIMT, PWV, and normalized Aix. **Results:** Age (β=0.26; p=0.002), systolic BP (β=0.16; p=0.04), waist-to-height ratio (β=0.24; p=0.01), hemoglobin A1c (β=0.18; p=0.01) and presence of hypertriglyceridemic waist (defined as triglycerides ≥110mg/dL and WC ≥90 percentile) (β=0.28; p=0.006) were the strongest predictors of PWV (R²=0.353). Diastolic BP (β=0.21; p=0.01), waist-to-height percentile (β=0.22; p=0.01), and remnant particles (β=0.21; p=0.01) were the strongest predictors of normalized Aix (R²=0.175). Age (β=0.19; p=0.03), and systolic BP (β=0.28; p=0.002) were the strongest predictors of CIMT (R²=0.138). Triglycerides, history of tobacco smoke exposure, total cholesterol, LDL-C, HDL-C, and non-HDL-C were not predictive of CIMT, PWV, or normalized Aix. **Conclusion:** BP consistently predicted was the most common predictor of CIMT, PWV, and Aix in children and adolescents with dyslipidemia. Waist-to-height ratio/percentile was also a reliable predictor in both PWV and Aix. BP and abdominal obesity management should be a focus in this at risk population.

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Sex Differences in Fitness Outcomes After Participation in a Park-Based After school Program Among Minority Youth

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Introduction

Only 18% of high school girls compared with 37% of boys are reported to meet national physical activity guidelines, but much less is known about sex differences in fitness levels during the elementary and middle school years. This study aimed to describe sex differences in longitudinal fitness outcomes after participation in Fit2Play™, a park-based afterschool health and wellness program targeting high risk youth ages 6-to-14 years old.

Hypothesis

It was hypothesized that over time boys would have more improvement in (1) cardiorespiratory fitness via the Progressive Aerobic Cardiovascular Endurance Run (PACER) and 400 meter run test; (2) strength via 1-minute timed push-ups and sit-ups; and (3) flexibility via the sit-and-reach test, versus girls.

Methods

Youth who participated in Fit2Play™ for either 1, 2 or 3 school years between 2010-2016 (N=2129, mean age 9.1 years, 52% Hispanic, 48% non-Hispanic black, 54% male) participated in a fitness battery at the beginning and end of the school year(s). Effects of length of Fit2Play™ participation on fitness outcomes were assessed via 3-level repeated measures analysis stratified by sex and adjusted for child sociodemographics, weight category, area poverty, and year.

Results

Adjusted models showed significant improvements for both boys and girls in the PACER and 400 meter run tests (p<0.001 for both), with greater magnitude of effects and dose-response trends for girls after up to 3 years of participation in Fit2Play™. Specifically, from baseline to 1, 2 and 3 years of program participation, girls demonstrated 8% (95% CI: 0.87, 0.97), 14% (95% CI: 0.77, 0.96), and 23% (95% CI: 0.65, 0.92) mean improvement in 400 meter run times versus 9% (95% CI: 0.86, 0.96), 9% (95% CI: 0.82, 1.01), and 17% (95% CI: 0.70, 0.98) for boys, respectively (p<0.001 for all). Significant strength improvements were found for both boys and girls for push-ups (p<0.01 for both, though 4%, 11% and 12% higher magnitude of effects in girls vs. boys for 1, 2 and 3 years of participation, respectively), and only girls for sit-ups (p<.001).

Conclusions

Park-based afterschool physical activity programs have the potential to improve fitness performance in all youth, and particularly girls. Future research should further examine sex differences in the effects of park and other community based programs to ultimately reduce sex disparities in youth fitness, particularly in light of the current youth obesity epidemic that continues to challenge our nation.


New Pediatric Hypertension Guidelines Alter Prevalence Distribution and Associations With Cardiovascular Risk Factors and Target Organ Damage in Youth

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Introduction: A Clinical Practice Guideline (CPG) for pediatric hypertension was recently published, serving as an update to the previous guidelines (“4th Report”). The CPG includes changes to the cut-points defining pediatric hypertension, including the incorporation of absolute cut-points rather than percentiles for adolescents.

Objective: To evaluate the impact of the new CPG (compared with the 4th Report) on the prevalence of hypertension and associations with cardiovascular risk factors (CVRFs) and target organ damage (TOD) in a population of high-risk youth.

Methods: Subjects (N=364, 10-18 years) underwent fasting anthropometric, blood pressure (measured as per the Fourth Report), CVRF (lipid profile, insulin, glucose, HbA1C%), carotid artery intima-media thickness (cIMT), pulse wave velocity (PWV), and left ventricular mass and diastolic (via echocardiography) assessments. Blood pressure was categorized as normal, elevated, Stage 1, and Stage 2 hypertension, as defined by the 4th report and by the new CPG. The agreement between the prevalence of hypertension using the two guidelines and associations with other CVRFs and markers of TOD were evaluated using weighted Kappa statistics and tests of symmetry.

Results: Of the 364 subjects (65% female, 15.1 +/- 2.1 years), 36 (10%) had Stage 1 and 11 (3%) had Stage 2 hypertension, as defined by the 4th report and by the new CPG. Hypertension (Stage 1 & 2) was associated with the presence of other CVRFs and TOD (Table). With respect to hypertension prevalence distribution, the 4th Report and CPG produced only a moderate agreement (weighted kappa 0.82 (95% CI 0.78, 0.86)) with a significant departure from perfect agreement (test of symmetry p <0.001). Similar findings were noted for associations with other CVRFs and markers of TOD (Table).

Conclusions: The 4th Report and CPG produced asymmetric blood pressure category distributions and associations with CVRFs and TOD. This finding should be considered when using the CPG in clinical and academic settings, and warrants further evaluation.


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P096


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Introduction: The AHA emphasizes healthy lifestyle habits in 4 domains for pediatric cardiovascular health: nutrition, body size, physical activity, and smoking. We tested the hypothesis that in recent years among US youth, nutrition and smoking improved, while body size and physical activity did not.

Methods: We analyzed cross-sectional data in 15,712 youths aged 6-19 years from 6 NHANES surveys: 2003-04, 2005-06, 2007-08, 2009-10, 2011-12, and 2013-14. We applied survey weights to generate US population-level estimates and used multivariate linear regression to test for time-dependent linear trends in lifestyle habits, separately by sex and age group (6-11 vs. 12-19 years).

Results: See Table. Favorable linear trends were seen across age and sex groups in many
nutrient intakes, particularly total energy, solid fats, and added sugars; fiber intake also improved among 6-11 year-old youths. However, prevalence of ideal intakes as defined by clinical guidelines remained low. Favorable trends were also seen in smoking and secondhand smoke exposure. On the other hand, body mass index and waist to height ratio showed no time-dependent trends, except for a small increasing linear trend in the prevalence of obesity for 12-19 year-old youths. Similarly, for physical activity and screen time, the only significant linear trend was decreasing mean physical activity among 12-19 year-old females. Conclusions: US youth have generally improved nutrition and avoidance of smoking in recent years, although these habits remain suboptimal in the population. Body size and physical activity are not improving, and may be worsening in adolescents.


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P097

Trajectories of Childhood Blood Pressure and Adult Left Ventricular Hypertrophy: The Bogalusa Heart Study

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Background: Childhood blood pressure (BP) levels predict adult left ventricular hypertrophy (LVH). However, information is limited on the association between childhood BP trajectory and adult LVH. This longitudinal study aims to characterize longitudinal BP trajectories from childhood and examine the impact of level-independent childhood BP trajectories on adult LVH and remodeling patterns. Methods: The longitudinal cohort consisted of 1,154 adults (787 whites and 367 blacks) who had repeated measurements of BP 4-15 times from childhood (4-19 years) to adulthood (20-51 years) and assessment of echocardiographic LV dimensions in adulthood. Model-estimated levels and linear slopes of BP at childhood age points were calculated in one-year intervals using the growth curve parameters and their first derivatives, respectively. Results: Linear and nonlinear curve parameters differed significantly between race-sex groups. BP showed race and sex differences from age 15 years onwards. Adults with LVH had higher long-term BP levels than normal adults in race-sex groups. Linear and nonlinear slope parameters of BP differed consistently, significantly between LVH and normal groups. Level-independent linear slopes of systolic BP showed significantly negative associations (odds ratio=0.75~0.82, p=0.001~0.015) during pre-puberty period of 4-9 years but significantly positive associations (odd ratio=1.29~1.46, p=0.001~0.008) during the puberty period of 13-19 years with adult LVH, adjusting for covariates (see the figure below). These associations were consistent across race-sex groups. Of note, the association of childhood BP linear slopes with concentric LVH was significantly stronger than that with eccentric LVH during the puberty period of 12-19 years. Conclusions: These observations indicate that the impact of BP trajectories on adult LVH and geometric patterns originates in childhood. Puberty is a crucial period for the development of LVH in later life, which has implications for early prevention.
Background: Persistent organochlorine pollutants (POPs) include several groups of synthetic compounds with high lipophilic and bioaccumulative potential that accumulate in the food chain. Despite their long-term ban, they are still of concern and the general population is constantly exposed to these pollutants at low doses through diet. POPs are proposed to be involved in the atherosclerotic process and to cause endothelial cell dysfunction. We assess longitudinally whether plasma concentrations of different POPs were associated with blood pressure (BP) and risk of hypertension in middle-aged women and men.

Methods: Study subjects were 850 participants in the Västerbotten Intervention Programme with two blood samples and BP measurements, 10 years apart, during 1990 to 2003 (baseline) and during 2001 to 2013 (follow-up). The POP measured were the fungicide hexachlorobenzene (HCB), the insecticide dichlorodiphenyl-trichloroethane (DDT)—and its persistent metabolite p,p′-dichlorodiphenyl-dichloroethylene (DDE)—and the dioxin-like and non-dioxin-like polychlorinated biphenyls (DL-PCBs, NDL-PCBs). We used generalized estimated equations to assess the associations.

Results: At both sampling occasions, about 50% had hypertension. DL-PCBs and DDE, but not NDL-PCBs or HCB, were associated with hypertension, while only the association for DL-PCB remained statistically significant after lipid-standardization and adjustment for BMI and total plasma lipids. The multivariable-adjusted OR of hypertension based on repeated measurements were 1.50 (95% CI: 1.07-2.11) for DL-PCBs (3rd vs. 1st tertile of lipid-standardized POPs). In stratified adjusted analyses, ORs for those born after 1950 increased: 3.99 (95% CI: 2.15-7.43), while no association was observed among those born earlier. For DEE, when non-adjustment for BMI, the OR of hypertension were 1.43 (95% CI: 1.04, 1.97).

Conclusions: Based on repeated measurements, the accumulated exposure to the pollutants DL-PCBs and DDE, although less clear for the latter, may disrupt the normal BP levels. Individuals born after 1950—when early-life exposure to these substances became common—may be pre-disposed for these effects.


Funding: No
Background: Perfluoroalkyl substances (PFAS) are highly persistent synthetic chemicals with high global demand. Although PFAS may affect different components of cardiometabolic risk through the peroxisome proliferator-activated receptor (a master regulator of lipid and glucose metabolism), evidence remains scarce and inconsistent.

Objective: Our aim was to evaluate plasma levels of six PFAS in association with cardiometabolic risk factors in a longitudinal setting among 40-50 year old women and men.

Methods: Participants in the Västerbotten Intervention Programme visited their health center twice, 10 years apart: during 1990 to 2003 (baseline) and during 2001 to 2013 (follow-up). Participant underwent a medical examination, and measurements of systolic and diastolic blood pressure, total cholesterol and triglycerides were performed twice 10 years apart. PFAS were measured in 374 participants. The PFAS analysed were perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluorodecanoic acid (PFDA), and perfluoroundecanoic acid (PFUnA). A generalized estimated equations method was used to assess repeated measurements and to provide beta coefficients (β) with their 95% confidence intervals (CI).

Results: Overall, we observed little or no evidence of associations between PFAS and cardiometabolic risk factors. Exceptions were statistically significant inverse associations between PFOS and PFHxS with total cholesterol (β~0.30; mmol/L, comparing 3rd tertile vs 1st) and PFOS, PFOA and PFDA with triglycerides (β from -0.17 to -0.26 mmol/L, comparing 3rd tertile vs 1st), when analysis were restricted to those who did not develop diabetes during the follow-up.

Conclusions: Our findings did not support the emerging premise that PFAS might increase cardiovascular risk through disrupting lipid metabolism and/or vascular system.


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P100

Long-Term Exposures to Community Noise and Blood Pressure Levels in Chicago, Illinois

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Objectives: Over half the US population experiences noise levels above WHO recommendations yet little research within the US has examined the health effects of these exposures. Our objective is to investigate the associations between community noise and blood pressure in residents of Chicago.

Methods: Participants were from two prospective cohort studies: the Multi Ethnic Study of Atherosclerosis (MESA) and the Chicago Health and Aging Project (CHAP). MESA is a multi-site study of persons aged 45-84 years and free of clinical cardiovascular disease. CHAP is an open cohort initiated to study chronic conditions of aging among persons aged ≥65 years. This analysis focuses on the 5,167 participants of these cohorts living in Chicago with an average of 2.5 (CHAP) and 4.5 (MESA) assessments per participant, for systolic (SBP)
and diastolic (DBP) blood pressure between 1999-2011. In both cohorts, hypertension was defined as taking antihypertensive medication, SBP ≥140 or DBP ≥ 90 mmHg. We estimated noise at participant addresses using land use regression models weighted according to participants’ 5-year residential history before each exam. Among those taking antihypertensive medication, blood pressure was adjusted using multiple imputation. Associations between noise and blood were estimated using linear mixed models. A Cox proportional hazards model was used to estimate relative risk (RR) of incident hypertension. All models included calendar time, age, sex, race, income, education, neighborhood socioeconomic score, smoking, cohort, interaction between cohort and age, race, and gender, and NOx (a traffic-related air pollutant).

**Findings:** At baseline, MESA participants were younger (63 vs 73 years) and more educated (36 vs. 3% with ≥graduate degree) than CHAP participants. MESA participants had higher noise levels (60 vs 56 dB) and lower blood pressures (e.g. SBP: 124 vs 135 mmHg) than CHAP participants. After adjusting for cohort and other confounders, we found that 10 dB higher residential noise levels were associated with 0.9 (95% CI: -0.2, 0.2; p=0.1) and 0.5 mmHg greater (95% CI: -0.1, 0.11; p=0.08) SBP and DBP, respectively. Similar associations were found within each cohort. Noise was not associated with incident hypertension overall (RR: 1.00; 95% CI: 0.8, 1.3, p=0.98) or within cohort.

**Conclusions:** We found a suggestive association between noise and blood pressure levels, but no association with hypertension. This could be due to the lack of nighttime noise information, which has been shown to be more strongly associated with blood pressure outcomes than daytime levels or with the selection of healthy older participants.

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**P101**

**Methylome-wide Association Study Provides Evidence of Particulate Matter Air Pollution-associated DNA Methylation at Cardiovascular Disease-related Genes**

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Background: DNA methylation (DNAm), a heritable but dynamic epigenetic modification that can influence gene expression without altering the genome, may underlie the associations between air pollution and cardiovascular disease risk. Therefore, our objective was to evaluate associations between DNAm and ambient concentrations of particulate matter (PM) ≤ 2.5 and ≤ 10 micrometers in diameter (PM$_{2.5}$; PM$_{10}$).

Methods: We conducted a methylome-wide association study among twelve cohort- and race/ethnicity-stratified subpopulations from the Women’s Health Initiative and the Atherosclerosis Risk in Communities study (discovery n = 6,720; replication n = 1,936; mean age: 61.3 yrs; 83% female; 46% African American; 9% Hispanic/Latino American). We averaged geocoded address-specific estimates of daily and monthly mean PM concentrations over 2, 7, 28, and 365 days and 1 and 12 months before exams at which we measured leukocyte DNAm in whole blood. In each subpopulation, we estimated PM-DNAm associations at approximately 485,000 Cytosine-phosphate-Guanine (CpG) sites in multi-level, linear mixed-effects models adjusting for sociodemographic, behavioral, and meteorological characteristics; estimated leukocyte proportions; and technical covariates. We combined subpopulation-specific PM-DNAm associations in fixed-effects, inverse variance-weighted meta-analyses of the discovery, replication, and overall populations. Then we conducted in silico characterization of CpG sites at which PM-DNAm associations exceeded methylome-wide significance and were not heterogeneous ($P < 1.0 \times 10^{-7}; P_{	ext{Cochran’s } Q} > 0.10$) to assess their putative function and biological plausibility. Results: Discovery analyses identified significant PM$_{2.5}$- and PM$_{10}$-DNAm associations at four CpG sites, but none survived Bonferroni correction. Overall analyses identified significant associations at two CpG sites. On chromosome 20 near MATN4, 28-day mean PM$_{10}$ was associated with increased DNAm at cg19004594 ($P_{\text{all}} = 2.8 \times 10^{-8}; P_{	ext{Cochran’s } Q} = 0.61$). MATN4 is expressed in heart and lung tissues. It encodes Matrilin 4, a von Willebrand factor A domain-containing protein linked to cardiac remodeling. On chromosome 10 near ARPP21, 1-month mean PM$_{10}$ was inversely associated with DNAm at cg24102420 ($P_{\text{all}} = 4.8 \times 10^{-8}; P_{	ext{Cochran’s } Q} = 0.51$). ARPP21 is expressed in the brain/spinal cord and neutrophils. It encodes cAMP-regulated phosphoprotein 21, a regulator of calmodulin/calcium signaling.

Conclusions: Findings from this methylome-wide association study suggest that ambient PM$_{10}$ concentrations affect DNA methylation at regions of the genome potentially related to cardiovascular disease among racially, ethnically and environmentally diverse populations of U.S. men and women. Further investigation is warranted to uncover epigenetic mechanisms of PM-associated cardiovascular traits.


Funding: No
have a disproportionate burden of cardiovascular disease (CVD). Whereas smoking is a well described risk factor for CVD, it is unclear if menthol cigarettes are associated with more or less risk. Therefore, our aim was to evaluate the association between menthol cigarette use and subclinical atherosclerosis in the Jackson Heart Study (JHS).

**Methods.** JHS participants (n=5,301) were classified by self-reported smoking status as current, past (smoked ≥400 cigarettes/life), or never smokers at Visit 1 (V1, 2000-2004). Menthol cigarette use data were captured at Visit 3 (V3, 2009-2013). We used multivariable logistic and robust linear regression models to examine the associations between cigarette type and measures of subclinical atherosclerosis [carotid intimal medial thickness (CIMT, Visit 1) and coronary artery calcium (CAC) or aorto-iliac calcium (AIC) by computed tomography (Visit 2, V2, 2005-2008)] to estimate β-coefficients (adjusted differences) comparing menthol to non-menthol (reference group) smoking.

**Results.** There were 401 current smokers with available data on cigarette preference including 326 menthol (81%) and 75 non-menthol (19%) smokers at V3. Menthol cigarette preference in current smokers was not associated with significant differences in measures of subclinical atherosclerosis: CIMT (β -0.003, 95% CI -0.053, 0.046, p=0.90); CAC (β -0.20, 95% CI -1.09, 0.69, p=0.66) or AIC (β -0.32, 95% CI -1.23, 0.59, p=0.48). **Conclusion.** Our study provides no evidence for an association of menthol cigarette use with subclinical atherosclerosis in African Americans. These findings warrant replication by studies that address the limitations of this study, including the assumption that menthol smokers in V3 were long-term menthol smokers before V1 and V2, potential selection by exclusions of deaths related to smoking and CVD among participants at V3 and lack of longitudinal data on outcomes after the collection of menthol use data at V3.

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**Age Differences in Patterns of Use, Health Knowledge, Perception, and Intention to Quit Among Current E-Cigarette Users**

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**Background.** Using electronic nicotine delivery systems (e.g., e-cigarette) or vaping may have negative health effects from the aerosol and product constituents. Though the products are relatively new in the US, the use of e-cigarettes has rapidly increased, especially in younger adults. In this study, we examined age differences in use patterns, reasons for use, health knowledge, e-cigarette perceptions, and quit intentions among current e-cigarette users.

**Methods:** The sample was 1,494 current e-cigarette users ages 18-64, drawn from a national adult vaping survey conducted in 2016. Intention to quit was categorized into 3 groups: very likely, moderate, and less likely. Descriptive and multivariate analyses were used.

**Results:** The sample included participants in the following age groups: 18-24 (17%), 25-34 (38%), 35-44 (23%), and 45-64 (25%). Main reasons for e-cigarette initiation were as a cigarette alternative, perceived as healthier, and attraction to flavors. Only 4% of the participants reported using e-cigarettes on recommendation from a healthcare professional(s); 66% did not hear/see/read about the health effects of e-cigarettes in the past 3 months. Compared to older groups, the 18-24 age group was less likely to use e-cigarettes as an alternative to
cigarettes (33% vs. 40-49%) or on a healthcare professional’s recommendation (2.3% vs. 6.8%), but more likely to vape for reasons such as flavors (44% vs. 20-33%) or friends’ use (18% vs. 4%). The 18-24 age group was also more likely than the oldest age group to use flavored e-liquid other than tobacco flavor (67% vs. 53%), have heard/seen/read information about vaping health effects (41.4% vs. 27%), and believe that vaping has no health benefits (26.1% vs. 16%). (All P-values for the above comparisons <.05). With adjustment for sex, race/ethnicity, and education levels, compared to the oldest group, the odds of being very likely to quit e-cigarette use versus less likely to quit in the 18-24 age group were 37% lower (95% CI: 0.41-0.98).

Conclusions: There were significant age differences in use motivation, usage patterns, receipt of health information, perceived risks, and quit intentions. Public health efforts should increase the accessibility of information on e-cigarette use risks. Different health messaging and communication strategy approaches may be required for varying age groups.


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P104

Dietary Polychlorinated biphenyls and Long-chain Omega-3 Fish fatty acids Exposures and Risk of Heart Failure

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The potential beneficial effects of fish consumption on heart failure (HF) may be modified by major food contaminants in fish. Polychlorinated biphenyls (PCBs) in particular, have been associated with well-established risk factors of HF such as coronary heart disease, hypertension, and diabetes. Likewise, experimental and cross-sectional studies in humans suggest that PCB exposure may be involved in the development of HF. We aimed to assess the association of both dietary PCB and long-chain omega-3 fish fatty acids exposures with risk of HF in two large population-based prospective cohorts. We used the Swedish Mammography Cohort and the Cohort of Swedish Men, comprising 32,867 women and 36,545 men, free of cancer, heart failure, myocardial infarction and diabetes at baseline in 1997. A questionnaire on diet (96-food items) and lifestyle factors was completed at baseline. We calculated validated estimates of dietary PCB exposure and intake of long-chain omega-3 fish fatty acids [eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)]. First incident cases of HF were ascertained through computerized linkage to the National Patient Register and the Cause of Death Register, defined as hospitalizations for (listed as the primary diagnosis) or death from HF. We use multivariable-adjusted Cox regression to estimate hazard ratio (HR) and its 95% confidence interval (CI), by quintiles of dietary PCB and EPA/DHA and controlling for known HF risk factors. During an average of 12 years of follow-up, 1,263 and 1,606 first incident cases of HF were ascertained in women and men, respectively. In multivariable-adjusted models, we observed no association between dietary PCB exposure or EPA/DHA intake and risk of HF. However, after additional mutual adjustments for PCBs and EPA/DHA, HRs for dietary PCB exposure were 1.60 (95% CI, 1.08-2.38) among women and 1.40 (95% CI, 0.97-2.02) among men, comparing extreme quintiles. The corresponding HRs for EPA/DHA intake were 0.62 (95% CI, 0.42-0.92) and 0.79 (95% CI, 0.55-1.13), respectively.
Dietary exposure to PCBs was associated with an increased risk of HF in women, while EPA/DHA intake was associated with a lower risk of HF. Results for men was less evident but showed a similar trend. The results provide important information regarding the risk-benefit analysis of fish consumption, especially in cardiovascular disease prevention.

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P105

Gaseous Air Pollutants and DNA Methylation in a Methyome-wide Association Study of an Ethnically and Environmentally Diverse Population of U.S. Adults

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Background: Epigenetic mechanisms underlying associations between coronary artery disease (CAD) and ambient exposures to carbon monoxide (CO), nitrogen oxides (NO$_2$/NOx), ozone (O$_3$), and sulfur dioxide (SO$_2$) are incompletely understood. We therefore examined associations between these gaseous air pollutants and DNA methylation (DNAm)—a process that controls gene expression.

Methods: We conducted a race/ethnicity- and study-stratified, methylome-wide association study of 12 Women’s Health Initiative and Atherosclerosis Risk in Communities subpopulations (N=8567, mean age 61.3 years, 83% female, 46% African American, 8% Hispanic/Latino American). In each subpopulation, we estimated daily mean ambient pollutant concentrations at geocoded participant addresses using national-scale, lognormal ordinary kriging. We averaged the concentrations over the 2, 28, and 365 days before phlebotomy, the source of leukocyte DNA used in estimating DNAm at 485,000 Cytosine-phosphate-Guanine (CpG) sites on the Illumina Infinium HumanMethylation450 BeadChip. We estimated pollutant-DNAm associations using multi-level, linear mixed-effects models adjusted for socio-demographic, behavioral, and meteorological factors; estimated leukocyte proportions; and technical covariates. Then we combined estimates from the 12 subpopulations in inverse variance-weighted meta-analyses and characterized CpG sites associated with significant associations and little evidence of heterogeneity among subpopulations ($p<1.0\times10^{-7}; \chi^2\text{Cochran’s Q}>0.05$).

Results: Although we found no significant or suggestive CO-, O$_3$-, or SO$_2$-DNAm associations, we found a significant 28-day mean NO$_2$-DNAm association at cg01885635 near ZNF621 on chr. 3 ($p=5.01\times10^{-8}$) and suggestive 365-day mean NO$_2$-DNAm associations at cg12684684 near ARPC2 on chr. 2 ($p=9.3\times10^{-7}$), cg19693031 near TXNIP on chr. 1 ($p=7.3\times10^{-7}$), and cg01885635 near ZNF621 on chr. 3 ($p=6.7\times10^{-7}$). We also found 2- and 365-day mean NOx-DNAm associations at cg27032760 near KCTD16 on chr. 5 ($p=4.1\times10^{-7}$) and cg15008743 near ZNF83 on chr. 19 ($p=2.8\times10^{-7}$), respectively. ZNF621 and ZNF83 encode zinc finger proteins that possess transcription factor activity. ARPC2 encodes an actin-related protein complex
subunit that has been associated with mean platelet volume, a known risk factor for myocardial infarction (MI) and post-MI mortality. **TXNIP** encodes a thioredoxin-binding protein that protects cells from oxidative stress, is highly glucose responsive, and has been associated with triglycerides, blood pressure, diabetes, and CAD. **KCTD16** encodes a potassium channel tetramerization domain-containing protein. Conclusions: Pending replication, the preliminary findings suggest that biologically plausible epigenetic mechanisms may underlie associations between nitrogen oxide exposures and CAD in multi-racial/ethnic populations.

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**P106**

**Association of Race and SES with the Treatment of STEMI and NSTEMI and the Rate of Coronary Revascularization among Post-Menopausal Women: The Women Health Initiative**

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**Background**— Racial disparities in coronary revascularization have been documented. However, it is unclear whether these disparities are consistent on a national basis among post-menopausal women hospitalized with STEMI and NSTEMI or for chronic stable angina. Our objective was to assess racial and potential SES disparities in emergent treatment of STEMI, revascularization of STEMI, NSTEMI and for any indication among white, blacks and Hispanic post-menopausal women. **Methods**— We used data from the 133,760 post-menopausal women, 11,843 were African-American, 4,875 Hispanic, and 117,042 Caucasian. We compared rates of emergent therapy and of coronary revascularization by race and SES. Emergent therapy is defined as thrombolysis, PCI or CABG within 12 hours of chest pain. PCI and CABG any time during a hospitalization were determined by trained physician adjudicators of hospitalized medical records triggered by participant annual self-report. Low SES was defined as less than a high school education or a household income of less than $20,000. Age-adjusted proportional hazards models were performed to evaluate potential disparities in outcomes. No additional covariate adjustment was performed as established CHD risk factors, insurance status, geography are potential causal mediators of the disparities evaluated. **Results** - Overall, Black women (HR=0.75, 95% CI 0.68-0.82) and Hispanic women (HR=0.69, 95% CI 0.60-0.80) received less revascularization regardless of indication. Black women received less revascularization during a MI hospitalization (HR=0.74, 95% CI 0.62-0.89). For STEMI, Black women received less emergent therapy (HR=0.61, 95% CI 0.48-0.79), less non-emergent revascularization (HR=0.53, 95% CI 0.33-0.86) and overall less revascularization regardless of timing (HR=0.54, 95% CI 0.39-0.75). The number of events in Hispanics precluded analysis. For NSTEMI, no difference by race was found (HR=0.88, 95%CI 0.70-1.10). Overall, women with
low SES received more revascularization (HR=1.40, 95% CI 1.32-1.48) regardless of indication. For STEMI, low SES women compared to high SES received more emergent therapy (HR=1.19, 95% CI 1.03-1.39), and a trend towards more non-emergent revascularization (HR=1.11, 95% CI 0.86-1.44) and revascularization regardless of timing (HR=1.14, 95% CI 0.96-1.37). For NSTEMI, low SES women received more revascularization (HR=1.21, 95% CI 1.04-1.41) than high SES women.

**Conclusions**— There appear to be health disparities with regards to race in emergent therapy for STEMI and revascularization for STEMI, MI and any indication in post-menopausal women. We observed an inverse association between revascularization rates and SES suggesting that other factors may need to be considered to explain this relationship. Mediation analyses to better understand the causal factors associated with our findings need to be explored.

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P107


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Geographic differences in CVD mortality across the U.S. are well-established, but frequently overlooked. ARIC enrolled African Americans (AA) from Jackson, MS and Forsyth County, NC, areas of the Southeast with some of the highest CVD mortality rates, especially among AAs. The Minnesota Heart Survey enrolled AAs from Minnesota where CVD rates are among the lowest. However, it is not known whether AAs in Minnesota also have low rates. Using these two cohorts, we assessed whether CVD-related mortality risk among AAs differs by region. Baseline measures of CVD risk factors for MHS were taken in 1985 from a population-based sample of AAs, ages 45 to 65, living in the Minneapolis-St. Paul metropolitan area. These same measures were made at ARIC visit 1 (1987-89) in AA participants of the same age residing in Jackson, MS and Forsyth County, NC. CVD and total mortality were identified using ICD codes for underlying cause of death from State and National Death Index records in both cohorts. We compared MHS and ARIC on CVD death rates using Poisson regression, prevalence of risk factors, and risk factor hazard ratios using Cox regression.

After risk factor adjustment, AA men in MHS had a rate of 5.2 (95% CI: 3.2, 7.2) CVD deaths per 1000 person-years compared to 15.1 (95% CI: 13.1, 17.1) for AA men in ARIC. For AA women, MHS had 4.1 (95% CI: 2.7, 5.5) CVD deaths per 1000 person-years versus 10.2 (95% CI: 9.0, 11.4) in ARIC. CVD mortality rates were higher in Jackson than Forsyth County within ARIC. CVD death rates paralleled risk factor prevalence at baseline. Compared to MHS, ARIC had significantly higher total cholesterol (215 vs. 202 mg/dL), albeit higher HDL cholesterol (55 vs. 53 mg/dL), as well as higher anti-hypertensive medication use (41 vs. 30%), diabetes (13 vs. 11%) and BMI (30 vs. 29 kg/m²), while smoking did not differ. Despite risk factor differences, hazard ratios of CVD death associated with each risk factor did not differ between studies even after inclusion of a competing risk of non-CVD death.

In conclusion, the CVD death rate was lower in AAs in MHS than in AAs residing in the
Southeast in ARIC largely due to lower risk factor levels, since the hazard of CVD death for each risk factor did not differ. Study differences reflect incompletely identified geographic variation that need further exploration, especially in the context of health disparities, but support maintaining low risk as a key to CVD prevention.


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P108

Race and Socioeconomic Status Are Strongly Associated With Racial Disparities in Cardiovascular Health and Outcomes in Chicago

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Introduction: Cardiovascular (CV) disease (CVD) is the leading cause of mortality in Chicago according to the most recent data gathered by the Chicago Department of Public Health (DPH). This is also true at the state and national level. The unique distribution of the population in Chicago along racial/ethnic lines promotes disparity in CVD prevalence and, consequently, higher mortality in certain racial minorities and neighborhoods. We sought to identify the factors contributing to racial disparities in CV health, interventions that have been initiated to address these risk factors and lastly, solutions to decrease this gap in Chicago.

Hypothesis: We hypothesize that unique risk factors put certain racial minorities, especially African Americans (AAs), at greater risk for CVD and mortality.

Methods: An extensive literature search was performed using PubMed, Scopus and the Chicago DPH Epidemiological database with the search terms/phrases health disparities, CVD, mortality, longevity, life expectancy and Chicago in order to identify contributing factors to racial disparities in CV health and outcomes in Chicago.

Results: Many CV risk factors identified at the national level held true for Chicago. Race and socioeconomic status (SES) were repeatedly found to be significantly associated with increased prevalence of CV risk factors with one study finding no association between residence in a primary care health provider-deprived area and increased prevalence of CV risk factors after adjusting for SES and race. AAs, persisting into old age, had poorer control of hypertension (45% vs 51%, p <0.001) relative to their Non-Hispanic White counterparts regardless of their Medicare eligibility status and after adjusting for potential confounders such as SES and obesity. Life expectancy for AA Chicagoans was the lowest at 71.7 with Hispanics having the highest life expectancy at 84.6, and Non-Hispanic Whites at 78.8 years. CVD claims the most lives in Chicago with AAs at greatest risk for CV mortality greatly contributing to longevity being the lowest in this racial subgroup. Interventions identified include city-level efforts such as the Healthy Chicago 2.0 initiative and partnerships involving public, community and healthcare organizations striving to narrow the health disparities gap. Recognition that race and SES are strongly associated with adverse CV health outcomes to a greater extent in certain racial subgroups is a huge step in increasing effective strategies to combat the disproportionate burden of CVD in this subgroup.

Conclusion: African Americans in Chicago suffer the greatest burden of CVD and mortality with studies strongly suggesting that race, itself, and SES are leading culprits in this racial disparity.

Racial/Ethnic Disparities in Post-Stroke Disability: A Focus on Outcome Measures

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Background and Purpose: Several studies suggest that racial/ethnic minority groups experience worse disability across the course of stroke recovery. However, there is little consistency in the measurement of stroke outcomes, which may contribute to some inconclusive evidence of racial/ethnic disparities in post-stroke disability. The objective of the current review is to examine how stroke outcomes are measured to identify racial/ethnic disparities in disability and functioning among stroke survivors in the US.

Methods: A review of the literature was conducted to identify outcome measures used in racial/ethnic disparities in post-stroke disability literature, use the International Classification of Functioning, Disability, and Health (ICF) model as a frame of reference for mapping the contents of the identified measures, and evaluate the time points of measured outcomes and racial/ethnic representation. Articles published between January 2001 and July 2017 were identified with our search criteria through Scopus, PubMed, CINAHL, and PsycINFO according to predefined inclusion criteria. Results: One hundred and ninety-four articles met inclusion criteria for full-text review and 41 articles were included in the final review. Although we found evidence of outcome measure content aligning with all ICF domains, little research has examined contextual factors in post-stroke disability disparities research. Additionally, we discovered the outcome measures are conducted across stroke recovery trajectories including pre-stroke, acute stroke, early recovery (≤90 days), and long-term (>90 days) but little consistency in outcome measure use was discovered. African American and Hispanic populations were assessed most frequently and minimal studies examined disparities among other minority populations comprising the US (i.e., Asian, Native Hawaiian or Other Pacific Islander, American Indian or Alaska Native). Conclusions: A variety of outcome measures have been used to assess disparities in disability across the course of stroke recovery. Yet, the lack of consistency in what outcomes are measured and when specific outcomes are assessed may contribute to mixed findings in the racial/ethnic disparities literature. Additional concerns include the lack of evidence on validity of outcome measures among racial/ethnic minority populations, the lack of representation among all racial/ethnic populations comprising the US, and minimal emphasis placed on the disparities in personal and environmental factors that contribute to disability. This review sheds light on the need for additional disparities in post-stroke disability research focusing on contextual factors and greater representation among less studied populations in the US.


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Sex Differences in the Prevalence of Cardiovascular Risk Factors Among United States- and Foreign-born Adults in the 2011-
Background: Cardiovascular disease (CVD) is the leading cause of death worldwide and in the United States (US). Foreign-born (FB) persons in the US are a rapidly increasing population. Despite increased awareness of important sex differences in CVD risk factors (CVDRF), few studies have examined this phenomenon among FB- and US-born adults.

Hypothesis: We hypothesize that sex differences exist in the prevalence of overweight/obesity, hypertension, diabetes, and hypercholesterolemia among FB- and US-Born participants.

Methods: A retrospective cross-sectional design was used to examine the 2011-2016 National Health and Nutrition Examination Surveys. A generalized linear model using Poisson distribution was fitted to obtain age-adjusted predicted probabilities and risk of overweight/obesity, hypertension, diabetes, and hypercholesterolemia by place of birth. These CVD risk factors were defined according to national guidelines.

Results: A total of 22429 participants were included with 29.68% (6658/22429) FB and 69.3% (15771/22429) US-born. The mean age was 47.5(±18.6 SD) years; 48.5% (10875/22429) were male. Overall, US-borns had higher prevalence of overweight/obesity (69.8% vs 63.8.0%; p<0.05) and hypertension (32.6% vs 22.2%; p<0.05), but lower prevalence of diabetes (11.3% vs 12.4%; p<0.05), and hypercholesterolemia (39.3% vs 43.3%; p<0.05) compared to FB-born participants. The sex differences in the prevalence and the prevalence ratios of CVDRF are presented in Table 1.

Conclusion: Males were more likely to be overweight/obese and be hypertensive than females regardless of place of birth. US-born males were more likely to be diabetic but less likely to have hypercholesterolemia compared to their female counterparts. It is important to consider place of birth when examining sex-differences in CVD risk in the US population.

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P111

Racial Disparity and Outcomes Among Parturients Undergoing Cesarean Section With Epidural Anesthesia

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Introduction: In obstetrical health care, racial disparities have been documented in different aspects of maternal care and outcomes. We aimed to examine the effect of race as a factor in affecting outcomes of cesarean section done under epidural analgesia (CS under EA).

Methods: We performed a population-based retrospective analysis of the Nationwide Inpatient Sample (NIS) (years 2003-2013) in adult hospitalizations for women undergoing CS with EA to determine outcomes [cost, length of stay (LOS), discharge destination (DD)] and complications (hematoma, surgical site infection, postpartum haemorrhage, blood transfusion, severe anaesthesia complications, amniotic fluid embolism, disseminated intravascular coagulation (DIC), and pulmonary edema) using ICD-9-CM codes. Weighted univariate analysis by chi-square test was performed to analyze the associations between race and outcomes with complications. Multivariate linear regression was used to
analyze the cost and LOS. **Results:** Out of 87,076 women underwent CS with EA, 63% were Caucasians, 13% were African Americans (AA), 20% were Hispanics, 3% were Asians and 1% were Native Americans. The majority of health care coverage for Caucasians and Asians was private insurance, while AA, Hispanics and Native Americans were utilized Medicare and Medicaid. The AA had higher numbers of comorbid conditions including hypertension, obesity, diabetes and renal failure, except for congestive heart failure that was highest in Asians. Though AA had highest DD to home, but cost and LOS were slightly higher in comparison to other races. Though rates of adverse events were very small in the overall cohort, hematoma was highest in Hispanics, anaesthesia complications were highest among Native Americans, and DIC was highest in Asians. (Table) **Conclusion:** Parturients undergoing CS under EA in minority groups especially AA had higher numbers of comorbidities. Risk stratifications among AA before CS procedure might improve outcome and reduce the cost burden and complications.

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**BACKGROUND:** Studies have demonstrated that chronic kidney disease (CKD), especially its last stage - end-stage renal disease (ESRD) - is not only an independent risk factor for coronary artery disease (CAD), but it also worsens survival prognosis in CAD patients. It remains unclear whether racial disparities affect the outcomes of coronary revascularization procedures - coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) - in CAD patients with ESRD (CAD-ESRD).

**STUDY OBJECTIVES:** (1) to investigate comparative effectiveness of CABG and PCI on in-hospital mortality outcomes in CAD-ESRD patients and (2) to investigate racial disparities in the utilization and in-hospital mortality outcomes of CABG and PCI in CAD-ESRD patients.

**METHODS:** We conducted a retrospective cohort study of in-hospital mortality in 23,519 CAD-ESRD patients [mean±SD age: 65.4±11.6 years; 62.2% (14,626 of 23,519) males] after CABG and PCI during 2007-2011. Patient race was defined as white, black, Asian, or Native American. In-hospital patient death was a binary outcome of interest. Adjusted odds ratios were obtained from multivariable logistic regression (MLR), adjusted for known clinical, demographic, and socio-economic covariates.

**RESULTS:** In the covariate-adjusted MLR analysis, post-PCI in-hospital mortality in CAD-ESRD patients was significantly lower than post-CABG mortality (adjusted OR = 0.47, 95% CI: 0.41-0.53, p<0.001). Post-procedure mortality was associated with emergency room (ER) admission (adjusted OR 1.62, 95% CI: 1.44-1.83, p<0.001), older age (3.2% increase for each year, 95% CI: 2.6-3.8%, p<0.001), and higher severity of co-existing conditions other than ESRD measured by the Elixhauser Comorbidity Index (8.5% increase for each point increase in the modified Elixhauser-Walraven score, 95% CI: 7.5-9.5%, p<0.001). Blacks were more likely to undergo an ER admission (48.4%) than Asians (46.0%), Native Americans (43.2%) or whites (42.4%, p<0.05, with multiple comparison
correction). In the adjusted MLR analysis, race was not a statistically significant independent predictor of post-procedure mortality. C-statistic for the MLR was 0.729.

CONCLUSIONS: Our results suggest that in-hospital post-PCI mortality in CAD-ESRD patients is lower than post-CABG mortality. Racial disparities in ER admissions - a demonstrated predictor of post-procedure mortality in these patients - may reflect the underlying racial disparities in access to and utilization of primary care. Further studies investigating disparities in CAD-ESRD mortality are warranted.

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Predictors and Correlates of Secondhand Smoke in Work Environments Among Rural and Urban American Indians

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Objective: In 2010 nearly 60% of American Indian (AI) adults in Minnesota reported they currently used cigarettes, a prevalence 3.5 times greater than the general population in that region. Here, we aim to describe the prevalence of secondhand smoke exposure and its correlates among Upper Midwest AIs in their homes and at work. Methods: Between 2010 and 2012 the American Indian Community Tobacco Project (AICTP) administered the Adult Tobacco Survey in collaboration with seven reservations and three urban communities in Minnesota. Eligible participants (n=2926) answered questions regarding exposure to secondhand smoke. Results: A third [33% (347 of 1059), 95% CI (30-36%)] of AIs reported being exposed to smoke in their workplace (compared to the 9% of the general Minnesota population). Half of males [50% (155 of 365), 95% CI (42-58%)] were exposed to secondhand smoke in the workplace, whereas only 27% [188 of 686, 95% CI (26-33%)] of females were exposed to secondhand smoke in the work environment. Of those who work on the reservation, 42% [237 of 570, 95% CI (36-48%)] of Al’s were exposed to secondhand smoke at their workplace. Within Al’s who have never smoked 25% [34 of 134, 95% CI (21-41%)] were still exposed to secondhand smoke within the workplace. Among Al’s who reported smoking policies in the workplace 30% [205 of 671, 95% CI (26-38%)] were exposed to secondhand smoke within the workplace, and 27% [158 of 578, 95% CI (20-30%)] of Al’s who stated their workplace was always enforced were still exposed to secondhand smoke in the workplace. A third [37% (120 of 321), 95% CI (35-54%)] of those who reported not having a workplace policy were exposed to secondhand smoke, demonstrating the need for policy development regarding smoking in the workplace. Conclusions: In conclusion, although strong policy protects most Minnesotans from secondhand smoke in workplaces, these policies do not seem to be benefitting AIs in the state. Discovery of who is at greatest risk for secondhand smoke exposure can inform future interventions and inform future policy optimization and protection.

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Association of Subjective Social Status With Cardiovascular Health in Hispanics/Latinos

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**Introduction:** Evidence suggests that subjective social status (SSS)—perceived status in the social hierarchy—may be more strongly associated with health than objective markers of social status (OSS), income and education. Compared to persons with high SSS, those with low SSS report poorer self-rated physical health and have higher rates of medical comorbidities. Little is known about the relationship between SSS and ideal cardiovascular health (CVH) profiles defined by the American Heart Association (AHA), particularly among diverse Hispanic/Latino adults.

**Hypothesis:** Higher SSS will be associated with more favorable CVH profiles.

**Methods:** We analyzed baseline HCHS/SOL data† on adults ages 18-74 in 2008-11 (N=15,440). SSS was assessed using the McArthur Scale, a 10-rung “social ladder” to specify social rank (scores range from 1-10; higher scores indicate higher SSS). CVH was defined based on levels of 7 metrics: diet, body mass index (BMI), physical activity, cholesterol, blood pressure, fasting glucose, and smoking status; levels of each metric were categorized as ideal, intermediate and poor using AHA criteria. A composite CVH score was calculated by summing across metrics (scores range from 0-14; higher scores indicate better CVH). Linear and logistic regressions were used to examine cross-sectional associations of SSS with CVH (overall and single metrics), after adjusting for OSS, demographics, Hispanic/Latino group, study center, marital status, insurance, prevalent coronary heart disease, and depressive symptoms (CESD).

**Results:** In multivariate-adjusted models, each one unit increase in SSS* was associated with a higher overall CVH score (β = 0.03, 95% CI 0.004, 0.057, p <0.05); higher SSS was also positively associated with ideal levels of BMI, physical activity, and fasting blood glucose levels (see Table 1).

**Conclusions:** These findings suggest an association between SSS and CVH among diverse Hispanic/Latino adults. Future studies will explore the mechanisms through which SSS may influence CVH.

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**P115**

**Race, Sex, and Geographical Variation in Perceived Racial Discrimination: The Coronary Artery Risk Development in YoungAdults (CARDIA) Study**

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**Introduction** Variation in exposure to discrimination has been proposed as a contributor to disparities in cardiovascular disease (CVD) among black and white women and men in the U.S. Yet, evidence is conflicting, perhaps due to insufficiently studied race-sex and geographical differences in the pathogenicity of discrimination. We hypothesized that the prevalence of perceived racial discrimination in a variety of settings differs by race, sex, and geographic location.

**Methods** We used data from CARDIA, a population-based cohort of black and white adults recruited in Birmingham, AL; Chicago, IL; Minneapolis, MN, and Oakland, CA in 1985-6 (year 0). Racial discrimination perceived in several scenarios was assessed using the Lifetime Discrimination Scale at years 7, 15, and 20 (2005-6). We assessed the prevalence at each of these exams and in each scenario, stratified by race-sex group. **Results** Prevalence of reported discrimination did not differ markedly over time; we report on year 7 only (n=4,025, figure), with qualitatively similar findings at the other years. Reported
discrimination in ≥2 scenarios ranged from 52% in Birmingham to 70% in Minneapolis among black women; among black men, from 65% in Birmingham and 75% in Minneapolis and Oakland. This prevalence was <20% among white women and men in every city. Within all groups, discrimination on the street or in a public setting was most prevalent (p<0.001) and least prevalent in receiving medical care (p<0.001). The proportion of black men reporting discrimination by the police or courts was substantially greater than the other three race-sex groups in each of the four cities (all p<0.001).

Conclusions We found variation in the prevalence of reported racial discrimination across race, sex, and geography. Differences in the experience of discrimination may lead to differences in the health-damaging effects of exposure and partially explain inconsistencies in the evidence of discrimination as a cause of disparities in cardiovascular disease between black and white women and men.

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P116

The Relationship Between Body Mass Index and Depression Among Black U.S. Born and Foreign-born Adults in the United States: A Retrospective Analysis of the 2009-2014 National Health and Nutrition Examination Survey

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Background: Overweight/obesity—a national epidemic affecting more than 70% of U.S. adults—is defined as Body Mass Index (BMI) ≥ 25kg/m². It is associated with hypertension, diabetes, and cardiovascular disease. Overweight/obesity may be associated with depression which has been linked to poor health behaviors. The prevalence of overweight/obesity is disproportionately high among U.S. Blacks. However, limited information is known about differences in the relationship between overweight/obesity and depression among Black U.S. born and foreign-born adults. We hypothesized that BMI would be associated with depression among a sample of Black adults in the U.S., and nativity would be an effect modifier of this association. Methods: We analyzed data on Black adults who participated in the 2009-2014 National Health and Nutrition Examination Surveys. The main predictor variable was depression on the Patient Health Questionnaire (PHQ-9). The main outcome variable was BMI. Linear regressions were performed to examine the relationship between BMI and depression adjusting for known confounders. Results were stratified by nativity (i.e., U.S. born versus foreign-born).

Results: A total of 1,974 Black adults were included in this study. The mean age (±SD) was 46.8 (±17.9), nearly half (49.2%; n=972) were female, and 13.7% (n=270) identified as foreign-born. Overall, 79.8% (n=1360) of U.S. born and 83.1% (n=226) of U.S. foreign-born were overweight/obese. Additionally, 10.6% (n= 180) U.S. born and 6.7% (n=18) of foreign-born adults met criteria for mild, moderate, and moderately severe depression. After adjusting for age, sex, household income, and level of education, depression was a significant predictor of BMI among Black U.S. born and foreign-born adults (F (5, 1816) = 22.851, p<001) accounting for 38.8% of the variation in BMI (adjusted R²=.386). We fitted an interaction
term for nativity and BMI which was significant (p<.001). However, depression was only a significant predictor of BMI in Black female U.S. natives (F(4,775) = 2.93, p=.020) but not among Black male U.S. natives (F((4, 775) = 2.93, p=.164). Depression remained a significant predictor among U.S. born and foreign-born Black males and females. **Conclusion:** In Black adults residing in the U.S., we observed a positive association between depression scores and BMI with nativity status modifying this association. While depression was associated with BMI for females in both categories, depression was only associated with BMI in foreign-born Black males and not U.S. born Black males. Unique experiences among foreign-born populations may help explain the co-morbidity between depression and BMI, particularly among foreign-born males. Behavioral health interventions should be developed to account for differences among foreign-born Blacks that may increase risk for depression and associated health outcomes.

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**P118**

**Differences in Tobacco Use of sexual minorities of Diverse Racial and Ethnic Backgrounds**

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**Background.** Although studies have found that cigarette smoking is more prevalent among persons who identify as lesbian, gay, bisexual, transgender, or queer (LGBTQ) compared to persons who identify as heterosexual, limited research has examined tobacco use among LGBTQ individuals of different racial and ethnic backgrounds. **Methods.** During summer 2016, the AHA-Tobacco Regulation and Addiction Center (A-TRAC) Project 3 conducted 27 focus groups and 196 surveys in Chicago, New York City and San Diego with smokers and non-smokers. Study inclusion criteria were self-identifying as LGBTQ and White Non-Hispanic (WNH), African American (AA), or Hispanic/Latino (H/L). Our study aim is to examine potential differences in tobacco use by race/ethnicity and factors that may be associated with such differences. Chi-square tests were used for group comparisons using SAS version 9.4. Atlas ti.v 7.5 software was used for qualitative analyses. **Results.** Study participants were: 23% WNH, 16% AA, and 57% H/L; 60% identified as gay/lesbian, 20% as bisexual, and 20% as members of other groups. Socioeconomic status (SES) of the participants varied by smoking status. More smokers than nonsmokers lived in households with incomes under $20,000/year (50% of smokers vs. 39% of nonsmokers (p.001)) or were unemployed (34% vs. 19% (p.003)). Many participants suggested that easy access to tobacco products (e.g., cigarettes are “cheaper,” “you find single cigarettes sold everywhere”) contributed to smoking initiation. Continued tobacco use was often mentioned as a way to deal with stress, such as the stress related to “coming out.” For racial minorities (AAs and H/Ls) compared to NHWs, sources of social stress included discrimination based on race, class, and sexual orientation as well as pressures to respond to community and cultural norms and expectations, such as gender roles (e.g., machismo). AAs and H/Ls also reported more heavy marketing of tobacco in their communities and indicated less knowledge about the risks associated with tobacco use. Racial minorities also expressed preferences for different tobacco products (e.g., cigarettes with menthol) than NHWs. **Conclusion.** Differences in
knowledge, attitudes and perceptions related to tobacco use were found among LGBTQ individuals of diverse racial/ethnic backgrounds. These findings have implications for culturally tailoring health communication campaigns and educational programs for LGBTQs, as well as for low SES groups. The findings also suggest the need for additional tobacco regulatory efforts in populations most vulnerable to tobacco marketing.


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P119

High Stress Reasons for Immigration Affect Diabetes Risk, Body Size and Behavior: The Africans in America Study

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Introduction: Leaving Africa to live in the United States is stressful. Due to oversecretion of glucocortoids and catecholamines, stress has biologic consequences. No data exists on whether Africans who come to America for reasons associated with high stress have a higher rate of conditions such as obesity, diabetes and hypertension than Africans who come for low stress reasons. Goals: Working with the Africans in America cohort and using allostatic load score (ALS) to measure biologic stress, our objectives were to (a) rank by ALS the 5 most common reasons for immigration (work, study, asylum/refugee, family unification and lottery); (b) divide the cohort in to 2 groups: high stress (combining the individuals with the lowest ALS); (c) compare body size, visceral adipose tissue (VAT), glucose, BP, sleep duration and smoking in Africans with high and low stress. Methods: OGTT and abdominal CT scans were performed in 114 African immigrants (68% male, age 41±10, range22-62y) born in sub-Saharan Africa but living in Washington, DC. Results: Ranked from highest to lowest, ALS for each reason for immigration was: work 3.18±1.71; asylum/refugee 2.68±1.46; study 2.66±1.88; family 1.77±1.27; lottery 1.60±1.27. Hence, high stress reasons for immigration were: work, asylum/refugee and study. Low stress reasons were: family and lottery. ALS in high vs. low stress reasons for immigration were: 2.81±1.74 vs. 1.72±1.25, P<0.01. BP did not vary by group. However, Africans with high stress had a higher BMI, more VAT and hyperglycemia than Africans with low stress (Table). Africans with high stress also had a greater tendency to sleep <7h per night and smoke (Table). Conclusions: High stress reasons for immigration include work, asylum/refugee and study. As obesity, hyperglycemia, and behaviors such as decreased sleep duration and smoking are associated with high stress reasons for immigration, medical histories when possible should include reason for immigration.


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P120
Racial Differences in Midlife Brain Health and the Role of Cardiometabolic Risk

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Introduction: Blacks are at a higher risk for adverse brain-related outcomes, including stroke and dementia. Due to associations of vascular risk factors with brain health, differences in brain health may result from a greater burden of vascular risk factors in blacks, especially in midlife. However, the role of vascular risk factors in midlife racial disparities in brain health have been underexplored. We thus examined racial differences in midlife brain health and tested whether vascular and metabolic risk factors partly explain cross-sectional racial differences.

Hypothesis: A composite cardiometabolic risk (CMR) score statistically mediates cross-sectional relationships between race and brain health measures.

Methods: 747 adults (20.6% black) aged 30–54, underwent MRI to assess cerebral blood flow (CBF) and morphology. Components of composite CMR were: body mass index, waist circumference, high-density lipoproteins, triglycerides, glucose, insulin, SBP, and DBP. Mediation was tested using the PROCESS v2.14 macro. All models were adjusted for age, sex, income, education, and intracranial volume.

Results: Blacks exhibited lower gray matter volume, smaller hippocampi, less cortical surface area, and a thinner cerebral cortex than whites (all p’s<0.05). We observed no significant differences in CBF by race. CMR partially mediated the association of race with gray matter volume (6.94% mediation) and cortical surface area (9.33% mediation). Independent of CMR, there was a direct effect of race on hippocampal volume, cortical surface area, and cortical thickness. The effect was equivalent to: 6.9, 9.59, 13.06, and 9.98 years of aging, respectively.

Conclusions: Race differences in some indicators of brain health are evident in midlife. Cardiovascular and metabolic risk factors may partly explain some of these differences. These results have implications for understanding vascular contributions to disparities in brain health prior to the onset of stroke and other clinical outcomes.


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Introduction: Higher education and income can modify behavioral risk factors for lifetime cardiovascular disease (CVD) risk. The aim of this study was to observe ethnic differences in the CV health, as measured by inadequate cardiovascular health index (CVHI) category, among a cohort of females with high family income, education, and BMI. We also examined differences in perception about self-reported weight and attitudes toward weight loss and exercise. Methods: Adult non-pregnant females aged 20 years or older from the 2011-2012 NHANES were included in the study. Participants were at least college educated, had a poverty to income ratio of 350% or above, and BMI (≥ 30). Weighted regression was
adj usted for demographics, PHQ-9 score, perception about weight, if participant tried to lose weight last year, and history of CVD, angina, or heart attack. **Results:** The sample represented 2,990,456 eligible females in the US. About 13.2% Hispanic perceived their weight to be about right as compared to 10% Black, and 3.3% White. About 89% Hispanics tried to lose weight in past year compared to 71% White and Black. Weighted regression showed that Hispanic (β: -2.47, 95% CI: -4.44, -0.50) and Black (β: -0.74, 95% CI: -1.93, 0.45) had low CVHI score as compared to White. Higher PHQ9 score (β: -0.12, p > 0.05) and those who did not try to lose weight (β: -1.55, p < 0.01) were associated with lower, and those with positive attitude towards their weight were associated with higher CVHI score (β: 0.38, p > 0.05). Our study suggests huge variations in these characteristics by country of birth and citizenship with corroborated ambiguity in definitions. **Conclusion:** Previous research is inconclusive about existence of Hispanic paradox in cardiovascular health domain. Our study suggests that Hispanic ethnicity was a significant predictor of negative CVHI, when socioeconomic status (SES) was high among all obese females. There was higher prevalence of history of weight management and low CVHI score among Hispanic females; Hispanic females belonging to higher SES may be at a higher risk for CVD related adverse events. In our study, effect of education and income diminished and SES was not associated with participant’s willingness to lose weight despite being obese. Health disparities expressed as differences in CVHI exist despite high education and family income.

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P122

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**Racial/Ethnic Variation in Incidence and Progression of Coronary Artery Calcification: Implications for Understanding the Hispanic Paradox**

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**Background:** Previous studies show that Hispanic persons have similar or lower levels of coronary artery calcium (CAC) and slower progression than non-Hispanic whites (NHW), even after adjustment for traditional risk factors. We examined whether this health advantage in CAC incidence and progression among Hispanic adults extends across all levels of risk factor (RF) burden, and whether associations vary by nativity (foreign-born, US-born) and by heritage group (Mexican, non-Mexican).

**Methods:** We analyzed data on Hispanic and NHW participants aged 45-84 years from the Multi-Ethnic Study of Atherosclerosis (MESA). Follow-up CAC measurements and complete covariate data were available for 3694 participants with an average of 6.6 years between the follow-up and baseline scans (2000-2002). Baseline measures of the following traditional RFs were considered: current cigarette smoking, high total cholesterol, hypertension, diabetes, and obesity, with RF burden scores ranging from 0-5. Outcomes were incident CAC (any follow-up CAC >0 Agatston units) among individuals without detectable CAC at baseline, and CAC progression (any positive increase in CAC) among all participants estimated using relative risk regression. All models were adjusted for age, sex, RF burden, race/ethnicity, education,
income, and time between scans

Results: Although a higher proportion of Hispanics had RF burden scores ≥3 compared to NHW (14.6% vs 8.9%, p<0.0001), Hispanics had a lower adjusted incidence (risk ratio (RR) = 0.83, 95% CI: 0.72-0.96) and less progression of CAC (RR=0.90, 95% CI: 0.86-0.95) than NHW. However, there was evidence of heterogeneity in this pattern. For example, among individuals with no detectable baseline CAC, a Hispanic health advantage was only seen among individuals with RF burden scores of 0 (RR=0.66, 95% CI: 0.48-0.91 for Hispanics vs. NHW at RF=0), with race/ethnic differences getting progressively smaller with increasing RF burden (for RF ≥3: RR=1.01, 95% CI: 0.69-1.48).

Compared to NHW, lower adjusted incidence and progression of CAC was evident to an even greater extent among foreign-born Hispanics, but a health advantage was still present for US-born Hispanics, and for both Hispanic heritage groups. However, these patterns also only remained among individuals with lower RF burden scores.

Conclusions: The Hispanic health advantage in CAC incidence and progression was primarily evident among individuals with fewer traditional risk factors for CVD, but was present among different Hispanics groups. Future research is necessary to identify the factors underlying this advantage, and the dynamics that erode it as RF burden increases.


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Comorbid Conditions May Explain Sex/ Race Disparities in Risk of Pulmonary Hypertension

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Background: Pulmonary hypertension (PH) occurs as a rare idiopathic condition or more often with associated conditions (PH-COMORBID) including sleep apnea, COPD, and venous thromboembolism (VTE). Limited data suggest PH is commoner in women and Blacks, but less common in Asians. The sparseness of systematic epidemiologic studies of PH prompted our study of sex/race disparities and the role of 25 PH-COMORBIDs. Hypothesis: Sex/racial differences in PH are due substantially to PH-COMORBIDs.

Methods: We studied PH and PH-COMORBID in 61,459 comprehensive health plan members with self-classified ethnicity on prior health exams. Subjects were 58% female, 42% male, 28% Black, 53% White, and 12% Asian. From 1996-2015, PH (ICD-9 code 416) was diagnosed at outpatient visits or hospitalization in 2,183 persons. We identified PH/COMORBIDs during the same study period. Cox models yielded hazard ratios (HR) and 95% confidence intervals (CI) for PH. The PH-CORMORBID conditions were studied individually as logistic regression endpoints and Cox model covariates with PH as endpoint.

Results: In adjusted models, sex was unrelated to PH risk with male/female HR=1.05 (0.96-1.15). Increasing age, BMI and smoking were related to increased risk, while higher education was inversely related (table). Compared to Whites, Black women had increased risk, while Asians had similar risk. With p<0.001 (statistically significant), Blacks had higher risk than Whites for 16 PH-COMORBIDs and were at decreased risk for none, while Asians were at higher risk than Whites for 10 PH-COMORBIDs and at decreased risk only for VTE. In the models with individual PH-COMORBID covariates, the greatest individual contributor to change in PH risk in Black women was hypertensive heart disease which decreased the HR from 1.31 (p<0.001) to 1.15 (p=0.03). Several other PH-COMORBID covariates decreased the HR by approximately
0.10. **Conclusions:** Independent sex and race associations with PH are modest and substantially influenced by PH-COMORBID conditions.

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P124

**Neighborhood Density of Hispanic/Latinos and Left Ventricular Structure: ECHO-SOL and SOL-CASAS**

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**Introduction:** Heart failure represents a significant public health problem because of increasing prevalence and lack of effective medical treatment. Hispanic/Latinos have a high burden of cardio-metabolic comorbidities and adverse socioeconomic conditions that place them at risk for heart failure. However, some literature indicates that among Hispanics/Latinos, residing in areas with high Hispanic/Latino ethnic density is associated with better health outcomes. There is a paucity of data on the effect of Hispanic/Latino ethnic density and risk markers for heart failure. Therefore, we evaluated the association between Hispanic/Latino ethnic concentration and several echocardiographic measures of left ventricular structure and function. **Methods:** Data on baseline characteristics from the Hispanic Communities Health Study/Study of Latinos (HCHS/SOL), echocardiographic measures of cardiac structure and function (ECHO-SOL), and neighborhood Hispanic/Latino ethnic density (San Diego SOL-CASAS) were analyzed. Hispanic/Latino ethnic density was calculated for each person based on an 800-m buffer around their home. Hispanic/Latino ethnic density was then calculated using data from the 2010 Census as the percent of Hispanic/Latinos divided by the total population at the Census block level and calculating an average value for all Census blocks that overlapped with the participant’s address. Multivariable linear regression analysis adjusting for personal demographics and cardiovascular risk factors was conducted. **Results:** A total of 350 participants with data from all three databases were included in the analysis. The mean age was 55±7 years, 69% were female, and 26%, 38%, and 43% had diabetes, hypertension, and dyslipidemia, respectively. Thirty-six percent had less than high school education, and 58% were low income. In models adjusting for age, sex, education level, income, acculturation, and cardiovascular risk factors, a 1-percent higher Hispanic/Latino ethnic density was associated with lower left ventricular mass (0.47, p-value = 0.02). Other echocardiographic measures of cardiac structure and function were not significantly related to Hispanic/Latino ethnic density. **Conclusion:** Higher Hispanic/Latino ethnic density was associated with lower LVM independent of personal SES and common cardiovascular risk factors. These findings suggest that Hispanic/Latinos residing in areas with higher Hispanic/Latino ethnic density might have a lower risk of future HF. However, further research to understand the specific
factors that mediate the observed associations are necessary.


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P125

Multiple Measures of Energy Expenditure and Substrate Oxidation in Non-obese White and African American Young Adults

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Introduction: African Americans (AA) experience higher rates of obesity and related disorders than the general U.S. population. It has been hypothesized that the increased risk of obesity among AA may be explained, in part, by lower levels of energy expenditure (EE) and lower levels of fat oxidation. However, many different measures of EE and substrate oxidation have been employed across previous studies. Objective: The objective of this study was to compare multiple measures of EE and substrate oxidation among White (W) and AA adults. We hypothesize that AA will have lower EE and lower fat oxidation rates than W.

Methods: A sample of 12 young (ages 22 to 35 y), non-obese AA adults was recruited from the local community and pair-matched by age, sex and body mass index (BMI) to a sample of 12 W adults. Height and weight were measured and BMI was calculated (kg/m²). Total fat mass (FM) and fat free mass (FFM) were measured using dual energy x-ray absorptiometry. Resting EE (REE) and respiratory quotient (RQ) were measured in a fasting state using a metabolic cart; 24-hour EE, 24-h RQ, sleep EE and sleep RQ were measured in a whole room calorimeter; and free-living total daily EE (TDEE) was measured over two weeks using doubly labelled water. Physical activity level (PAL) was computed as TDEE/REE. Differences between W and AA were determined using general linear models, adjusting for FFM. Results: The analytic sample had a mean age of 27.0 y (SD 4.3 y) and mean BMI of 22.9 kg/m² (SD 2.9 kg/m²). There were no significant differences in age, BMI, FM or FFM between W and AA (all p>0.05). However, W had significantly higher REE (1459 vs 1305 kcal/day; p=0.001), 24-h EE (1826 versus 1737 kcal/day; p=0.02), sleep EE (1509 vs 1405 kcal/day; p=0.005); but not TDEE (2452 vs 2313 kcal/day; p=0.30) compared to AA. There were no race differences in RQ (0.83 vs 0.83; p=0.93), 24-h RQ (0.86 vs 0.88; p=0.24) or sleep RQ (0.86 vs 0.87; p=0.44). On the other hand, AA had higher PAL (1.34 vs 1.26; p=0.04) compared to W. Conclusions: Non-obese W adults demonstrated higher REE, 24-h EE, and sleep EE compared to AA, but had similar levels of free-living TDEE. It appears as though some AA adults may compensate for lower REE by increased physical activity, which may be an effective strategy to prevent weight gain and obesity.

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P126

Sex Interacts With Chromosome 6p24 on Coronary Artery Calcium but Not Chromosome 9p21

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**Introduction:** Coronary artery calcium (CAC) is a marker of subclinical atherosclerosis. CAC has been shown to strongly correlate with the amount of atherosclerotic plaque and predicts future coronary disease events and mortality. CAC is a complex heritable trait and levels differ by sex. We investigated the interaction between sex and genome wide association study (GWAS) signals on chromosome 6p24 and 9p21 on Coronary Artery Calcium (CAC) in the COPDGene study.

**Hypothesis:** We assessed the hypothesis that sex would interact with the GWAS signals on CAC.

**Methods:** The COPDGene is a study of 10,192 current and former smokers with at least 10 pack-years of smoking history. CAC was measured using high dose, inspiration chest CT scans, following an established protocol in 8,739 individuals (6,150 non-Hispanic Whites (NHW) and 2,589 African Americans (AA)). We considered sex by SNP interactions on CAC for our previously identified GWAS signals on chromosome 6p24 and chromosome 9p21 using R software adjusting for genetic ancestry using principal components as well as recognized risk factors (age, pack-years of smoking history, BMI, diabetes, high blood pressure, high cholesterol, and steroid use). We used the log transformation of CAC plus 1 as the quantitative phenotype.

**Results:** There was a significant interaction between sex and chromosome 6p24 PHACTR1 [rs9349379] (p=0.023) on CAC among NHW subjects in the COPDGene study. There was a genome-wide significant association for rs9349379 with CAC among male NHW subjects [p-value= 1.21E-8] but not among female NHW subjects [p-value= 0.02]. Overall there was no genome-wide significant association for rs9349379 with CAC among all NHW subjects [p-value= 6.39E-7]. There was no significant interaction between sex and chromosome 9p21 CDKN2B-AS1 [rs10757272] (p-value=0.21) on CAC.

**Conclusions:** There was a SNP by sex interaction on CAC for chromosome 6p24 with a genome wide significant signal for NHW men but not for NHW women. The chromosome 9p21 signal for CAC did not significantly differ by sex. This study demonstrates the importance of considering gene by sex interactions in genome wide association studies of cardiovascular disease risk.

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**P127**

**Gene-Lifestyle Interactions Detect Novel Blood Pressure Loci**

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**Introduction:** Gene-lifestyle interaction effects (GxE more generally) on blood pressure (BP), a promising approach for novel loci discovery, is being actively pursued in the CHARGE Gene-Lifestyle Interactions Working Group using individual lifestyle domains, such as smoking status.

**Objectives:** To explore the potential utility of a “lifestyle index” (aggregating multiple lifestyle domains) for identifying novel BP loci in a GxE context, we performed genome-wide interaction analysis with two lifestyle index variables.

**Methods:** For each of 6,257 subjects (19 – 80 years, 46.9% male) in the Framingham Heart Study SHARE dataset, lifestyle index was defined as the sum of risk scores for four lifestyle factors: smoking status (0 = Never, 1 = Former, 2 = Current), alcohol intake (0 = Moderate, 1 = Never, 2 = Heavy), physical activity,
activity (0 = Active, 1 = Inactive), and educational level (0 = College degree, 1 = Some college, and 2 = No college). We examined GxE for systolic BP using the quantitative index (ranging from 0 to 7) and a binary form of the index ($\geq$ vs < the median), while adjusting for sex, age, and kinship. Promising loci were identified using a 2 df joint test of main and interaction effects at $\alpha = 5 \times 10^{-6}$.

**Results:** Sixteen promising single nucleotide polymorphisms (SNPs) representing 8 loci were found when using the quantitative lifestyle index, and 43 SNPs representing 4 loci when using the binary lifestyle index (Table 1), with only one locus common to both indices. Of the 11 unique loci detected, 3 are within 500 kb of known BP loci and 6 are in or near a gene with a known function.

**Conclusions:** We demonstrate that a composite of multiple lifestyle factors can enhance novel discovery.


**Funding:** No

**Introduction:** Life’s Simple 7 (LS7) comprises seven health factors and behaviors promoted by the American Heart Association to reduce cardiovascular morbidity and mortality. Despite compelling evidence of inverse association between LS7 adherence and a variety of adverse health outcomes, the epigenetic sequelae of healthy lifestyle have not been comprehensively characterized and may offer valuable insights into the underlying biological mechanisms.

**Hypothesis:** We hypothesized that LS7 adherence is associated with an epigenetic signature that is consistent with the deceleration of the aging process.

**Methods:** Using data from the Genetics of Lipid Lowering Drugs and Diet Network (GOLDN, n=853), we have estimated cross-sectional associations between epigenome-wide DNA methylation at 487,432 cytosine-phosphate-guanine (CpG) sites in CD4+ T-cells and the number of achieved LS7 goals as measured by study staff (blood pressure, body mass index, total cholesterol, and fasting glucose) or reported by the participant (diet, smoking, physical activity). The associations were tested using linear mixed models adjusted for age, sex, study site, technical artifacts (fixed effects), and family relatedness (random effect). Additionally, we tested associations between LS7 compliance and age acceleration, estimated from DNA methylation data and chronological age using two complementary validated algorithms (1: Horvath and 2: Hannum). These linear mixed models adjusted for chronological age, sex, study site, CD4+ T-cell subtype estimates (fixed effects), and family relatedness (random effect). Epigenome-wide association results were considered statistically significant if they fell under the Bonferroni corrected threshold ($\alpha=0.05/487,432= 1.03\times10^{-7}$).

**Results:** Methylation of an intronic CpG site in *CPT1A*, cg00574958, was positively associated with the number of achieved LS7 goals at the epigenome-wide significance level ($\beta=0.008$, SE= 0.001, $P= 4.7\times10^{-8}$). *CPT1A* encodes a key enzyme in the beta-oxidation process and has previously been linked to fasting triglycerides,
body mass index, and adiponectin levels. Age acceleration was associated with LS7 adherence under the Hannum algorithm (beta=-0.01, SE= 0.006, P= 0.02) but not the Horvath algorithm (beta=-0.005, SE= 0.004, P= 0.18).

Conclusions: Achievement of LS7 goals was significantly associated with methylation variation in \textit{CPT1A}, a critical lipid metabolism gene, and was associated with age deceleration in the Hannum but not the Horvath models. Following independent replication, future studies should consider interrogating \textit{CPT1A} methylation in relation to cardiovascular morbidity and mortality in a prospective setting.


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P129

\textbf{Association Between Blood Pressure and DNA Methylation in Blood Pressure-related Genes in Adolescents}


Introduction: Pediatric hypertension is a significant public health burden. Although the association between genetic variants and blood pressure (BP) has been extensively investigated, the relationship between DNA methylation and BP, especially in adolescents, has not been characterized.

Hypothesis: DNA methylation of previously reported BP-related genes is associated with BP levels in adolescents.

Methods: We examined this relationship in 263 adolescents from the Penn State Child Cohort follow-up exam. We extracted peripheral leukocytes DNA 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. Bases with less than 10x coverage or available from less than 50% of the participants were excluded, resulting in a total of 165,297 analyzable sites. For each participant, 3 seated-BP measurements were taken and the average of 2nd and 3rd measurements was used to represent the participant’s BP. We used robust linear regression to associate site-specific methylation level with systolic BP (SBP) and diastolic BP (DBP). All regression models were adjusted for age, race, sex, and body mass index percentile. All intragenic sites were then mapped to the hg19 assembly and subjected to enrichment analyses. Significance of the enrichment analyses was assessed by hypergeometric and permutation tests. False discovery rate (FDR)-corrected p values were used to determine the significance between site-specific methylation and BP measures.

Results: The mean (SD) age of the participants was 16.7 (2.2) years. It consisted of 55% male, 79% white and 16% obese. Among the 5,551 and 5,890 sites related to SBP and DBP at \textit{p}<0.05 level, 35 and 38 were intragenic to BP genes. BP genes were significantly enriched among intragenic sites for both SBP ($P_{\text{hypergeometric}}=0.015; P_{\text{permutation}}=0.019$) and DBP ($P_{\text{hypergeometric}}=0.008; P_{\text{permutation}}=0.012$). At individual site level, two sites within \textit{MECOM} were significantly related to SBP (FDR-corrected $P=0.02$ and 0.03).

Conclusion: Despite the need of external validation from other independent cohorts, data from this exploratory study suggests that DNA methylation of BP-related genes is associated with BP regulation in adolescents and, consequently, with the pathogenesis of hypertension in early developmental periods.

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Infant Growth as an Effect Modifier of Genetic-lipid Associations: Evidence From a Chilean Infancy Cohort

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Background
The postnatal period can function as a window of time for metabolic programming. As evidence from human observational studies is scarce, we examined the role of postnatal weight, length (linear growth), and weight-for-length (WFL) growth trajectories as effect modifiers of established single nucleotide polymorphism (SNP) associations on lipid levels in a cohort of adolescents from the Santiago Longitudinal Study (SLS) (n=484).

Methods
Growth trajectories were characterized via two different approaches: nonlinear mixed effects model (SITAR) and a latent growth mixture model (LGMM). We assessed gene-environment interaction in an additive model within: 1) SITAR including product terms that accurately reflects the trichotomous genetic term, and 2) LGMM using stratified SNP-lipid associations by latent growth patterns. Bonferroni-corrected significant findings are reported.

Results
SITAR models did not reveal any evidence of gene-environment interaction. In contrast, given three LGMM patterns of growth, gene-environment interactions emerge for both weight and WFL trajectories. One group of infants had lower velocity but higher acceleration; another group had medium velocity and lower acceleration; a third group had high velocity and lower acceleration. The association between the rs7412 (APOE) variant and HDL (mg/dL) was negative for the low velocity/high acceleration weight trajectory group (mean= -10.2; 95% CI = -16.0, -4.5; n~23) compared to the high velocity/low acceleration group (mean = 11.3; 95% CI = 2.6, 20; n~152). Similarly, the association (95% CI) between the rs78536982 (BAI3, LMBRD1) variant and triglycerides (log(mg/dL) was lower for the low velocity/high acceleration WFL group (-0.61; 0.84, -0.37; n~24) when compared to both the medium velocity/low acceleration (-0.09; -0.23, 0.05; n~271) and high velocity/low acceleration (0.001; -0.11, 0.11; n~189). In sex-stratified analyses, the high velocity/low acceleration group for males (n=254) had a negative association (95% CI) between the rs11076175 (CETP) variant and LDL (mg/dL) (-10.6; -16.7, -4.5; n~140) versus a positive association for the low velocity/high acceleration (12.6; 2.93, 22.2; n~114).

Summary
These results demonstrate potential heterogeneity in the genetic association between lipid loci and adolescent lipid levels across different patterns of growth from 0 to 5 months. Future work to examine the role of infant growth as a causal factor in direct and indirect effects is of interest.


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**P131**

**Influence of PNPLA3 Interaction With Physical Activity and Dietary Pattern on Hepatic Steatosis Among African Americans in the Jackson Heart Study**

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**Background:** The genetic basis for nonalcoholic fatty liver disease (NAFLD) has been studied widely. Several common variants near genes known to be associated with NAFLD have been identified and replicated across ancestries. The extent to which these variants interact with lifestyles factors, particularly in African Americans (AAs) is unknown. We hypothesized that physical activity and dietary pattern moderate the association of patatin-like phospholipase domain containing 3 (PNPLA3) variant rs738409 with NAFLD.

**Methods:** Of the 2,884 Jackson Heart Study participants with hepatic steatosis measured by computed tomography, a subset of 1,075 were part of a family study and another set of 1,583 were genotyped for common genetic variants near PNPLA3. We estimated polygenic heritability of hepatic steatosis (inverse normally transformed) using a variance components approach implemented in SOLAR controlling for variations in age, age², gender and alcoholic drinks. To evaluate moderation effect of rs738409 by diet and physical activity, we analyzed genotyped individual using multiple linear regression and controlled for population structure in addition to covariates included in estimating heritability. Dietary pattern was defined using principal components analysis while physical activity according to AHA categorization.

**Results:** The polygenic heritability estimate of hepatic steatosis in our study was 0.33±0.09 (p<0.001). The G allele of the rs738409 variant (allele frequency 14%) was significantly (beta ± standard error; p-value) associated with high hepatic steatosis in participants who are physically inactive (0.29±0.12; 0.0169) and those with unhealthy dietary pattern (0.25±0.10; 0.0144) (Figure).

**Conclusions:** In a community-based cohort of AA, heritability of hepatic steatosis is moderate and compares favorably with previous estimates. Physical activity and diet modulates the effect of PNPLA3: rs738409 on NALFD. The role lifestyle factors on NAFLD need to be validated in other population samples.

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**P132**

**Genome-wide Linkage Analysis of Carotid Artery Traits in Exceptionally Long-Lived Families**

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The extent to which genetics plays a role in vascular health in exceptional aging has not been established. We performed genetic heritability and genome-wide linkage analysis of carotid artery ultrasound derived traits in 1931 individuals (3913 relative pairs) from the Long Life Family Study (LLFS). The LLFS is a longitudinal family-based cohort study that recruited long-lived individuals and at least 1 of their long-lived siblings, as well as, all offspring and offspring spouses. Participants had a home visit that included B-mode carotid artery ultrasound to assess inter-adventitial diameter (IAD), common carotid artery far wall (FW) intima-media thickness (IMT), lumen diameter (LD), and carotid plaque prevalence and burden.

We conducted residual heritability analyses for each of these traits, adjusted for age, age², sex, and field center (4 sites) using pedigree-based maximum-likelihood methods in SOLAR. Linkage markers were haplotypes generated from genotypes typed on the Human Omni Chip 2.5 v1 (Illumina, CA) and multipoint identity-by-descent estimates were calculated by Loki. Multipoint genome-wide (chr 1-22) linkage analysis was conducted in SOLAR. Chromosomal regions were considered significant if the logarithm of the odds (LOD) score was ≥3.0 (suggestive: LOD ≥2.0). Proband and offspring generations, respectively, were 59% and 55% female and had mean ages of 97.3 and 73.5 years. Carotid traits were significantly heritable, ranging from 0.37 for mean FW IMT to 0.67 for mean IAD. We found significant evidence of linkage on chromosome 3 at 125 cM (max LOD=3.57; Table). We also found 4 peaks suggestive of linkage with other carotid traits (Table). There are many genes of interest underlying these peaks with previous association with vascular disease, and fine-mapping the associations will require further refinement via sequence analysis. This is the first study to show that genetics appear to play a very strong role in determining variation in carotid artery traits in families with exceptionally long-lived members.


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P133

Epigenome-Wide Association Study of Moderate-Vigorous Physical Activity in Adult African Americans Identifies Loci Near HCCA2

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Regular moderate-vigorous physical activity (MVPA) reduces the risk of cardiovascular and other chronic diseases, among other important benefits at all life stages. It is hypothesized that physical activity may alter disease risk via epigenetic modifications, including potentially long-standing changes in DNA methylation as previous research has shown epigenetic changes following exercise interventions. Most existing reports examine global methylation or study acute exercise effects on DNA methylation. To our knowledge, there are no published epigenome-wide association studies (EWAS) of habitual MVPA. In this analysis, we tested associations between leisure time MVPA and genome-wide variation in CpG methylation, an epigenetic mark, in 2,601 African American participants (1,663 women; mean age 56.6 years) in the Atherosclerosis Risk in Communities (ARIC) study. The Illumina HM450K Bead Chip was used to measure methylation in 471,035 CpG sites in stored frozen leukocyte samples, from visit 2 (1990-1992) or 3 (1993-1995). Linear regression models tested the cross-sectional association of DNA methylation M-value with self-reported leisure time MVPA at the visit of sample collection, modeled as minutes of MVPA per week and by category based on the AHA guidelines for physical activity in adults (none, less than 150, or at least 150 minutes MVPA per week), adjusting for age, sex, body mass index, education, alcohol use in grams per week, smoking status, cancer status, white blood cell count, imputed cell-type proportions using the Houseman method, and batch effects with the top 30 HM450K built-in nonnegative control probe principal components. Three CpGs, cg08269485, cg20272155, and cg08966208, upstream of the cathepsin D encoding gene, CTSD, were observed to be significantly inversely associated (q<0.05, FDR) with MVPA minutes/week. This is a strongly imprinted genomic region (chr11p15.5) and the region has also been reported to include DNA methylation variants that changed in response to an exercise training intervention. Additionally, 163 CpGs that we identified in the literature to be associated with habitual MVPA were also tested using the same models. One CpG, cg07863043, upstream of the adenomatosis polyposis coli gene, APC, in the 5q22.2 genomic region, was observed to be significantly positively associated with achieving at least 150 minutes of MVPA per week compared to none (q=0.0001, FDR). APC encodes a tumor suppressor protein that is an antagonist of the Wnt signaling pathway, and is involved in carcinogenesis and embryonic development. Replication in other populations is ongoing to confirm these findings as well as to identify additional physical activity-related DNA methylation variants.

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P134

Genome-wide Association Study of Heart Rate Response to Mental Stress

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Ischemia results from an imbalance between myocardial oxygen supply and demand. Ischemia associated with mental stress (MS) has been associated with adverse outcomes in patients with coronary artery diseases (CAD). Higher heart rate (HR) and blood pressure responses to MS are associated with a greater likelihood of MS-induced ischemia. Although multiple genetic loci have been associated with baseline HR, genetic associations for HR responses to MS remain unknown. We aimed to discover the genetic determinants of HR response to MS in a bi-ethnic population.

A sample of 499 Caucasian and 271 African American patients with CAD were recruited into the Mental Stress Ischemia Prognosis (MIPS) study. Race was defined using genetic ancestry. Genome-wide SNP data were genotyped using Illumina’s Multi-Ethnic Genotyping (MEG) chip and then imputed to the 1000 Genome Project phase 3 panel. Cardiovascular risk factors, demographic, behavioral, and medication history data were obtained by questionnaires and chart reviews. MS was induced by a public speaking task and the HR response to MS was measured as post-stress HR minus pre-stress HR. We conducted genome-wide association analysis of HR response to MS using multiple linear regression adjusted for age, sex, beta-blocker use, the pre-stress HR and ethnicity. A meta-analysis was performed across the two ethnicities.

After multiple-testing correction, no significant associations with HR response to MS were identified among Whites. However, fourteen SNPs located in gene ITGA1 with a mean minor allele frequency of 36.5% (range: 36.3% - 37.1%) were significantly associated with the HR response to MS in Blacks (meta-analysis p<5×10^-8). The minor alleles of all 14 variants were associated with a higher HR response. On average heterozygotic and homozygotic Blacks of the minor allele in any of these SNPs have a 4.558 beat/min (range: 4.514 – 4.659 beat/min) and 9.116 beat/min (range: 9.028 – 9.318 beat/min) increase in HR response to MS, correspondingly. The ITGA1 gene encodes the alpha-1 subunit of integrin receptors. This protein heterodimerizes with the beta-1 subunit to form a cell-surface receptor for collagen and laminin. The heterodimeric receptor is involved in cell-cell adhesion and may play a role in inflammation and fibrosis. Further functional studies to follow up these genetic loci may provide insight into regulatory mechanisms of HR response to mental stress that may be prognostically informative for CAD patients.


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P135

Prevalence of Peripheral Vascular Disease: Results of the Global Burden of Disease 2016 Study

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Introduction: Peripheral arterial disease (PAD) is a common condition among older adults. While many patients are asymptomatic, a substantial proportion experience intermittent claudication or critical limb ischemia and require revascularization or bypass surgery. PAD has also been associated with higher rates of cardiovascular and all-cause mortality. Estimates of the prevalence of PAD are essential to a complete understanding of the burden of atherosclerotic disease. We produced
national and global estimates of PAD as part of the Global Burden of Disease 2016 Study. Methods: We used national health surveys which assessed ankle-brachial index, commercial insurance claims databases, and published literature on population-based studies as input data. Our analyses corrected for readmission rates and variation in the use of diagnosis codes. Geospatial disease meta-regression software (DisMod-MR 2.1) was used to generate models separately by sex, location, and year to produce consistent estimates of prevalence. Uncertainty intervals (UI) were estimated using 1000 draws from the posterior distribution of each model. A country-level socio-demographic index (SDI), combining national income per capita, mean years of schooling, and total fertility rate, was used to examine disease burden by level of development.

Results: In 1990, there were an estimated 395 (95%UI: 345 to 453) million prevalent cases of PAD globally in women and 265 (95%UI: 231 to 307) million cases in men. By 2016, these numbers had increased to 695 (95%UI: 613 to 797) million cases in women and 506 (95%UI: 444 to 583) million cases in men. Age-standardized global rates in 1990 were 2106 (95%UI 1847 to 2415) per 100,000 and 1773 (95%UI: 1561 to 2037) per 100,000 in women and men, respectively. In 2016, these rates were 1930 (95%UI: 1702 to 2202) per 100,000 for women and 1658 (95%UI: 1457 to 1900) per 100,000 for men. The largest change in total number of prevalent cases from 1990 to 2016 was seen in middle-SDI countries with a 136% (95%UI: 131% to 137%) change in women and 140% (95%UI: 137% to 143%) change in men, indicating that the overall atherosclerotic burden in these countries is increasing. Comparisons indicate that these changes are largely being driven by population aging in high-SDI countries and by population growth in other locations.

Conclusions: The prevalence of PAD is increasing worldwide, with large increases in low- and middle-SDI countries in particular. These estimates of prevalence provide important estimates of the number of people who may benefit from medical therapies to reduce cardiovascular events.


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Funding Component:

P136

Adherence to the Mediterranean Diet is Associated With Lower Pericardial Fat in African-Caribbean Men

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Introduction: Adherence to a Mediterranean-style diet pattern has been associated with altered body fat distribution among African Americans. To further evaluate these relationships, we investigated associations of adherence to the Alternative Mediterranean Diet (aMED) pattern with fat deposition in an ongoing cohort study of African-Caribbean men.

Methods: Diet was assessed from 2014-2017 using a 146-item semi-quantitative food frequency questionnaire in the Tobago Health Study (N = 800, mean age=64.1, mean BMI=27.7). Adherence to the aMED pattern (score range 0-9) was calculated as the
following: +1 for intake above the population median for fruits, vegetables, whole grains, nuts, legumes, fish, and monounsaturated:saturated fat ratio; +1 for intake below the population median for red and processed meats; and +1 for alcohol intake between 10-25 grams per day. Walking, TV watching, and smoking were assessed by interviewer-administered questionnaires. Abdominal subcutaneous adipose tissue (SAT), visceral adipose tissue (VAT), and pericardial adipose tissue (PAT) depot volumes were measured in a subset of this cohort (N = 679) using computed tomography. Multiple linear regressions were performed across adherence groups.

**Results:** The average age was 64.1 ± 8.8 years old. After adjusting for age, walking, TV watching, total energy intake, and BMI (for VAT and PAT models only), PAT significantly decreased across increasing aMED adherence groups (P=0.0174), with median PAT being 8% lower in the high-adherence versus low-adherence group. No other fat measure significantly differed by adherence group (Table).

**Conclusion:** Higher adherence to the aMED pattern was significantly associated with reduced PAT, but not with measures of general or central fat, in middle-aged and older African Caribbean men. Further studies are needed on dietary patterns and ectopic fat distribution to fully describe the potential impact of race/ethnicity.


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Funding Component:

P137

**Socioeconomic Status And Hypertension Control In Sub-saharan Africa: The Multination Eight Study**

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**Introduction** Systemic hypertension is a rapidly growing epidemic in Sub-Saharan Africa. Adequacy of blood pressure (BP) control and the factors influencing it, especially the role of socio-economic status (SES) have not been well studied in this part of the world. **Hypothesis** We therefore aimed to quantify the association of SES both at the individual and at the country level with BP control in Sub-Saharan Africa. **Methods** We conducted a cross-sectional survey in urban clinics of twelve countries, both low-income and middle-income, in Sub-Saharan Africa. Data were collected on demographics, treatment and standardized BP measures were made among the hypertensive patients attending the clinics. BP control was defined as BP<140/90 mmHg and hypertension grades were defined according to European Society of Cardiology guidelines. Country income was retrieved from the World Bank database and patient’s individual wealth status was documented by the treating physician. The separate association between SES (both country-level income and individual patient wealth) and BP control was investigated using Generalized Linear Mixed-Effects Models adjusted on sex and age. **Results** A total of 2198 hypertensive patients (58.4±11.8 years; 39.9% male) were included, of whom 1017(46.3%) were from low-income and 1181(53.7%) from middle-income countries. Individual wealth level was low, mid and high in 376(17.6%), 1053(49.2%) and 713(33.3%) patients respectively. Uncontrolled hypertension was present in 1692 patients (77.4%) including 1044(47.7%) with ≥grade 2 hypertension. The proportion of uncontrolled hypertension progressively increased with decreasing level of patient individual wealth, respectively 72.8%, 79.3% and 81.8% (p for trend<0.01). Stratified analysis shows that these differences of uncontrolled hypertension according to individual wealth index were observed in low-income countries (p for trend=0.03) and not in middle-income countries (p for trend=0.26). In low-income countries the odds of uncontrolled hypertension increased 1.37 fold (OR=1.37 [0.99-1.90]) and 1.88 fold (OR=1.88 [1.10-3.21]) in patients with middle and low individual wealth as compared to high individual wealth. Similarly, the grade of hypertension increased progressively with decreasing level of individual patient wealth (p for trend <0.01). **Conclusions** Low individual wealth was significantly associated with poor hypertension control, especially in low-income countries. Strategies for hypertension control in Sub-Saharan Africa should especially focus on people in the lowest individual wealth groups who also reside in low-income countries.


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Association of a Potentially Functional Wnt Pathway Mutation With Carotid Artery Wall Traits in African Ancestry Men

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The wingless (Wnt) pathway is known to regulate many human systems, including embryonic development, bone mineralization, and cancer. There is emerging basic research evidence that the Wnt pathway is also involved in angiogenesis, atherosclerosis, and vascular damage repair. However, there have been no studies of the Wnt pathway and cardiovascular disease (CVD) in human populations. In a cohort of Afro-Caribbean men (the Tobago Health Study (THS)), we previously identified a potentially functional coding mutation (Ala64Thr) in the Frizzled-1 (FZD1) gene, which acts as a co-receptor with the low-density lipoprotein receptor protein (LRP) to initiate the Wnt signaling cascade. This mutation has a carrier frequency of ~4% in the THS and additional studies reported in the 1000 genomes project have found similar frequencies in other predominantly West African populations. In order to investigate the phenotypic consequences of this Wnt pathway mutation on subclinical CVD, we measured carotid artery wall traits using B-mode ultrasonography in 64 Ala64Thr mutation carriers and 395 controls from the THS. For this analysis, carotid artery measures of interest included carotid plaque prevalence, and common carotid mean intima-media thickness (IMT), inter-adventitial diameter (IAD), and lumen diameter (LD). We assessed differences in carotid traits by Ala64Thr status using multiple linear regression adjusting for CVD risk factors, including age, BMI, smoking, hypertension, diabetes, alcohol intake, physical activity, and sedentary behavior. Men were aged 64 years and were overweight (BMI: 27.5kg/m²), on average. Prevalence of hypertension and type 2 diabetes is high in this sample (66% and 24%, respectively). Men with Ala64Thr tended to be older and had higher prevalence of hypertension than non-carriers (P<0.05 for both). Carrying the Ala64Thr mutation was associated with significantly wider carotid diameters and, after adjustment for traditional CVD risk factors, mutation carriers had >1/3 of a SD greater LD than non-carriers (P=0.01). The effect magnitude of this mutation was similar for IAD, though not statistically significant (P=0.08). There was no significant difference in carotid IMT or plaque prevalence. While this mutation is not expected to be severely deleterious using in silico prediction software, Ala64 is highly conserved and located in a putative signaling peptide sequence. Carriers of a low frequency FZD1 coding mutation show greater remodeling of the carotid artery compared to non-carriers, suggesting that the Wnt pathway may be involved in vascular changes that occur early in the atherosclerotic disease process.


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P140

High Poverty Among Patients With Noncommunicable Diseases in Rural Haiti

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Background. Noncommunicable diseases (NCDs) are a major and growing cause of death and disability in low-income countries, and
contribute a substantial portion of outpatient clinic visits. Poverty can be a major barrier to accessing healthcare in rural low-income countries. The objective of this study is to describe the demographics and socioeconomic status of patients attending an NCD clinic in rural Haiti, where poverty is highly prevalent.

Methods. We analyzed routinely collected clinic data from adult patients in rural Haiti presenting to the NCD clinic at Hôpital Universitaires de Mirebalais. We collected data during routine initial clinic visits from July 2013 through October 2016. We performed descriptive statistics to assess patient demographics and socioeconomic status using available data. We evaluated poverty based on the Multidimensional Poverty Index by evaluating 9 indicators within three dimensions: health, education, and standard of living - we did not assess electricity. We assessed deprivation within each indicator. The “poorest” patients were defined as those deprived in 4 of the 9 poverty indicators. We also assessed measures of catastrophic health spending. Results. A total of 518 adults were included, with 72% (373/508) women. The mean overall age was 52.8 years (SD 14.7) and 21% (108/518) were 40 years old or younger. Of the patients, 32% had only hypertension, 18% had only diabetes, 32% had both diabetes and hypertension, 5% had heart failure, and 13% had no recorded diagnosis. 45% of patients travel more than 1 hour for clinic visits. Almost half (49%, 146/296) of adults sold belongings and 61% (178/292) borrowed money to pay for healthcare. Among the poverty measures, the top indicators with deprivation were cooking fuel with charcoal or wood (96%, 290/302), child death in household (70%, 169/243), and no household members completing primary school (25%, 83/324), lack of household assets (25%, 79/313), poor sanitation (19%, 59/304), dirt floor (16%, 50/304), and lack of improved drinking water (9%, 29/308). Of all patients, 21% (78/378) were among the poorest. Throughout Haiti, however, 55% of the population are among the poorest. There were more patients among the poorest living closer to the hospital (27%) than living farther away (10%). Interpretation. The great majority of patients were middle-aged women, with predominantly hypertension and/or diabetes. Socioeconomic deprivation was high among many poverty indicators and most patients experienced catastrophic health spending. At this clinic in rural Haiti, the proportion of patients presenting for care who are among the poorest is less than that overall in Haiti. Patients who travel far distances have less poverty. Health systems for chronic disease management in rural low-income countries must account for patient poverty.


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P141

Detection of Abnormal Glucose Tolerance in Africans: International Diabetes Federation Waist Circumference Thresholds Perform Better in Africans Than the Higher Thresholds Used in America

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Introduction: In the 21st century, Africans are experiencing an epidemic of diabetes and heart disease. Key to addressing this public health challenge is the identification of thresholds for risk factors for diabetes and heart disease which are valid in Africans. For example, central obesity indicates both insulin resistance (IR), a
risk factor for heart disease, and abnormal glucose tolerance (abnl-GT), a term which encompasses both prediabetes and diabetes. There are two major standards for diagnosing central obesity by waist circumference (WC): the European standard of the International Diabetes Federation (IDF) (men: 94 cm, women: 80 cm) and the American standard of the AHA/NHLBI (men: 102 cm, women: 88 cm). It is unknown if either the IDF or higher AHA/NHLBI thresholds are appropriate for Africans.

**Objectives:** Our goals were to determine in Africans the WC that best predicts IR and abnl-GT and then compare these thresholds to the standards put forward by the IDF and AHA/NHLBI. **Methods:** We measured WC and determined glucose tolerance status by the OGTT in 348 subSaharan Africans (male 69%, age 39±10y (mean±SD) range 20 to 64y, BMI 27.6±0.2, (range 18.2 to 42.4) who were living in America, born in Africa (West: 51%, Central: 23%, East: 26%) and self-identified as healthy. The area under the receiver operating characteristic curve (AUC-ROC) and the Youden Index were used to determine the WC which best predicts IR and abnl-GT. IR was defined by the lowest tertile of the Matsuda Index. Visceral adipose tissue (VAT) and subcutaneous adipose tissue (SAT) were measured by computerized tomographic scan. Prior to analyses, the participants were divided into 4 groups: (1) normal glucose tolerant (NGT), (2) NGT and IR, (3) abnl-GT and IR, (4) abnl-GT and no IR.

**Results:** The prevalence of these 4 groups did not differ by sex and their overall frequency were: 47% with NGT; 13% with NGT and IR; 19% with abnl-GT and IR; and 21% with abnl-GT and no IR. BMI was higher in women than men (28.5±5.4 vs. 27.2±3.9, P=0.01). After adjusting for BMI, women had lower WC and VAT and higher SAT than men (all P < 0.001). According to the Youden Index, the optimal WC in men which predicted IR and abnl-GT were: 91 cm (AUC-ROC±SE 0.78±0.03) and 92 cm (0.67±0.04), resp. In women, the optimal WC which predicted IR and abnl-GT were: 96 cm (0.75±0.05) and 82 cm (0.67±0.06), resp.

**Conclusions:** Gender differences in body fat distribution may explain why in women, but not men, the WC which predicts IR was higher than the WC which predicts abnl-GT. However, and most importantly, the WC thresholds which optimally predict abnl-GT in African men and women were much more similar to the IDF(men: 94 cm, women: 80 cm) than the higher AHA/NHLBI (men: 102 cm, women: 88 cm) thresholds. Therefore, we recommend that WC thresholds from the IDF be used to screen African men and women for abnl-GT.


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P142

**Light Smoking is Associated With Metabolic Syndrome Risk Factors in Chilean Young Adults**

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**Background:** Metabolic syndrome (MetS) is a cluster of risk factors for CVD and DM2 that includes abdominal obesity, hypertension, hyperglycemia, and dyslipidemia. While cigarette smoking has been associated with MetS risk factors in adults, young adulthood is an under-studied, susceptible period for developing long-term morbidity and mortality related to MetS.

**Objective:** This study aims to examine the association between cigarette smoking and MetS in Chilean young adults. We hypothesized that cigarette smoking, even at low levels of exposure (< 30 per week), is associated with an increased risk of developing MetS in young...
adults.

**Methods:** We studied 243 Chilean young adults who were part of infancy studies related to iron deficiency and recruited for a study of cardiovascular risk at age 16. Participant BMI, waist circumference, blood pressure, fasting serum glucose, cholesterol, triglycerides, and HDL were measured. MetS was defined using IDF and AHA/NHLBI criteria, and MetS risk z-scores were calculated using published equations. Participants self-reported smoking and drinking habits using standardized questionnaires. Logistic regressions examined associations between smoking and each MetS risk factor. All models were adjusted for sex, MetS at adolescence, and frequency of alcohol consumption.

**Results:** Participants were mean 22.5 years old and 49.8% male (121 of 243). The prevalence of obesity and MetS was 24.3% (59 of 243) and 15.3% (37 of 243) respectively. Among smokers (125 of 243), mean age of smoking initiation was 14.6 years and mean consumption was smoking 28 cigarettes per week. Smokers had significantly higher fasting serum glucose levels, lower HDL, and higher MetS risk scores compared to non-smokers. Smoking was significantly associated with greater odds of fasting hyperglycemia (OR 2.41, CI 1.04 - 5.59) and low HDL (OR 1.87, CI 1.05 - 3.31).

**Conclusion:** Cigarette smoking was associated with MetS risk factors, specifically fasting hyperglycemia and low HDL cholesterol levels, in a population-based sample of Chilean young adults. Since our sample had low levels of smoking exposure (< 30 cigarettes per week), these risk factors may herald the onset of MetS associated with light cigarette smoking. Increased emphasis should be placed on preventing the initiation of smoking or promoting cessation during this crucial risk period.

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**P143**

**Cardiovascular Health Among Asian Americans, NHANES 2011-2014**

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Background. Non-Hispanic Asian Americans (AA) are one of the fastest growing populations in the U.S., yet little information is known about the cardiovascular health (CVH) of this group. The objective of this study was to assess the CVH of AA using a nationally representative survey. Methods. Merging data from the National Health and Nutrition Examination Surveys (NHANES) in 2011-2012 and 2013-2014, we examined 7 metrics of CVH using national guidelines and recommendations: not smoking, normal weight (body mass index, BMI <25 kg/m²), adequate physical activity, healthy diet, normal blood cholesterol, normal blood glucose and normal blood pressure. Each CVH metric was weighted evenly, with scores for each metric being a 0 (not meeting standards) or 1 (meeting current standards), and the metrics were summed for a total score. Ideal CVH (ICVH) was defined as the percentage of those meeting recommendations for 6-7 metrics, and poor CVH (PCVH) defined as those meeting only 0-2. We compared the prevalence of ICVH and PCVH between non-Hispanic whites (NHW) and AA, as well as among AA by birthplace and years living in the U.S. We also assessed the adjusted prevalence ratios (APR, 95% Confidence Intervals [CI]) of ICVH for AA, using NHW as referent, controlling for age, sex, education, and health insurance status. Additional sensitivity analyses were performed using a previously established Asian-specific normal weight cut-point (BMI<23 kg/m²) for AA.

**Results.** In adjusted models, AA were more likely to not smoke, have a normal weight, report a healthy diet and have normal blood pressure, compared with NHWs. However,
NHWs were more likely to have normal blood glucose compared with AA, and no difference was identified with reported physical activity and blood cholesterol. The adjusted prevalence of ICVH was 9.2% for AA and 5.7% for NHWs (p<0.01). The adjusted prevalence of PCVH was 26.6% for AA and 33.5% for NHWs (p<0.01). AA were significantly more likely to have ICVH (APR 1.41, 95% CI: 1.25-1.60) compared to NHW, but there was no difference in ICVH comparing US-born and foreign-born, nor by years living in the US. Additional sensitivity analyses using lower BMI thresholds for AA, consistently found a higher percentage of normal weight AA compared with NHW (36.4% vs 30.4, p<0.01); with no differences in the adjusted prevalence of ICVH (6.7% vs 5.7%, p=0.4) and PCVH (30.8% vs 33.5%, p=0.2) between AA and NHW (APR 1.18, 95% CI: 0.84-1.66). Conclusion. AA currently account for 5.3% of adult population in the US, and have been identified as one of the fastest growing minority populations. In this study, AA had a higher prevalence of overall ICVH compared with NHWs; however, when using a lower BMI threshold for AA as recommended by some, there was no difference of ICVH between AA and NHW. Using unique risk scores for AA may better identify AA with less than ideal cardiovascular health.

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P144

Cardiovascular Risk Assessment in Western Honduras; An Epidemiological Perspective

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Background - Cardiovascular Disease (CVD) epidemiology varies significantly among Low and Middle-Income Countries. Honduras is the Central American country with the highest ischemic heart disease and CVD mortality rates. The objective of this study is to provide an epidemiologic perspective of CVD in Western Honduras by analyzing cardiovascular (CV) risk in a population of Hispanics/mestizos and calculating their predicted CVD mortality using Cardiovascular Risk Assessment Scores (CVRS) such as AHA/ACC Pooled-Cohort Equations (PCEs), Framingham Risk Score (FRS) and Multi-Ethnic Study on Atherosclerosis (MESA) Risk Score.

Methods - Data was derived from Torres et al study, which was a cross-sectional, primary-prevention study, including 382 subjects between 45-75 years, in Copán, Honduras, between November 2016 and January 2017. Results - Out of 379 subjects meeting inclusion criteria, 38% (143 of 379) were male and 62% (237 of 379) were female. Age was 57 ± 8.2 for men and 58 ± 7.7 for women. Prevalence of hypertension was 49.7% (71 of 143) in men and 47.7% (113 of 237) in women; 91.3% (168 of 184) were being treated. DM was present in 19% (27 of 143) of men and 22.1% (52 of 237) of women; 96.2% (75 of 79) were being treated. Obesity was 24.5% (35 of 143) in men and 24.1% (57 of 237) in women. Total cholesterol was ≥ 200 mg/dl in 63.1% (239 of 379) of subjects, 21.8% (52 of 239) were taking lipid-lowering medications. For men and women respectively; AHA/ACC-PCEs was ≥7.5% (high-risk) in 62.2% (89 of 143) and 29.8% (71 of 237), FRS was ≥20% in 46.2% (66 of 143) and 15.2% (36 of 237), and MESA Risk Score was ≥7.5% in 70.6% (101 of 143) and 17.7% (42 of 237).

Conclusions - After collecting anthropometric
and laboratory data, calculation of CVRAS showed significantly elevated rates of high-CV risk patients according to all 3 scores. This is the first study of its type in Honduras. Efforts should be made to aggressively reduce CVD risk factors, and follow this cohort of subjects to better understand CVD morbidity and mortality in Western Honduras.


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P145

Ideal Cardiovascular Health and Incidence of Atherosclerotic Cardiovascular Disease in a Large Integrated Health Care System

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Background: The American Heart Association (AHA) introduced the concept of cardiovascular health (CVH) and defined "ideal," "intermediate," and "poor" CVH categories for adults based on cardiovascular disease risk factors and health behaviors. We sought to examine the association between these levels of CVH and incident atherosclerotic cardiovascular disease (ASCVD) events in a large diverse population. Methods: In a large integrated healthcare delivery system in Northern California, we gathered 6 AHA metrics (smoking status, physical activity, body mass index, blood pressure, total cholesterol, and blood glucose) during 2013-2014, graded on a scale of 0 to 2, with 2 indicating "ideal" status, 1 "intermediate" status, and 0 "poor" status. Points were summed to define three categories of Poor (0-6), Intermediate (7-9) and Ideal (10-12) CVH. ASCVD was defined as non-fatal myocardial infarction (MI), fatal coronary heart disease (CHD) and fatal and non-fatal stroke from electronic medical records and state death certificates during 2015. Incident ASCVD rates per 100,000 person-years were calculated. Results: Among 1,103,583 adult members (55.5% female) receiving outpatient care with all 6 metrics, there were 194,957 (17.7%) age 18-39, 585,449 (53.0%) age 40-64, and 323,177 (29.3%) age >65 years. There were 74,737 (6.8%) Blacks, 171,058 (15.5%) Hispanics and 225,303 (20.4%) Asian/Pacific Islanders. Poor CVH was present in 240,831 (21.8%), Intermediate in 584,013 (52.9%) and Ideal CVH in 278,739 (25.3%). During 2015, incidence of overall ASCVD, CHD (non-fatal MI and fatal CHD) and stroke (fatal and non-fatal stroke) was lower with better CVH metrics (p < 0.0001 for trend) (Figure). Conclusions: In a diverse real-world population, a significantly lower incident of ASCVD was noted among individuals with
Ideal CVH. This indicates continued need for large scale efforts to track and improve cardiovascular risk factors and behaviors.


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P146

Public Health Surveillance Reveals an Increase in Health Care Utilization for Generic versus Brand-name Warfarin Users

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Background: Even with many direct oral anticoagulant options, brand-name or generic warfarin is still widely used to prevent atherothrombotic events in cardiology. Federal standards regulate bioequivalence of generic vs. brand-name drugs through comparative bioavailability studies but does not regulate clinical equivalence nor tolerability in a “real-life” settings. Through public health surveillance, we have evaluated the impact of the generic warfarin commercialization on health care utilization: emergency room (ER) consultations or hospitalizations. Methods: We used an interrupted time series analysis using the Quebec Integrated Chronic Disease Surveillance System, a surveillance system from the second populous province in Canada (~8.3 million in 2017). Rates of health care utilization for warfarin users (n=280,158) aged ≥ 66 years were calculated for 6-month periods, 5 years before up to 15 years after warfarin commercialization (from January 1996 to January 2016). Periods before and after generic warfarin commercialization were compared by negative binomial segmented regression models for all users with a specific variable for generic or brand-name users. Sensitivity analyses were also conducted. Results: Generic warfarin analogs (n=5) were commercialized from January 2001. There was an approximated mean rate of 1134 ER or hospitalizations for 1000 brand-name and generic users per 6-month period, similar before and after generics commercialization. After generics commercialization, there was an immediate increase in rates of health care utilization for generic (9.9%) vs. brand-name users (0%), a statistically significant difference (9.9% [95% confidence interval: 4.4% to 15.5%], p = 0.0001). Rates of health care utilization remained stable and higher for generic vs. brand-name users throughout the period after generics commercialization. Conclusion: Among generic warfarin users, we observed an increased rates of health care utilization soon after generics commercialization. Risk and survival analysis studies controlling for potential confounders are required to deepen this pharmacovigilance signal as stricter licensing process may be required.

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**P147**

**Statin Therapy is Associated With a Lower Risk of Death in Patients Post Myocardial Infarction**

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**Introduction:** The use of statins after acute myocardial infarction (MI) has been shown to reduce the risk of recurrent MI and mortality. We examined the association between statin therapy and the risk of 1-year mortality after MI hospitalization. **Methods:** Data from the Veterans Health Administration was used to create a national sample of Veterans hospitalized for their first MI event between 2002 and 2015. Veterans with prevalent heart failure, stroke, or cancer diagnoses at the time of discharge for the index MI and prolonged hospitalization (greater than 30 days) were excluded. The statin therapy group was defined as Veterans having any statin prescription at the time of discharge. The primary outcome was all-cause mortality obtained from the National Death Index. We fitted a Cox regression model adjusted for age, length of hospital stay, peak cardiac troponin I ratio (the ratio of the peak measurement to the reference upper limit of normal for the assay) during hospitalization, statin use before admission, beta blocker prescription at discharge, liver disease, peripheral arterial disease, estimated glomerular filtration rate, high-density lipoprotein and total cholesterol levels. Billing codes were used to define exclusion criteria and co-morbidities. **Results:** Among 16,263 Veterans hospitalized for MI, mean age was 62 years and 98% were men. During 350 days mean follow-up, 966 deaths occurred. In the statin therapy group 709/13,334 (5.3%) of Veterans died compared to 257/2,929 (8.8%) of Veterans without statin therapy. In an age-adjusted model, 1-year mortality was 35% lower (HR 0.65, 95% CI 0.56 - 0.75) for patients that were prescribed a statin at discharge compared to Veterans who did not receive a statin at discharge. In a multivariable model we observed a 27% (HR 0.73, 95% CI 0.63 - 0.85) lower risk of death for users of statin therapy compared to non-users (Figure). **Conclusions:** Statin therapy prescribed after a first MI event may reduce the 1-year risk of all-cause mortality.


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**P148**

**Heart Disease Among Breast Cancer Patients**

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Purpose:
In conjunction with women being diagnosed earlier with breast cancer and a rapidly aging population, advances in cancer therapies have swiftly propelled cardiotoxicity as a major health concern for breast cancer patients. Frequent cardiotoxicity outcomes include: reduced left ventricular ejection fraction (LVEF), myocardial infarction, asymptomatic or hospitalized heart failure, arrhythmias, hypertension, and thromboembolism. The purpose of this study was to use an electronic health records system determine if an increased odds of heart disease was present among women with breast cancer.

Methods:
Data from the Research Action for Health Network (REACHnet) was used for the analysis. REACHnet is a clinical data research network that uses the common data model to extract electronic health records (EHR) from health networks in Louisiana (n=100,000). Women over the age of 30 with data (n=35,455) were included in the analysis. ICD-9 diagnosis codes were used to classify heart disease (HD) (Hypertensive HD, Ischemic HD, Pulmonary HD, and Other HD) and identify breast cancer patients. Additional EHR variables considered were smoking status, and patient vitals. Chi-square tests, crude, and adjusted logistic regression models were computed utilizing SAS 9.4.

Results:
Utilizing diagnoses codes our study team has estimated 28.6% of women over the age of 30 with a breast cancer diagnosis (n=816) also had a heart disease diagnosis, contrasted with 15.6% of women without a breast cancer diagnosis. Among patients with heart disease, there was no significant difference in the distribution of the type of heart disease diagnoses by breast cancer status (p=0.87). There was a 2.21 (1.89, 2.58) crude odds ratio of having a CVD diagnoses among breast cancer cases when referenced to cancer free women. After adjusting for age (30-49, 50-64, 65+), race (black/white), and comorbidities (obesity/overweight, diabetes, current smoker) there was an increased risk of heart disease (OR: 1.24 (1.05, 1.47)).

Conclusion:
The short-term and long-term consequences of cardiotoxicity on cancer treatment risk-to-benefit ratio, survivorship issues, and competing causes of mortality are increasingly being acknowledged. Our next efforts will include making advances in predictive risk modeling. Maximizing benefits while reducing cardiac risks needs to become a priority in oncologic management and monitoring for late-term toxic effects.

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P149

Retention of Participants in Longitudinal Research: The Multi-Ethnic Study of Atherosclerosis

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Background: Retention of participants is a critical component of ensuring the scientific goals of longitudinal research studies. Differential rates of attrition for ethnic minority participants can be particularly problematic in the fields of health and cardiovascular research, where ethnic minorities are shown to have disproportionately higher rates of both cardiovascular disease and risk factors for heart disease such as diabetes, hypertension, and obesity. The ability to explore the underlying causes of these differences is adversely affected when attrition in a study occurs at a higher rate among the ethnic minority subject participants. Understanding and preventing the causes of subject drop-out to improve retention among all ethnic groups is therefore a vital endeavor of any longitudinal research or cohort study.

Methods: We analyzed data on ten-year
retention rates of Caucasian, Chinese, Hispanic, and African-American participants in the Multi-Ethnic Study of Atherosclerosis (MESA). 6814 participants were recruited into the study in 2000, and 5,865 participants were still alive for the fifth in-person examination ten years later. Of these, 4651 participants returned for this examination. Logistic regression was used to examine the association between retention in the study, race/ethnicity and various baseline demographic characteristics, including age, gender, marital status, income, employment, education, language, place of birth, health insurance status and overall health status as measured by a 10-year predicted cardiovascular disease rate.

**Results:** Racial differences in retention were observed, with Chinese, African-American, and Hispanic participants having 30-40% lower odds of being retained than Caucasian participants. However, after adjusting for demographic variables, these differences were primarily explained by indicators of socioeconomic status. Higher income, higher education, employment status, availability of health insurance and health status were significantly associated with ten-year retention in the study across all racial/ethnic groups. Marital status, gender, age, and birthplace (US vs non-US) were not associated with retention.

**Conclusions:** Although minority participants were retained at lower rates in MESA, this can be primarily explained by differences in socioeconomic status and health status. Individuals with higher SES indicators may have life circumstances making participation in an examination taking much of a full day more plausible. Future studies should consider how these findings may inform developing support services or incentives which make follow-up participation in clinical research more persuasive for these individuals.

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**P151**

**Primary ASCVD Risk Associated With Undiagnosed Conditions Decreased Over NHANES 1999-2014**

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**Introduction:** Atherosclerotic cardiovascular disease (ASCVD) is a general term for a group of diseases characterized by atherosclerosis that affect the heart and blood vessels. ASCVD is the leading cause of death in the United States contributing to at least 200,000 preventable deaths from heart disease and stroke each year. Cardiovascular disease, heart disease, and stroke mortality has declined since the year 2000, due to broader use of evidence-based therapies and changes to risk factors and lifestyle modifications, but the decline began to slow after 2011. Two main risk factors contributing to ASCVD are high blood pressure and high cholesterol. Efforts have been made to increase control of these factors at the population-level, however, only those who are diagnosed can be treated. While awareness has increased over time, there is still a significant contribution to ASCVD events from those who were undiagnosed but have high blood pressure, high cholesterol, and/or diabetes.

**Hypothesis:** To assess how much of the total U.S. population ASCVD risk is undiagnosed from 1999-2014. **Methods:** The Pooled Cohort Equations assessed 10-year ASCVD risk, based on age, sex, race, total cholesterol, HDL level, systolic blood pressure, use of blood pressure medication, smoking status, and diabetes status. The undiagnosed risk of the primary risk population (age 40-79 years, without missing values for necessary cholesterol, blood pressure, and glucose measures) from 1999-2014 Continuous National Health and Nutrition Examination Survey (NHANES) was calculated based on self-report questions and clinical measures, after age, sex, race, smoking, and diagnosed risks were accounted for. Linear regression for complex survey data tested
whether undiagnosed risk was changing over time. Results: Applying the ASCVD risk equation to the NHANES subset (n=8,763; weighted n=104,421,757), undiagnosed conditions were associated with 10% of the projected ASCVD events. That is, per 100,000 Americans in this subset, 7,747 ASCVD events were estimated over 10-years, and 800 were based on risk from undiagnosed diabetes, hypercholesterolemia, or hypertension. However, ASCVD risk associated with undiagnosed conditions over time decreased (p<0.001), from 1,169 per 100,000 in 1999-2000, to 642 per 100,000 in 2013-2014. Conclusions: NHANES creates a unique opportunity to quantify undiagnosed ASCVD risk in a nationally representative sample. Since 1999, a sizeable portion of the US primary ASCVD risk was based on undiagnosed conditions, however, this proportion of undiagnosed risk decreased over time.


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P152

Health Informatics: A New Hope for Familial Hypercholesterolemia

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Introduction: Electronic Health Records (EHRs) benefit record keeping, information collation, error prevention, and charge capture. They provide a large database of clinical information that can be used for research. Sorting vast amounts of data manually is inefficient, hence, an effectual, validated method is required to uncover information from large sets of data and generate knowledge.

The U.S., and especially West Virginia, has a tremendous burden of cardiovascular disease (CVD). Undiagnosed Familial Hypercholesterolemia (FH) is an important factor for CVD in the U.S. FH results in elevated levels of LDL from childhood and early atherosclerotic disease. We are interested in better screening processes for FH. One method is to detect adults with coronary artery disease (CAD) and determine if their lipid levels are indicative of FH. Relatives and children can then be screened for FH and treated. Efficient identification of a CAD phenotype from EHRs is an important initial step in this screening process.

Hypothesis: We hypothesized that a CAD phenotype detection algorithm that uses discrete data elements from EHRs can be validated as a precursor to detection of FH.

Methods: We developed an algorithm to detect a CAD phenotype, which searched through discrete data elements, such as diagnoses lists (ICD-10) and procedure (CPT) codes. Direct inspection of EHR discrete data avoided the need for artificial intelligence, such as natural language processing.

The algorithm was applied to a cohort of 1,000 patients with varying characteristics. We then determined which patients had CAD by systematically going through EHRs. Following this, we revised the algorithm by refining the constraints under which it operated. We ran the algorithm again on the same 1,000 patients, and determined the accuracy of the modified algorithm.

Results: Manual validation of the 1,000 patients resulted in 413 with CAD and 587 without. The original algorithm distinguished 488 CAD positive patients and 512 CAD negative patients. This was 89% accurate, 96% sensitive, and 85% specific.

After revising the algorithm and applying it to the same cohort, it determined that there were 474 CAD patients and 526 without CAD. This was 93% accurate, 99% sensitive, and 89%
specific.

**Conclusion:**
EHR usage has created a large pool of minable clinical data. However, without an efficient method to obtain inferences from it, the information cannot be effectually utilized. We have created an algorithm that detects CAD on a large scale with high accuracy. It has proven to be useful among a varied patient population. Since the constraints that are used, such as ICD codes and CPT codes, are universal, it can be utilized across many hospital systems; although, local validation is prudent. Using this algorithm can select a population with a propensity for FH, thereby allowing us to screen and manage patients with undiagnosed FH or other familial dyslipidemias.

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P154

**Blood Pressure and Lipid Control Variation in Faculty versus Trainee Clinics**

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Background: Clinics run by trainees are often composed of indigent patients with challenging problems as to implementation of preventive measures. Methods: Charts were selected based on the inclusion of hypertension as a diagnosis; 100 visits were reviewed in each of two groups. The first group (clinic 1) included patients seen by a cardiologist faculty; all patients had insurance. The second group (clinic 2) included visits seen by cardiology fellows, and directly supervised by the same faculty physician; with the majority of these patients lacking insurance. The difference between the groups with regards to age, systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), and LDL cholesterol were analyzed using Student's t-Test. Results: The mean age of patients in clinic 1 was 62±14 years compared with 52±9 years in clinic 2 (P < 0.01). There was 100% documentation of weight, BP and HR on every visit. The mean weight in clinic 1 was insignificantly lower compared with clinic 2 (202±61 vs 218±60 lbs respectively; P = 0.06). SBP was similar in both clinics (132±18 vs 130±21 mmHg respectively; P = 0.38). HR was lower in clinic 1 compared with clinic 2 (67±10 vs 77±15 BPM respectively; P < 0.01). Lipid profiles, which required a separate visit to the lab and extra charge, were documented in 93% of patients in clinic 1 versus only 34% of patients in clinic 2. LDL cholesterol was lower in clinic 1 compared with clinic 2 (88±34 vs 106±35 mg/dL respectively; P=0.01). While HDL was similar in both clinics (48 ± 14 in clinic 1 versus 46 ± 15 mg/dL in clinic 2; P = NS), non-HDL was lower, at 115 ± 38 in clinic 1 versus 136 ± 40 mg/dL in clinic 2 (P < 0.01). Discussion: Hypertension and dyslipidemia are major health problem. Adequate control of blood pressure and LDL cholesterol correlate with better cardiovascular outcomes. Our data demonstrate that both faculty and fellow clinics achieved mean BP of < 140/90 mmHg, with 100% documentation. However, documentation and control of lipids appear to be more challenging in indigent patients due to the extra burden and cost of undergoing lab tests. Compliance with medications and the prescription of affordable generic, often less potent, lipid-lowering therapy to indigent patients in the fellow clinic may also play a role in the higher LDL levels compared with the faculty clinic. Efforts at improving the adherence of all patients to preventive therapy aimed at achieving guideline-based BP and lipid targets should be included in quality improvement projects during residency training.

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RISK FOR RECURRENT EVENTS AMONG PATIENTS RECEIVING INTENSIVE MEDICAL MANAGEMENT FOLLOWING MYOCARDIAL INFARCTION


Background: Randomized trials have shown that several medications reduce the risk for recurrent coronary heart disease (CHD) events following myocardial infarction (MI). Knowing the risk for recurrent events among patients receiving intensive medical management following MI can inform patient-physician shared decision making. Objective: To estimate the risk for CHD events among patients receiving intensive medical management following an MI hospitalization. Methods: We identified US adults 18-64 years with commercial health insurance in MarketScan who had an MI hospitalization (defined by an ICD-9 code of 410.x0 or 410.x1 in the primary discharge diagnosis position) in 2014-2015. Intensive medical management was defined as filling a high-intensity statin, renin-angiotensin system inhibitor, beta-blocker and antiplatelet agent within 30 days following hospital discharge for MI. Patients receiving intensive medical management were matched 1:2 by age, sex and calendar year to randomly selected controls from the general population and followed for recurrent MI and CHD events (i.e., MI or coronary revascularization). Results: Among MI patients (n=17,643, mean age 55 years, 74% male), 29.6% received intensive medical management. After adjustment for comorbid conditions, intensive medical management was more common among men (relative risk [95% CI] 1.14 [1.07, 1.20]), those who received a stent during their MI hospitalization (2.54 [2.37, 2.73]) and those who received cardiologist care (1.17 [1.11, 1.22]) and cardiac rehabilitation (1.14 [1.08, 1.20]) after hospital discharge. The risk for recurrent MI and CHD events was higher among MI patients receiving intensive medical management compared to controls, overall and when restricted to MI patients with high medication adherence (Table). Conclusion: MI patients receiving intensive medical management have a substantial residual risk for recurrent CHD events.

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Comorbidity Profile Preceding Dementia Diagnosis: Findings From the Atherosclerosis Risk in Communities (ARIC) Study Cohort

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**Background** Most patients receive a diagnosis of dementia late in the course of the disease. In an effort to learn more about the potential for earlier detection, we examined comorbidity burden preceding a diagnosis of dementia in a cohort of older adults.

**Methods** Cognitive status of ARIC Study cohort participants (n=6,538) was adjudicated at Visit 5 (2011-2013) by a classification committee of physicians and neuropsychologists using a battery of neurocognitive tests, functional assessments, and neurologic exam. Additionally, cognitive status of participants who did not attend the Visit 5 examination, but were alive at the time of the visit (n= 2,289) was ascertained through a Telephone Interview for Cognitive Status-Modified (TICS) or Clinical Dementia Rating (CDR) informant interview. We examined the presence of dementia diagnostic codes in claims for inpatient and outpatient services occurring during the years 1991-2013 and preceding dementia diagnoses among all ARIC cohort participants with a dementia classification. In a sample of study participants who were enrolled in continuous fee-for-service (FFS) Medicare for at least 5 years prior to dementia ascertainment, we examined the comorbidity profile preceding the date of dementia ascertainment using ICD9 diagnostic codes obtained from inpatient records and claims for outpatient office visits.

**Results** Of the 7,283 ARIC participants enrolled in FFS Medicare at the time of ARIC dementia ascertainment (39.6% men, 26.4% black, mean age 76.7 years (SD 5.4)), 901 (12.4%) were classified as having dementia. Only 41.3% of those classified with dementia and 2.6% of those classified as cognitively intact had dementia diagnostic codes in any position in claims for inpatient or outpatient care preceding the ascertainment of cognitive status. In analyses limited to participants with 5 years of continuous FFS Medicare enrollment prior to the cognitive status ascertainment, we observed a consistently greater frequency of hospitalizations among study participants with a subsequent dementia classification, as compared to those with no cognitive impairment (1.62 (SD 0.08) vs. 1.10 (SD 0.05) hospitalizations per participant in the year preceding dementia diagnosis, respectively). No difference in the frequency of outpatient visits was observed. In addition to a greater frequency of diagnostic codes for cerebrovascular disease and cerebral degeneration, those with a positive dementia classification had a greater prior frequency of ICD9 codes for depression, heart failure, acute renal failure, and fluid and electrolyte disorders, as compared to those with no cognitive impairment.

**Conclusion** Dementia patients may have distinct comorbidity profiles in the years preceding a diagnosis. A greater understanding of these profiles is important for characterizing patient factors that may enable early detection and management.
Examining Differences in Interest in Clinical Trial Participation Between Those With and Without a Previous Diagnosis of Hypertension or Heart Disease

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Purpose: Despite the large impact heart disease has on morbidity and mortality, many are unaware of the risk factors and the steps they can take to reduce their own risk. Participation in clinical trials for discovering new approaches for the prevention and treatment of heart disease is important. This study sought to determine interest in participation in clinical trials of those diagnosed with heart disease and hypertension as compared to those without such diagnoses, and to assess associated sociodemographic characteristics of interest in participation.

Methods: Analyses were conducted using data from the 2014 administration of the National Cancer Institute's Health Information National Trends Survey. HINTS is a nationally-representative survey of the US adult (18+) population. The primary outcome of interest was whether respondents expressed interest in participating in research. Bivariate analyses were conducted initially to explore potential associations between sociodemographic factors and having a diagnosis of hypertension or heart disease. Multivariate logistic regression was used to assess relationships between sociodemographic factors and outcomes, controlling for relevant sociodemographic characteristics and prior diagnosis of hypertension or heart attack.

Weighted analyses were done to obtain population-level estimates. Findings: Of the 3,498 respondents, 1,569 (33.3%) reported having a prior diagnosis of hypertension; 362 of 3,493 (7.0%) respondents indicated that they had a previously diagnosed heart condition. Logistic regression showed that younger hypertensive participants had higher odds of being interested in participating in clinical trials as compared to those aged 75 years and older (OR = 3.62, 95% CI = 1.94-6.78). Those with regular care providers had higher odds of being interested in clinical trial participation compared to those without regular providers (OR = 1.51, 95% CI = 1.07-2.11). Likewise, younger participants aged 18-34 reporting heart conditions (OR = 3.58, 95% CI = 1.79-7.16) had higher odds of being interested in clinical trial participation compared to those aged 75 and older. No statistical differences were seen in clinical trial awareness, participation, or interest across race or gender.

Conclusions: Participants who have a diagnosis of heart disease or hypertension and report being interested in engaging in clinical trial research are generally younger and have a regular health care provider. Therefore, behavioral intervention efforts should focus on translating clinical trial participation interest to participation in younger adults. Clinical trial recruitment efforts should also focus on unique methods to increase interest and subsequent trial enrollment in older adults and those without regularly provided care.

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P157
Background: Availability of lipid profile during a patient’s clinic encounter can improve decision-making in regards to therapy, and help achieve therapeutic goals. Methods: Encounters from 2 clinics run by one cardiologist; a University-based clinic and a Veterans Administration (VA) clinic were compared for availability of cholesterol profiles and level of cholesterol control in patients with coronary disease. Results: There were 93 out of 300 encounters (31%) with documented coronary disease (CAD) in the University clinic and 77 out of 134 encounters (57%) in the VA clinic. University patients with CAD had 61% (57/93) lipid documentation during their encounters, while VA patients had 99% (76/77) documentation. The average total cholesterol and LDL for University patients was 179 ± 42 mg/dL and 111 ± 35 mg/dL respectively, compared with 154 ± 38 mg/dL and 93 ± 35 mg/dL for the VA patients respectively (P < 0.01 for each category). Only 39% (22/57) of the University-based patients achieved LDL < 100 mg/dL, compared with 66% (51/77) of VA patients. Blood pressures, which were consistently documented every clinic visit in both clinics, averaged 128/76 mmHg in the University clinic compared with 131/75 mmHg in the VA clinic, with no statistically significant difference. Conclusion: Better control of cholesterol levels is seen in the VA-based clinic compared with the University-based clinic. This may partially be explained by the availability of laboratory results through a unified computer system, allowing more prompt decision-making with regards to medication changes and intensified dietary counseling during the clinic encounter. This may not be always available in other settings where laboratory tests are performed by a different provider utilizing a different reporting system which may not be readily shared or available to the treating cardiologist. Other factors could include variable compliance with laboratory appointments and access to medications. Our findings support establishing means for cardiologists to have access to patients’ laboratory results during their encounter to help more efficient decision making.


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P159

No Gender Difference in All-Cause Mortality Rates in a Cohort of Heart Failure With Preserved Ejection Fraction in the US Veteran Population

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Introduction: Heart failure with preserved ejection fraction (HFpEF) affects about 5% of people 65 or older, with a higher prevalence in women. Previous studies suggest that women with HFpEF may live longer than men. Further understanding of mortality outcomes by gender could be useful in implementing gender-specific treatment strategies to improve outcomes in HFpEF patients.

Hypothesis: We assessed the hypothesis that women have a lower rate of total mortality than males in a US Veteran HFpEF cohort.

Methods: We used a validated algorithm to curate a HFpEF cohort using ICD9 codes, laboratory values, medications, and ejection fraction values from the national Veterans Affairs database. This algorithm had 88% sensitivity and 96% specificity. We examined crude and adjusted mortality rates by gender, beginning at the time of heart failure diagnosis with follow-up through 2016. The adjusted mortality rate was directly standardized to the population of veterans with heart failure (n=626,179) according to distribution of age, race,
cardiovascular disease (CVD), and chronic kidney disease (CKD). Crude and standardized rate ratios were calculated from the mortality rates.

Results: Our HFpEF cohort (n= 74,937) included 72,267 men and 2,670 women. Mean age was 72.5 (11.2) in men and 69.1 (14.3) in women at the time of heart failure diagnosis. Males were 85.2% white, 33.7% had CVD, and 27.1% had CKD, whereas females were 82.5% white, 28.7% had CVD, and 20.5% had CKD. During a mean follow up of 4.8 (3.7) years, 52,703 deaths occurred in men and 1,614 deaths occurred in women. The crude mortality rate was significantly lower for females (109.7/1000 person-years) compared to males (153.5/1000 person-years). Corresponding crude incidence rate ratio (95% CI) for total mortality comparing females to males was 0.71 (0.69-0.74; p<.0001). However, after standardizing, there was no significant difference in total mortality rates between men (170.0/1000 person-years) and women (173.4/1000 person-years). The standardized mortality rate ratio was 1.02 (95% CI: 0.84-1.23; p=0.8397).

Conclusions: In conclusion, our data do not show any difference in total mortality rate between men and women following the diagnosis of HFpEF.


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P160

Rehabilitation Therapy in Older Acute Heart Failure Patients (The REHAB-HF Trial)


Introduction: Older patients with acute decompensated heart failure (ADHF) have impaired physical function (PF) and reduced quality of life (QOL). However, the relationship between impairments in PF and QOL are unknown but relevant to clinical practice and design of targeted intervention trials in this high-risk population. Methods: We assessed 202 consecutive patients hospitalized with ADHF in the multicenter Rehabilitation Therapy in Older Acute HF Patients (REHAB-HF) Trial. Standard measures of PF included the Short Physical Performance Battery (SPPB), a validated PF outcome measure in frail elderly, and 6-minute Walking Distance (6MWD). QOL was assessed by Kansas City Cardiomyopathy Questionnaire (KCCQ). Pearson’s correlation statistics examined associations between PF and QOL. Stepwise regressions were performed to identify independent predictors of QOL including PF measures, demographics, and disease severity indicators (NYHA class, previous hospitalizations, duration of current hospitalization, and number of HF signs and symptoms). Results: Participants were 72±7.5 years, BMI 33.2±8.8 kg/m², 54% women, 52% non-white, 52% with reduced ejection fraction, and 44% with previous hospitalizations within 6 months. Participants had marked deficits in PF (SPPB 6.0±2.5 units, 6MWD 185±99 meters) and low QOL (KCCQ Physical Limitation Score (PLS)

Relationship of Physical Function and Quality of Life in Elderly Patients With Acute Decompensated Heart Failure: The
47.3±23.8). There were modest but highly significant correlations of QOL measures with SPPB, 6MWD, and number of HF symptoms and signs (Table). Using stepwise regressions, 6MWD and BMI were modest, significant independent predictors of QOL (partial r=0.18, p=0.012 and partial r=-0.27, p=0.0003, respectively), while SPPB, demographics, and HF severity indicators were not. Conclusion: In older, hospitalized ADHF patients, PF and QOL are both severely impaired, but are only modestly related. PF and QOL assess unique domains of impairment and provide complementary information for characterizing clinically meaningful patient-oriented outcomes in ADHF.


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P161

Self-Management Resources in Heart Failure: A Prospective Community Study

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Introduction: Little is known about the characteristics and resources that enable patients with heart failure (HF) to engage in effective self-management. To address this gap in knowledge, we measured personal and health care resources for self-management and examined associations with mortality among patients with HF. Methods: We surveyed 5543 residents of 11 counties in Southeast Minnesota with a first-ever code for HF [International Classification of Disease, Ninth Revision code 428 or Tenth Revision code I50] between 1/1/2013 and 3/31/2016. Self-management resources were measured with the health care and personal subscales of the Chronic Illness Resources Survey (CIRS), both of which included 3 questions on a 5-point scale. The responses were averaged and participants were categorized as low if the mean score was below the median of the distribution (range from 1 to 5). The survey was returned by 2866 participants (response rate 52%) and those with complete data on the main items of interest were retained for analysis (N=2212). Cox proportional hazards regression was used to determine the association between each subscale and mortality. Results: Among 2212 participants (mean age 72.8 years, 54.1% men) the median health care score was 4, while the personal score was 3. Those with low health care resources were older and less educated than those with a higher score (p<0.05), while those with low personal resources had less comorbidities and lower education attainment compared to those with a higher score (p<0.05). After a mean (SD) follow-up of 1.3 ± 0.6 years, 207 deaths occurred. Low levels of both self-management resources were associated with an increased risk of death compared with patients with high levels (Table). Conclusions: Having limited self-management resources is associated with an increased risk of mortality among patients with HF. Thus, interventions aimed at supporting self-management among patients with HF may improve outcomes.

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The Association Between Hypertension and Incident Heart Failure by Race and Gender

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Background: Hypertension is a major risk factor for heart failure (HF), but associations of hypertension with HF may vary by race and gender. Objective: To assess race and gender differences in the association between hypertension and incident HF hospitalization in the REasons for Geographic And Racial Differences in Stroke (REGARDS) study.

Methods: REGARDS participants without suspected baseline HF (n = 25,759) were followed from study entry in 2003-2007 through 2014 with adjudication of incident HF hospitalizations (n = 855). Hypertension was defined as systolic or diastolic blood pressure ≥ 140/90 mmHg or self-reported antihypertensive medication use. Cox regression was used to calculate hazard ratios (HR) and 95% confidence intervals (CIs) for the association between hypertension and HF hospitalization in subgroups separately by race or gender, with each subgroup model adjusted for race, gender, age, income, region of residence, health insurance, body mass index, smoking, history of coronary heart disease, diabetes, reduced estimated glomerular filtration rate, total cholesterol, statin use, physical activity, perceived stress, and depressive symptoms.

Results: The mean age of the population was 64.5 years, 40.0% were black and 55.0% were female. The prevalence of hypertension was 57.1% and more common among blacks (69.3%) compared to whites (48.9%) but similar among males (56.5%) and females (57.6%). Over a median follow-up of 8.4 years, incidence rates for HF hospitalization were 4.19, 4.46, 5.14 and 4.29 per 1,000 person-years for whites, blacks, males and females, respectively. After multivariable adjustment, the association between hypertension and HF was stronger among blacks versus whites (HR 2.28 vs HR 1.50, p-interaction=0.04) and similar among males and females (HR 1.61 vs HR 1.83, p-interaction=0.19). (Figure) Conclusion: Hypertension may be a stronger risk factor for incident HF among blacks versus whites. This finding may be due to disparities in hypertension severity, control, or duration.

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P163

Coffee Consumption and Risk of Heart Failure in the Physicians' Health Study
**Background:** Coffee consumption is highly prevalent in the United States (US). While previous studies have reported a positive association of coffee consumption with hypertension (HTN) and coronary artery disease, only a few studies have examined the association of coffee consumption with risk of heart failure. Hence, we sought to examine the relation between coffee consumption and risk of heart failure among male physicians.

**Hypothesis:** We hypothesized that coffee consumption is inversely associated with the risk of heart failure.

**Method:** We prospectively studied 20,433 middle-aged and older men from The Physicians’ Health Study. Coffee consumption was assessed using a semi-quantitative food frequency questionnaire. The incidence of heart failure was assessed using annual questionnaires and validated in a subsample using review of medical records. We used Cox Proportional hazard model to compute the hazard ratios (HRs) and corresponding 95% confidence intervals (CIs) across categories of coffee and calorie adjusted caffeine intake, and cubic spline to estimate nonlinear trend.

**Results:** The average age was 66.4 years. During a mean follow-up of 9.3 years, a total of 901 new cases of heart failure were reported. In a Cox model adjusting for age, diabetes, smoking, atrial fibrillation, exercise, and alcohol intake, the HRs (95% CIs) of heart failure were 1.0(reference), 0.89(0.67-1.20), 1.27(1.00-1.62), 0.99 (0.80 - 1.22), 1.19 (0.99- 1.43), and 1.37 (1.05 - 1.80) for coffee consumption of almost never, <=1 cup/week, 2-6cups/week, 1cup/day, 2-3cups/day, and 4+cups/day, respectively; P for nonlinear trend = 0.02.

In a secondary analysis, higher caffeine intake was associated with a higher risk of heart failure, with Multivariable HRs (95% CIs) from the lowest to the highest quintile of dietary caffeine were 1.00(reference), 1.10 (0.90-1.35), 1.00 (0.81-1.25), 1.17 (0.95-1.45), and 1.25 (1.00-1.56), respectively; P for nonlinear trend = 0.06.

**Conclusion:** Heavy (+4 cups/day), but not light to moderate, coffee consumption is associated with a higher risk of heart failure.


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P164

**Cognitive Impairment Among Adults With Incident Heart Failure**

**Background:** Cognitive impairment is as high as 70% among adults with heart failure (HF) and its prevalence increases with the duration and severity of HF. However, little is known about the prevalence of cognitive impairment early in the course of HF. This is important, as high cognitive impairment at diagnosis would suggest that earlier screening would be warranted. We examined the prevalence and correlates of cognitive impairment among adults with incident HF.

**Methods:** We used data from the Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study, an observational, longitudinal cohort study of 30,239 community-dwelling adults ≥45 recruited from 2003 to 2007. Blacks and residents of the stroke belt were oversampled. Global cognitive status was assessed annually by telephone with the Six-item Screener (SIS) and the diagnosis of incident HF was validated by physicians using medical records and standard clinical criteria. Participants who were hospitalized for incident HF from 2004 until 2016 with a SIS completed > 1 month but < 18 months before the index hospitalization were included. After determining the prevalence of cognitive impairment among this cohort, we identified which of their baseline characteristics were independently associated with cognitive impairment using multivariable logistic regression. We then compared the prevalence of cognitive impairment among adults with incident HF to the prevalence of cognitive impairment among age, sex, and race matched participants without HF, stratifying by 10-year Framingham Coronary Heart Disease Risk Scores (FRS) (<10%, 10-20%, and > 20%).

**Results:** Of the 436 participants with incident HF, 14.9% had cognitive impairment. In an age-adjusted model, older age (OR 1.04 [95% CI 1.01 - 1.08], black race (OR 1.88 [95% CI 1.08-3.28]), < high school education (OR 1.89 [95% CI 1.02-3.51]), and anticoagulation (OR 3.01 [95% CI 1.05 - 8.63]) were independently associated with higher odds of cognitive impairment, whereas female sex (OR 0.54 [95% CI 0.31 - 0.94]) was associated with lower odds of cognitive impairment. The prevalence of cognitive impairment among participants with incident HF was higher than the prevalence of cognitive impairment among controls with low FRS (9.4%) but was less than the prevalence of cognitive impairment among controls with high FRS (21.9%).

**Conclusion:** The prevalence of cognitive impairment among adults with incident HF was greater than the prevalence of cognitive impairment among matched participants with low CHD risk, but less than the prevalence of cognitive impairment among matched participants with the highest CHD risk. This suggests that the majority of cognitive decline in HF may occur later in the course of the disease. Increased awareness of cognitive impairment among newly diagnosed patients, as well as ways to mitigate cognitive decline in the context of HF management, are warranted.
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Background
Coronary artery calcium (CAC) predicts incident heart failure (HF) independent of cardiovascular disease (CVD) risk factors. In MESA, Components of CAC, volume and density, have opposite associations with incident CVD, such that for a given volume of CAC, higher CAC density is inversely associated with events. The relationship between CAC volume and density with HF is unknown.

Methods:
We studied 6814 participants in a multi-ethnic, community-based cohort, free from clinical CVD at recruitment. CAC volume and density were measured by non-contrast cardiac CT at the baseline exam (2000-2002). Adjudicated HF events were assessed through 2014, and analysis limited to those with imaging confirmation and estimated ejection fraction (EF). Cox proportional hazard was used to estimate independent associations of baseline CAC volume and density with incident HF: HF with reduced (< 50%), and preserved EF (HFrEF & HFpEF respectively).

Results:
The mean age was 62±10 years, 47% were men, 38% identified as European-, 28% as African-, 22% as Hispanic-, and 12% as Chinese-ethnicity. Average time to 189 HF events (119 HFrEF & 70 HFpEF) was 6.6 years. In unadjusted models, higher CAC volume (HR 1.27 [1.02-1.59], p=0.03), but not CAC density (HR 0.87 [0.67-1.13], p=0.29) was significantly associated with incident HF, non-significant associations were observed with HFrEF, or HFpEF, and no significant associations were observed for all three outcomes after adjustments for demographics and CVD risk factors (Table). Also, in unadjusted analyses, stratified by sex (p-value for interaction = 0.13), higher CAC volume was associated with increased risk for HF (HR 1.37 [1.03-1.81], p=0.03) and HFpEF (HR 1.76 [0.99-3.16], p=0.06), in males only. No significant associations were observed after adjustments.

Conclusion: In a multi-ethnic cohort, CAC volume and density were not independently associated with HF, the trend for volume was positive while density was inverse. Low frequency of incident HF in our cohort was an important limitation.


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Associations of Sleep-Disordered Breathing in Relation to Incident Atrial Fibrillation and Change in Serum NT-proBNP Levels Among Japanese: The Circulatory Risk in Communities Study (CIRCS)

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**Introduction:** Sleep-disordered breathing (SDB) is considered as a risk factor of cardiometabolic diseases. However, the evidence on prospective association between SDB and risk of heart failure is limited. Therefore, we aimed to examine whether SDB is associated with the incidence of atrial fibrillation (AF) which is linking to heart failure, and high serum NT-proBNP levels during follow-up in general population.

**Hypothesis:** Since SDB is a known risk factor of hypertension, we hypothesized that SDB was associated with higher risk of atrial fibrillation and high serum NT-proBNP levels.

**Methods:** Among 4,971 Japanese men and women, we measured the frequency of 3% or more oxygen desaturation during night (3%ODI) using Pulse-oximeter (Pulsox-3Si; Minolta Inc.) from 2000 through 2005 in three areas across Japan. SDB was defined as 5 or more events/hour of 3%ODI. Incidence of AF was documented by ECG in annual cardiovascular health check-up until the end of March, 2017. Among 2,588 participants who participated in both of baseline survey (2000-2005) and follow-up survey (2009-2011), we measured serum NT-proBNP levels by electrochemiluminescence immunoassay method (ECLusys NT-proBNP II; Roche Diagnostics K.K.) at both periods. High NT-proBNP levels were defined as 400 pg/mL or more. HRs and 95%CIs of incident AF were calculated by using the Cox regression. Difference in change of serum NT-proBNP levels were tested between the presence and absence of SDB using ANCOVA, and ORs and 95%CIs were estimated by using the logistic regression. Analyses were stratified jointly by sex and fifths of age, and adjusted for drinking status, and current smoking. Statistical analyses were performed using the Statistical Analysis System 9.4 (SAS Institute Inc.). All P values were two-sided, and statistical and borderline significances were defined as P<0.05 and <0.10, respectively.

**Results:** During 42,437 person-years of follow-up, 79 individuals developed AF. Multivariable-adjusted HR of incident AF in relation to SDB was 1.58 (95%CI: 1.00-2.48). However, after further adjustment for BMI, the association was attenuated and became non-significant. Mean change of serum NT-proBNP levels during follow-up was 21.9 (95%CI: 16.5-27.4) pg/mL for non-SDB and 35.7 (27.0-44.5) pg/mL for SDB. Further adjustment for BMI made the association weak and of borderline significance. In those who was free of high serum NT-proBNP levels at baseline, multivariable-adjusted OR of high serum NT-proBNP levels for SDB was 1.64 (95%CI: 0.91-2.97) with borderline significance (P=0.10). Further adjusting for BMI weakened this association up to non-significant level.

**Conclusions:** SDB is associated with a higher AF risk and increasing serum NT-proBNP levels independently of age, sex, and heavy drinking habit, but not BMI.


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**P168**

**The Association of Longitudinal Changes in Metabolic Syndrome With Incident Heart Failure: The Atherosclerosis Risk in Communities (ARIC) Study**

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**Background:** Metabolic syndrome (MS) is a risk factor for the development of heart failure (HF). However, little is known about how changes in
MS over time are associated with HF risk. Hypothesis: We hypothesized that increasing MS components over time and a longer duration of MS would be associated with greater HF risk. Methods: We studied 8,104 participants at ARIC Visit 4 (1996-98) without baseline HF, coronary heart disease or diabetes. MS components were defined using AHA/NHLBI criteria for waist circumference, hyperglycemia, elevated blood pressure, low HDL-C and hypertriglyceridemia, and MS was diagnosed if ≥ 3 criteria were present. Using data on MS components from Visit 1 (1987-89) through 4, we used multivariate Cox regression models to evaluate associations of changes in MS components over time and duration of MS with incident HF occurring after Visit 4. Results: The mean age was 63 years (+/-6), with 58% female. Over a median follow-up of 16 years, there were 902 HF events. Compared to those without MS at Visits 1 and 4, those with MS at both time points had a hazard ratio (HR) for HF of 1.87 (95% CI 1.60-2.19), while those with no MS at Visit 1 but MS at Visit 4 (HR 1.38; 95% CI 1.16-1.64) and those with MS at Visit 1 but not at Visit 4 (1.51; 95% CI 1.13-2.00) had more modest risk associations. Among those without MS at Visit 1, those with 0 MS components at both Visits 1 and 4 had lowest HF risk (reference), with progressively higher risk seen for those who increased to 1-2 (HR 1.66; 95% CI 1.06-2.61), 3 (HR 2.15; 95% CI 1.37-3.38) and 4-5 (HR 2.55; 95% CI 1.58-4.13) MS components by Visit 4. Duration of MS had a positive association with HF risk (Figure), with a HR of 1.08 (95% CI 1.06-1.10) per year of MS duration. Conclusions: Progression in MS components over time and a longer duration of MS are associated with increased HF risk. Given the cardiovascular implications of these findings, particularly for the growing number of individuals developing MS components at an early age, strategies to prevent MS onset and progression should be implemented widely.


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P169

Antibodies to Citrullinated Protein Antigens (ACPA), Left Ventricular Mass and Ejection Fraction in the Multi-Ethnic Study of Atherosclerosis

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Background: Antibodies to citrullinated proteins (ACPA) are elevated in patients with rheumatoid arthritis (RA) and have been linked to altered left ventricular (LV) structure and function in RA. ACPA are detectable years before RA onset and in some individuals who do not develop RA. Among individuals without RA and without heart failure in MESA, we investigated associations between ACPA, LV mass, and LV ejection fraction (LVEF).

Methods: In a cross-sectional subsample of
1232 MESA participants, we measured ACPA using a multiplex array of 38 different ACPA. Each ACPA was defined as positive (+) if > 95th percentile cut-off in MESA. Number of (+) ACPA were summed for each participant (range 0-38). We compared ACPA(-) to ACPA(+) participants, and examined the association of number of ACPA with both outcomes. LVmass (g) and LVEF (%) were measured on cardiac MRI. We analyzed associations using generalized linear regression and adjusted for covariates listed in the table.

**Results:** Mean age was 65 years. The sample was 50% women, 40% Caucasian; and 31% had ≥ 1 (+) ACPA. Among ACPA(+) participants, median number (+) was 2 (IQR 1-6). ACPA(+) participants were similar to ACPA(-) participants in age, gender, and race/ethnicity, but had higher IL-6 levels. Mean LVmass for ACPA(+) vs ACPA(-) participants was 147g(39) and 146g(39), respectively; mean LVEF was 69%(7) and 70%(8), respectively. In adjusted analysis, LVmass and LVEF did not differ significantly between ACPA(+) and ACPA(-) participants. However, for every higher number of (+) ACPA, LVEF was 0.07% lower (p=0.02). Among individual ACPA, antibodies to Filaggrin 48-65 arg2v1cyc (p=0.04), histone 2B (p=0.01), and histone 2Bcit (p=0.02) were significantly associated with lower LVEF. No individual ACPA was associated with LVmass.

**Conclusion:** In community-dwelling individuals without RA or heart failure, greater numbers of detectable ACPA were associated with lower LVEF, but not LVmass. Future studies are required to determine whether ACPA are associated with incident heart failure.


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**P170**

**Associations of Calibrated Dietary Sodium and Potassium Intakes With the Risk of Heart Failure and its Subtypes in Postmenopausal Women: The Women's Health Initiative**

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**Background:** Previous studies have suggested that sodium reduction could be a viable strategy for reducing heart failure-related disease burden. Relatively few studies had been conducted on dietary sodium and the incidence of heart failure (HF) and its major subtypes; HF with preserved ejection function (HFrEF) and HF with reduced ejection function (HFrEF).

**Hypothesis:** We hypothesized that dietary sodium was positively associated with the risk of HF and its major subtypes with a linear dose-response relationship, whereas dietary potassium was inversely associated with the risks of these outcomes.

**Methods:** Our observational cohort study included 118,057 racial/ethnically diverse postmenopausal women recruited during 1993-1998 and followed up until 2015 in the Women’s Health Initiative. Women who reported a history of HF, were underweight, or
had implausible/missing food frequency questionnaire (FFQ) data were excluded at baseline. The exposures of our study were FFQ-measured dietary sodium and potassium calibrated by recovery biomarkers estimated from 24-hour urine excretion collections. The main outcomes were hospitalized heart failure, including HFpEF and HFrEF subtyping, as adjudicated by trained physicians.

**Results:** During up to 22 years of follow-up, 2,533, 1,048 and 673 participants developed HF, HFpEF and HFrEF, respectively. The mean age of the study population was 63.4 years, in which 84.3% (99,297 of 118,057) were white, 7.8% (9,150 of 118,057) were African American, 3.8% (4,469 of 118,057) were Hispanic and 4.1% (4,832 of 118,057) were other race/ethnicity groups. The median of calibrated dietary sodium intake was 2,712.4 mg/day (interquartile range: 2,503.3 mg/day-2,948.4 mg/day) and the median of dietary potassium intake was 2,494.5 mg/day (interquartile range: 2,249.8 mg/day-2,718.2 mg/day). After adjusting for potential confounding variables and risk factors of HF, calibrated sodium intake was positively associated with the incidence of HF (HR Q5 vs. Q1 =2.59, 95% CI: 2.26-2.98, P-trend <0.001). Comparing extreme quintiles of sodium intake, the HR was 2.87 for HFpEF (95% CI: 2.29-3.60) and 1.71 for HFrEF (95% CI: 1.28-2.30, both P-trend<0.001). The dose-response relationships between calibrated sodium intake and the risk of HF and HFrEF were non-linear with accelerated increasing risks at higher intake level, while the dose-response relationship for HFpEF was linear. Similar positive associations were observed for the analyses on calibrated sodium/potassium ratio, whereas calibrated potassium intake was not associated with the risk of HF and its major subtypes.

**Conclusions:** Higher sodium intake is associated with increased risk of HF and its major subtypes. The observed positive association appears to be stronger for HFpEF than for HFrEF. These findings help to inform dietary recommendations for primary heart failure prevention.


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The “Hub and Spoke” Model of Heart Function Care Achieves Quality Index Markers

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INTRODUCTION: Heart failure (HF) affects approximately 2% of the population with major effects on morbidity and mortality. Over 80% of existing Heart Function Clinics (HFC) are located within a hospital setting. The CoHealth (Ontario) “hub-and-spoke” model encourages community-based HFCs for patients who are less complex or relatively stable while more complex/unstable patients receive care in a hospital-based HFC. The purpose of this project was to explore patient populations and achievement of established quality indicators (QIs) within a specialist-supported community-based HFC in a Family Health Team (FHT-HFC) and a HFC in a tertiary hospital (H-HFC) over 12 months. METHODS: Retrospective standardized chart reviews were conducted from all 60 patients enrolled in the FHT-HFC since its inception in 2010 to 2015, and 100 patients followed in the H-HFC in 2013. QIs were measured and compared at enrollment, 6
months and 12 months. RESULTS: Patients attending the H-HFC vs FHT-HFC had no difference in age, sex or etiology of HF. However, patients at the H-HFC were significantly more likely to have reduced LV function, have marked HF symptoms, and more likely to have a recent hospital admission. Both cohorts had multiple comorbidities, with greater frequencies of MI, ICD/CRT/pacemaker, smoking and respiratory disease in the H-HFC group. By 6 months' post enrollment, the number of patients with a HF with a reduced ejection fraction (HFrEF) in the H-HFC (n=65) who were on an ACEi/ARB, beta-blocker, and MRA increased from 75% to 82%, 86% to 88%, and 29% to 34% (vs 99% to 99%, 77% to 89% and 33% to 39%, respectively in the FHT-HFC (n=28)). Over the 12 months following enrollment in a HFC the proportion of patients with NYHA class III symptoms decreased from 67% to 38% (H-HFC) vs 47% to 14% (FHT-HFC) (p < 0.05) and HF hospital admissions were reduced by 31% (H-HFC) vs 68% (FHT-HFC) (p < 0.05). At 12 months 34% (H-HFC) vs 20% (FHT-HFC) (p=0.07) of patients were enrolled in a cardiac rehabilitation program. CONCLUSION: While the H-HFC and FHT-HFC patients had similar demographics and comorbidities, H-HFC patients tended to more frequently have HFrEF, were more symptomatic and more likely to have been recently hospitalized. Participation in either the H-HFC or FHT-HFC was associated with medication optimization, decreased symptoms and fewer hospitalizations compared to the previous year. In conclusion, this retrospective study shows that the “hub and spoke” HFC model may have merit but needs further evaluation on a wider, more formal scale.


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Associations of Body Mass Index From Early-, Mid-, and Older- Adulthood With Incident Heart Failure and Cardiovascular Disease: The Multi-Ethnic Study of Atherosclerosis

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Background: Obesity contributes significantly to increased risk of cardiovascular disease (CVD) and particularly heart failure (HF). However, an elevated body mass index (BMI) in older adults might not fully reflect the additional risk associated with excess weight at a younger age. We determined the prognostic value of self-reported weights from early- and mid-adulthood, after accounting for current weight, with incident HF and CVD.

Methods: We studied 6,437 MESA participants (aged 45-84 years) with self-reported weights at ages 20 and 40 (by questionnaire) and measured weight at the baseline exam (2000-2002). BMI was calculated using measured height at baseline. Cox hazard models assessed relationships between BMI at each age with HF and CVD.

Results: Participant mean age was 62±10 years and 53% were women. Over a median follow-up
of 13 years, 290 HF and 828 CVD events occurred. Elevated BMI at each age point (age 20, age 40, and MESA baseline) was independently associated with HF, and to lesser extent with CVD (Figure). After adjustment for demographics, CVD risk factors, and baseline BMI, higher self-reported BMIs at ages 20 and 40 years were independently associated with increased risk of incident HF with hazard ratios (HR) 1.18 (95% CI 1.05-1.32) and 1.30 (1.15-1.46), respectively, per 1 SD higher BMI. Participants with self-reported obesity (BMI≥30) at age 20 [HR 3.20 (1.93-5.32)] and age 40 [HR 1.92 (1.31-2.83)] had greater HF risk, even after accounting for current BMI. For incident CVD, only higher self-reported BMI at age 20 (per 1 SD) was associated after accounting for current BMI [HR 1.09 (1.01-1.17)].

Conclusions: Assessment of self-reported lifetime weights is a simple tool utilized in any clinical encounter. Although subject to recall bias, self-reported weights provide prognostic information about future HF risk, incremental to current BMI, in a multi-ethnic cohort of middle-aged to older adults.


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P173


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Background: Blood pressure treatment strategies and targets are generally similar for most patients with hypertension, apart from individuals with certain specific comorbidities such as diabetes. We hypothesize that there is latent heterogeneity in the population of adults with hypertension and that this may be associated with differential risk of mortality and might suggest opportunities for more tailored treatment strategies. Our study of adults with hypertension in the US explores whether clusters of social and health-related characteristics exist, how trends in clusters have varied between 1999 and 2012, and how risk of mortality varies between clusters.

Methods: In a nationally representative sample of adults (> 18 years) with hypertension (physician diagnosed, systolic ≥ 140 mmHg or diastolic ≥ 90 mmHg, or taking hypertension-related medication) from the National Health and Nutrition Examination Survey from 1999 to 2012 (Total N=16,855), we used a hierarchical cluster analysis approach to identify hypertension sub-groups according to chronic diseases, social factors, and health behaviors. Results: We found significant heterogeneity among hypertensive participants across time, according to 7 distinct clusters: Young Mexican-Americans with good health (55% of sample); Low-income non-White elderly with good health behaviors (7%); Elderly obese who smoke (18%); Men with poor health who drink and smoke (1%); Normal weight individuals with high prevalence of cancer (16%); Low-income and fit individuals with poor health (1%); and Obese and morbidly obese with high prevalence of chronic conditions (2%). The prevalence of each of these clusters remained relatively
constant throughout the last decade, although there was an increase in the “Elderly obese who smoke” cluster from 14% to 18%. Mortality risk varied by subgroup. For example, the odds of dying for “Obese and morbidly obese with high prevalence of chronic conditions” were 1.73 times higher compared to “Young Mexican-Americans with good health” (p-value<0.001), adjusting for confounders over a 12 year follow-up interval.

Conclusions: Sociodemographic and clinical clusters among hypertensive individuals in the U.S. remained stable over a decade, with higher risk of mortality associated with specific clusters. Recognizing these clinically-identifiable phenotypes may highlight opportunities to develop and evaluate targeted interventions that account for complex and inter-related clinical and social factors. Further, there is an opportunity through clinical trials to determine whether these clusters merit different blood pressure treatment strategies.


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Funding Component:

P174

Early Onset Parental Hypertension is Associated With Hypertension Status of Their Offspring


Background Family history is an important risk factor for hypertension (HT), however impacts of parental early onset versus late onset on offspring’s HT has not been explored yet in Asian countries. Methods and Results We analyzed 1,524 participants from two Korean prospective cohorts in cross-sectional design. Early onset was defined as onset before age of 55 and participants were categorized according to parental hypertension (PH) status; “No PH”, “late onset PH” and “early onset PH”. Logistic regression was conducted to compare risks of HT on parental, maternal and paternal HT status. Participants’ HT onset age was compared using least-square means. Overall prevalence of HT was 25.7% (392/1,524) and that of “early onset PH” group was 33.7% (98/291). This group conferred an OR of 3.83 (95% CI, 2.67-5.54) for HT. The onset age of HT was earliest in this group (48.2 years; 95% CI, 47.3-49.2). Conclusions Early onset HT in parents was associated with high HT prevalence in offspring and also with their onset age. Therefore, for applying early prevention and intervention to the high risk population, it would be beneficial to identify whether individuals had early onset PH.


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Predictors of Long Term Blood Pressure Variability in Young Adulthood Through Middle Age: The Coronary Artery Risk Development in Young Adults Study

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Introduction: Long-term blood pressure variability (BPV) refers to fluctuation in BP that occur over weeks, months and years. BPV has been identified as a risk factor for the development of subclinical and clinical cardiovascular events independent of mean BP. However, little is known about the factors associated with long-term BPV. We hypothesized that long-term BPV will vary by demographic, behavioral, anthropometric, lab, and clinical factors.

Methods: Using data from the CARDIA study – a longitudinal population based cohort study, we investigated whether baseline demographics (age, sex, race, education); behavioral factors (smoking, alcohol intake, physical activity); anthropometric measures (height, weight, body mass index - BMI); lab markers (total cholesterol, high density lipoprotein cholesterol - HDL-C, low density lipoprotein cholesterol – LDL-C, triglycerides, fasting blood glucose, glomerular filtration rate - GFR); and history of asthma are associated with different indictors of long-term BPV. Variability independent of the mean (VIM) and coefficient of variation (CV) of BP were calculated to quantify within-individual long-term BPV from baseline to visit 9 across 30 years. A least absolute shrinkage and selection operator (lasso) linear regression was used to identify variables that may be associated with long-term BPV and multivariate linear regression models were used to assess magnitude of association.

Results: Participants were 3,095 individuals who were not taking antihypertensive medication (mean age 24.6 years, 45.5% male and 56.9% white). Mean VIM was 8.5 mmHg (SD=3.7) for systolic and 7.1 mmHg (SD=3.2) for diastolic BP. Age, sex, race, education, physical activity, alcohol intake, pack-years of smoking, height, weight, triglyceride, LDL-C and asthma were potential correlates of VIM or CV of diastolic BP by the lasso model. In addition to those variables, total cholesterol, HDL-C, fasting glucose, and GFR were potential correlates of VIM or CV of systolic BP. Variables that significantly associated with VIM of systolic BP were: age (years) (β=0.11, p<0.001), white race (β=-0.94, p<0.001), female sex (β=1.36, p<0.001), alcohol intake (drinks/wk) (β=0.01, p=0.001), height (cm) (β=-0.03, p=0.001), and history asthma (β=-0.47, p=0.02). Consistent findings were observed when the outcome was CV of systolic BP. VIM of diastolic BP was also significantly associated with age (β= -0.09, p<0.001) white race (β= -0.47, p=0.26), pack-years (β=0.06, p<0.001), height (cm) (β= -0.03, p<0.001), and history asthma (β=0.47, p=0.01). The same variables were significantly associated with CV of diastolic BP.

Conclusion: Identifying factors associated with long-term BPV can be useful to detect individuals who may be at a greater risk for future higher long-term BPV, which in turn is associated with greater cardiovascular risk.

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Introduction: Hypertension is associated with increased risk for cognitive decline. Lifestyle behaviors such as moderate physical activity (MPA) and adequate sleep duration may mitigate this decline, though limited research exists. The aim of the study was to examine the joint association of MPA and sleep duration on cognitive function by hypertension status. Methods: Adults (n=2976, ≥60yrs) from the 2011-2014 National Health and Nutrition Examination Survey (NHANES) were assessed for their habitual sleep duration (<7, 7-8.9, ≥9hr), self-reported participation in regular MPA (yes/no), reported physician-diagnosed hypertension (yes/no), and cognitive function (Digit Symbol Substitution Test [DSST]; Animal Fluency test). Weighted linear regression analyses were conducted to assess joint association of sleep duration and MPA on cognitive function, and test the modifying effect of hypertension status (alpha level set at 0.1) after adjustment for demographics. Results: See Table. There were significant main effects for combined MPA and sleep duration on DSST (Wald F(5,28)=5.33, p=.001) and Animal Fluency (Wald F(5,28)=2.58, p=.05). Participants who did not engage in MPA regardless of sleep duration had significantly worse cognitive function compared to participants who engaged in MPA and obtained 7-8.9hr sleep. There was a significant interaction between MPA-sleep duration groups and hypertension status on DSST (Wald F(5,28)=2.42, p=.06), but not on Animal Fluency. Stratified analyses indicated among individuals with hypertension the buffering effect of MPA regardless of sleep duration was maintained, but not for individuals without hypertension. Conclusions: In a sample of adults, regular MPA predicted better cognitive outcomes regardless of sleep duration. Among individuals with hypertension regular MPA regardless of sleep duration was significantly associated with better executive function, but no such association was found among individuals without hypertension.

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P177

Potential Value of Intensive Blood-Pressure Treatment Based on Predicted Lifetime Cardiovascular Disease at Age 40: Computer Simulation Study

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Introduction In the SPRINT trial, intensive blood pressure (BP) treatment saved lives and was cost-effective in high-risk older adults. It is unclear if intensive BP treatment should be extended to high-risk adults aged 40-49 years. Objectives We used individual patient computer simulation to assess the incremental value of extending intensive BP treatment to adults as young as age 40 with high cardiovascular disease (CVD) risk. We selected patients aged <60 years with high lifetime risk because few have high ten-year risk. Methods Male and female cohorts of 100,000 individuals were assembled from NHANES surveys 1999-
2010 using sampling weights. BP and other risk factor trajectories were projected for ages 40 to 69 years based on Framingham Offspring Cohort analyses. The “standard of care” treatment scenario simulated treating BP <140/90 mmHg in all patients ≥140/90 mmHg. Two alternative scenarios were simulated: add intensive treatment (goal <130/90 mmHg) from age 40-69 or from age 50-59 in patients with high lifetime risk. The lifetime risk thresholds (Table 1) were chosen in order to capture patients with forecasted ten-year CVD risk ≥10% at age 60. Costs included added treatment and side-effect costs and avoided CVD costs; indexed to 2016. Incremental cost-effectiveness ratios (ICERs) assessed changes in costs and quality-adjusted life years due to adding intensive BP goals. Results Over a 30-year time horizon, adding intensive treatment in high lifetime risk patients at age 40 would prevent 2,880 additional CVD events in males and 2,958 in females compared to treating only BP <140/90 mmHg. Intensive treatment in high lifetime risk patients before age 60 appeared generally cost-effective except in females aged 40 years (ICER $59,000). Conclusion Our results suggest that over the long term, intensive BP treatment may be cost-effective in high-risk men as young as 40 and high-risk women as young as 50. Lifetime cardiovascular disease risk might be used to select high risk middle-aged adults for intensive BP treatment.


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Trends in Antihypertensive Medication Nonadherence Among US Adults With Commercial Health Insurance Initiating Treatment Between 2007 and 2014

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Introduction: Nonadherence to antihypertensive medication is common and associated with cardiovascular disease events. A previous study reported improvements in antihypertensive medication adherence among adults ≥65 years of age. It is unclear if this trend has also occurred among younger adults. Methods: Changes in antihypertensive medication nonadherence were calculated among commercially-insured US adults <65 years of age initiating treatment from 2007 to 2014 using MarketScan claims data. We required beneficiaries have ≥2 diagnoses for hypertension (ICD-9, 401.xx) and insurance coverage for 365 days prior to and following antihypertensive medication initiation. Initiation was defined by a pharmacy claim for antihypertensive medication with no claims for medication within the previous 365 days. During the 365 days after initiation, nonadherence was defined as having a proportion of days covered <80%.

Results: The percentage of patients who were nonadherent to their antihypertensive medication was 55.6% in 2007 and 54.1% in 2014 (p-trend<0.001) (Table). After multivariable adjustment, the relative risk (RR) of nonadherence in 2014 compared with 2007 was 0.98 (95% CI 0.96-0.99). Risk for nonadherence was lower at older age (RR 0.73,
95% CI 0.71-0.74 comparing adults 55-64 to <25 years of age). Nonadherence was more common among adults that were female versus male (RR 1.05; 95% CI 1.05-1.06), initiated treatment with a loop diuretic (RR 1.26; 95% CI 1.24-1.28), had diabetes (RR 1.11; 95% CI 1.10-1.12), or experienced a serious fall injury after medication initiation (RR 1.10; 95% CI 1.06-1.15), and less common among adults initiating treatment with an angiotensin receptor blocker (RR 0.96; 95% CI 0.95-0.96), multiclass regimen (RR 0.89; 95% CI 0.88-0.90), receiving 90-day fills (RR 0.73; 95% CI 0.73-0.74), or medications by mail (RR 0.92; 95% CI 0.91-0.93).

**Conclusion:** Among adults <65 years of age, nonadherence to antihypertensive medication did not meaningfully decrease between 2007 and 2014.


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P179

**Lifetime Variation in the Impact of Cardiovascular Risk Factors on CVD Outcomes and Mortality: Lifetime Risk Pooling Project**

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**Introduction:** Prior studies have suggested that there are age-specific differences in the association of traditional cardiovascular risk factors (RFs) with cardiovascular disease (CVD) and mortality later in life, but few have directly tested this. **Hypothesis:** We hypothesized that elevated RF levels at younger ages are more strongly associated with CVD and mortality. **Methods:** We used a synthetic cohort including black and white participants (ppts) of CARDIA, MESA, Framingham, Jackson Heart, ARIC and CHS. RF levels included SBP, BMI, total cholesterol and glucose from ages 20.

Outcomes included CVD incidence and total mortality. We implemented a Cox proportional hazards model with time-varying coefficients adjusted for age, sex, race, cohort, smoking status and time-varying effects for other risk factors. **Results:** We included 41,387 ppts (55% female, 30% black). Hazard ratios (HR) per standard deviation in risk factor levels at every 5 years of age are shown in the figure. Effects of SBP and BMI varied significantly by age, with early adulthood levels imparting the greatest relative hazards for CVD incidence and mortality. Ignoring time-dependent differences, the mean effect for every 1 SD higher SBP would be a hazard ratio (HR) of 1.3 for CVD and HR 1.2 for mortality (as shown by the dashed lines). However, association of SBP with outcomes varied by age, with the largest HR (~1.5) early in adulthood (ages 20-50), decreasing below 1.3 by age 70. Similarly, early adult levels of total cholesterol were associated with higher HRs for CVD; however its association with mortality did not differ by age. Higher glucose levels were significantly associated with CVD and mortality, with consistent associations across the lifespan. **Conclusions:** Strength of associations of RFs on CVD incidence and mortality are not consistent across the lifespan and vary by RFs and outcomes. These patterns and their differences may provide insights into vulnerable age periods when elevated RF levels impart a proportionally greater risk for future CVD and death.
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**P180**

**Ambulatory Blood Pressure Monitoring Phenotypes in Adults With and Without Chronic Kidney Disease Taking Antihypertensive Medication: The Jackson Heart Study**

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**Background:** Ambulatory blood pressure monitoring (ABPM) can detect hypertension phenotypes associated with increased risk for chronic kidney disease (CKD) progression. There is a high prevalence of these phenotypes in the general population; however, it is unclear whether they are more common among African Americans (AAs) with versus without CKD.

**Methods:** We examined the prevalence of daytime, nocturnal, white-coat, masked, and sustained hypertension and a non-dipping BP pattern among AAs participating in the Jackson Heart Study. Analyses were restricted to 561 participants taking antihypertensive medication with a complete ABPM recording at baseline (2000-2004). CKD was defined as an estimated glomerular filtration rate < 60 mL/min/1.73 m² or the presence of kidney damage indicated by the presence of albumin-creatinine ratio ≥30 mg/g. We used log binomial regression models in a multivariable adjusted model to calculate the association between CKD and ABPM phenotypes.

**Results:** The mean age of participants included in the current analysis was 62 years, 72% were female, and 26% had CKD. Daytime, nocturnal, masked, and sustained hypertension and non-dipping were more common, while white-coat hypertension was less common, among participants with versus without CKD (Table 1). The prevalence of sustained hypertension was 1.46-fold (CI 1.03-2.06) greater among those with CKD compared to those without after multivariable adjustment.

**Conclusions:** In a large community-based study of AAs, ABPM phenotypes were common among adults with CKD. Sustained hypertension was statistically significantly higher in those with versus without CKD.
Introduction: In the US, blacks are at higher risk of hypertension than whites. The single largest contributor to this disparity is the Southern Diet pattern. Inflammation biomarkers are associated with risk of hypertension, and C-reactive protein (CRP) is higher in blacks than whites. We studied whether elevated CRP in blacks relative to whites contributes to the racial disparity in hypertension in blacks.

Methods: We included 6,548 black and white men and women age ≥45 years from the REGARDS cohort without hypertension at baseline ('03-'07) and who completed visit 2 in '13-'16. Incident hypertension was defined as BP ≥140/90 mm Hg or hypertension medication use at visit 2. Using logistic regression, the black:white odds ratio (OR) for incident hypertension was calculated adjusting for age, sex, race, and baseline SBP. We assessed the percent change in the black:white OR for incident hypertension was calculated adjusting for age, sex, race, and baseline SBP. We assessed the percent change in the black:white odds ratio (OR) for incident hypertension after adding CRP. The 95% CI was calculated using 1,000 bootstrapped samples. We determined the impact of known hypertension risk factors and anti-inflammatory medications on the percent mediation by CRP.

Results: Hypertension developed in 46% of blacks and 33% of whites. Adjusting for demographics, the black:white OR (95% CI) was 1.51, which was reduced to 1.46, a 9.3% reduction (95% CI 5.4%, 13.2%) by CRP (Table). In models including exercise, waist circumference, BMI, and depressive symptoms, the percent mediation by CRP was 3.7% (1.0%, 6.4%). Similar patterns were seen for models incorporating socioeconomic factors and medication use. After adding Southern diet pattern and dietary Na/K ratio, CRP no longer attenuated the association (1.3% mediation; -1.5, 4.1). Conclusions: CRP significantly attenuated the black-white difference in incident hypertension; however, once dietary factors were accounted for, CRP had no impact on the black:white difference in incident hypertension. Thus, inflammation as measured by CRP, may be part of the reason that dietary factors influence the black:white disparity in incident hypertension.


Funding: No
**Introduction:** Clinical trials have shown increased survival at lower blood pressures, but low diastolic blood pressure (DBP) is associated with increased cardiovascular (CV) events and mortality. The suggested mechanism in patients with coronary artery disease (CAD) is limitation in coronary blood flow; however, evidence is lacking. We investigated the association between DBP, biomarkers of myocardial injury, and incident events in patients with CAD.

**Methods:** We assessed 2448 individuals (aged 65±12 years, 68% male, median follow-up 4.5 years) with stable CAD undergoing cardiac catheterization. Those with acute coronary syndromes or heart failure with reduced ejection fraction were excluded. DBP was categorized into 10 mm Hg increments. Biomarkers of myocardial damage (high sensitivity cardiac troponin-I [hs-cTnI] and soluble urokinase plasminogen activating receptor [suPAR]) were dichotomized at their median values. DBP 80-89 mmHg was used as the referent group and individuals were followed for MACE (CV death or non-fatal myocardial infarction) and all-cause mortality.

**Results:** After adjusting for relevant demographic and clinical covariates, individuals with DBP < 60 mm Hg had increased odds of elevated hs-cTnI (OR = 1.75; 95% CI = 1.05, 2.90) and suPAR (OR = 1.73; 95% CI = 1.09, 2.76) compared to the referent group. Additionally, DBP < 60 mm Hg was associated with increased risk of MACE (HR = 2.01; 95% CI = 1.24, 3.25) and all-cause mortality (HR = 2.18; 95% CI = 1.50, 3.19). Adding hs-cTnI and suPAR into the Cox proportional hazards model attenuated the association between DBP < 60 mmHg and MACE (HR =1.63, 95% CI 0.91, 2.91), but not all-cause mortality (HR = 1.67, 95% CI = 1.06, 2.63).

**Conclusion:** In patients with CAD, low DBP is associated with biomarkers of myocardial injury and incident events. Aggressive blood pressure control may be harmful in these patients, and further investigation is warranted to determine appropriate blood pressure targets in patients with CAD.

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**P183**

20-year Secular Trend of Cardiovascular Disease Comorbidities in the United States, 1997-2016

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**BACKGROUND:** Cardiovascular disease (CVD) has been the number one cause of death and disability in the US and globally for decades, and its comorbidity complicates the management of CVD. However, little is known about the secular trend of CVD comorbidities in national representative populations in the last 20 years.

**METHODS:** Prevalence of CVD and nine major chronic comorbidities was estimated using data from 1,324,214 adults aged 18 years and older in the National Health Interview Survey (NHIS) from 1997 through 2016, with age-standardized to the U.S. population in the year 2000.

**RESULTS:** CVD prevalence in the US adult population significantly declined in the past twenty years (from 6.6% in 1997 to 5.9% in 2016, Pr=0.01in Figure a). And such trend was shown in women and whites (Pr<0.01), but not in men and blacks (Pr>0.05). We ranked the nine major chronic comorbidities...
(high to low) in the CVD patients (Figure b.), including (1) hypertension, (2) respiratory conditions, (3) nervous system conditions, (4) digestive conditions, (5) diabetes, (6) cancer, (7) genitourinary conditions, (8) circulatory conditions, and (9) endocrine/nutritional/metabolic conditions. From 1997 to 2016, the prevalence of CVD comorbidities including hypertension (38.8% to 50.2%), digestive conditions (17.0% to 27.1%), diabetes (10.0% to 19.2%), cancer (9.4% to 12.8%), and genitourinary conditions (4.1% to 5.2%) continuously increased (all \( P_{\text{trend}} < 0.01 \)), while respiratory conditions declined (35.9% to 27.6%, \( P_{\text{trend}} < 0.01 \)). Similar trends of CVD comorbidities were observed among subgroups stratified by gender or by race. CONCLUSIONS: CVD prevalence in the U.S. adults have declined significantly in the past two decades, but rates of CVD comorbidities including hypertension, digestive conditions, diabetes, cancer, and genitourinary conditions increased substantially.

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P184

Meat Cooking Methods and Risk of Hypertension: Results From Three Prospective Cohort Studies

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Background: The role of open-flame and/or high-temperature cooking (grilling/barbequing, broiling, or roasting) and doneness preferences (rare, medium, or well-done) in the association between meat consumption and risk of hypertension remains unknown. This study aimed to examine cooking methods for meats (red meats, chicken, or fish) in relation to hypertension risk among men and women who consumed meat regularly (≥2 servings/week).

Methods: Study population consisted of 32,925 women from the Nurses’ Health Study (NHS 1996-2012), 53,852 women from the NHSII (2001-2013), and 17,104 men from the Health Professionals Follow-Up Study (HPFS 1996-2012), who were free of hypertension, diabetes, cardiovascular disease, and cancer at baseline.

Results: We documented 37,123 incident hypertension cases during 1.06 million person-years of follow-up. After multivariate adjustments of covariates including total consumption of red meats, chicken, and fish, a higher frequency of open-flame and/or high-temperature cooking and a preference for higher meat doneness level were both independently associated with an increased hypertension risk. When comparing open-flame and/or high-temperature cooking >15 times/month with <4 times/month, the pooled hazard ratio (HR) and 95% confidence interval (CI) of hypertension was 1.17 (1.12, 1.21; \( P_{\text{trend}} < 0.001 \)). When comparing the extreme quartiles of meat doneness level score, the pooled HR (95% CI) of hypertension was 1.15 (1.12, 1.19; \( P_{\text{trend}} < 0.001 \)). The associations persisted when data were analyzed by individual meat groups: comparing extreme groups, for red meats, the pooled HR (95% CI) of hypertension was 1.18 (1.13, 1.23; \( P_{\text{trend}} < 0.001 \)) for open-flame and/or high-temperature cooking and 1.15 (1.12, 1.19; \( P_{\text{trend}} < 0.001 \)) for high meat doneness level; for white meats (chicken and fish), the pooled HR (95% CI) of hypertension was 1.12 (1.08, 1.16; \( P_{\text{trend}} < 0.001 \)) for open-flame and/or high-temperature cooking and 1.10 (1.07, 1.14; \( P_{\text{trend}} < 0.001 \)) for high meat doneness level. Moreover, levels of estimated intake of
heterocyclic aromatic amines (HAAs) were also independently associated with an increased risk of hypertension. Comparing extreme quintiles of HAAs, the pooled HR (95% CI) of hypertension was 1.16 (1.13, 1.21; \( P \text{ trend} < 0.001 \)). These associations were attenuated but remained significant when further adjusting for baseline body mass index. **Conclusions:** Our results suggest that, independent of the amount of meat consumption, open-flame and/or high-temperature cooking and high doneness level for both red meats and white meats are associated with an increased risk of hypertension.

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**Funding Component:**

**P185**

**Racial Disparities in Statin Use Among Persons With HIV: The HIV Electronic Comprehensive Cohort of CVD Complications (HIVE-4CVD)**

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**Background:** Few studies have evaluated utilization of ASCVD-preventive therapies, such as statins, among PLWH. Although disparities by race, sex, and insurance status in statin utilization exist in the general population, the extent to which these disparities exist among PLWH - a population with a distinct demographic and risk factor profile - is unknown.

**Methods:** We compared statin utilization rates by race for the 3252 black and white PLWH in HIVE-4CVD who received care at Northwestern Medicine between 1/1/2000 and 5/17/2017. Persons were considered as having an indication for statin therapy if they had one or more of the following: (1) diabetes mellitus; (2) coronary heart disease; (3) a total cholesterol level of \( \geq 240 \text{ mg/dL} \); and/or (4) calculated 10-year ASCVD risk of \( \geq 7.5\% \). We compared statin utilization between black and white PLWH overall and stratified by insurance status. Multivariable-adjusted logistic regression adjusted for age, sex, and insurance status then was used to compare statin utilization for black vs. white PLWH with statin indications.

**Results:** Of 1680 white PLWH and 1572 black PLWH, 610 whites (36.3%) and 508 blacks (32.3%) had at least one indication for statin therapy. Among PLWH with statin indications, whites were significantly more likely than blacks to be taking statins (60.0% vs. 42.1%, \( p<0.001 \); Figure 1). This pattern persisted when analyses were stratified by insurance status. After adjustment for age, sex, and insurance status, black PLWH with statin indications were significantly less likely than their white counterparts to be taking statins (Odds ratio for blacks vs. whites = 0.56 , 95% CI 0.46-0.68, \( p<0.001 \)).

**Conclusions:** Among PLWH with indications for statin use, blacks were significantly less likely than whites to be taking statins, even after adjustment for age, sex, and insurance status. Further studies of real-world statin use among PLWH are needed to understand reasons for disparities.

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Plasma Ceramides Are Associated With HIV Treatment and Increased Risk of Carotid Artery Plaque in Two Prospective HIV Cohorts

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Introduction

Ceramides, a family of bioactive sphingolipids on plasma membrane, have been implicated in inflammation, immune response, and HIV infection. Recent studies have related plasma ceramides with cardiovascular diseases (CVD), but data are sparse in HIV infected people who have excess CVD risk.

Methods

We profiled baseline plasma ceramides C16:0, C22:0, C24:0 and C24:1 in 737 participants aged 35-55 years (520 HIV+, 217 HIV-) from two prospective cohorts (Women's Interagency HIV Study and Multicenter AIDS Cohort Study) and examined their associations with the risk of incident carotid artery plaque (CAP), assessed by B-mode carotid artery ultrasound imaging over a 7-year period. Plasma levels of ceramides were inverse-normal transformed. We used robust variance estimates from Poisson regression to estimate risk ratios (RRs) on CAP per standard deviation increment in ceramides. We also compared ceramide levels by HIV infection status and antiretroviral therapy (ART) use.

Results

Over a 7-year follow-up, 112 individuals developed CAP (90 HIV+, 22 HIV-). After multivariate adjustment, ceramides C16:0 (RR=1.40 [95% CI: 1.09-1.79]; P<0.001) and C24:1 (RR=1.32 [1.06-1.65]; P<0.001), but not ceramides C22:0 or C24:0, were significantly associated with increased risk of CAP in all participants. Ceramides C16:0 showed stronger association with CAP in HIV+ people compared to HIV- people (Figure), but there was no significant effect modification by HIV infection status (P for interaction>0.05). Compared to HIV- group, plasma ceramides C16:0, C22:0 and C24:1 were significantly (P<0.001) higher in HIV+ group. Further analyses in HIV+ group showed that ceramides were significantly (P < 0.001) higher in people using ART than those not using ART. Conclusions This study reported that elevated plasma ceramides, especially C16:0, are increased with ART use and associated with HIV-related atherosclerosis. Our data suggest that ceramides might be an intermediate link between HIV infection and CVD risk.


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P187

Increasing CVD and CVD Risk Among PLWHA in Louisiana 2002-2012

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Introduction: While effective HIV treatments have decreased the likelihood of AIDS-defining illnesses among people aging with HIV, HIV-associated non-AIDS conditions are more common in individuals with long-standing HIV infection, including cardiovascular disease (CVD), hypertension, diabetes mellitus, and renal failure among others. It has been estimated that 30% of deaths among those with well-controlled viral load has been attributed to CVD, compared to 23.5% in the general US population. The purpose of this study was to determine the prevalence trends of CVD in people living with HIV/AIDS (PLWHA) in South Louisiana. Methods: A ten-year retrospective cohort study was conducted using data abstracted from the Louisiana State University (LSU) Health Care Services Division, Disease Management Evaluation Database (DMED) that included patients who received care within the LSU Medical System 7 state facilities. Inclusion criteria included 18 years of age or above, a positive HIV lab test, and a HIV diagnose code. Total sample size for the analysis was 9,374. The presence of CVD was established using ICD9 Diagnosis codes, patient vitals, and lab results. CVD outcomes evaluated included myocardial infarction, coronary artery disease, hypertension, heart failure, and stroke. All analyses were conducted in SAS 9.4. Results: The racial distribution was 24% white, 67% black, 2% other, and 7% unknown; distribution by sex remained stable over the ten-year period approximately 58% male and 42% female. The mean age of the clinic population increased from 39.24±10.17 to 45.09±10.46 over the ten year period. There has been a positive trend in CVD among the HIV Clinic population, from 23.0% to 50.7% prevalence. There was an increase in hypertension, heart failure, stroke, and coronary artery disease among PLWHA. Hypertension showed the largest increase in prevalence from 19.4% to 44.8%. A positive trend and in increased Framingham Risk score was also observed (p<0.05). Conclusion: As PLWHA continue to increase in age, mortality and hospital admissions attributed to CVD has the potential to continue to increase. Data from this project has the potential to guide additional screening recommendations and practices, ultimately resulting in more timely detection of disease, which improves outcomes for patients.


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P188

Differences in Statin Utilization for Persons Living With HIV (PLWH) and Uninfected Controls in the HIV Electronic Comprehensive Cohort of CVD Complications (HIVE-4CVD)

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Background: Real-world clinical data on statin use and intensity among PLWH are sparse. We hypothesized that significant differences exist regarding statin utilization and dosing as well as on-statin total cholesterol (TC) lowering for PLWH compared with uninfected controls.

Methods: HIVE-4CVD is an electronic data repository of 5,041 PLWH and 10,082 uninfected controls frequency matched on age, sex, race, zip code, and clinic location receiving care at Northwestern Medicine from 1/1/2000 to 5/17/2017. Medication administration records, prescription data, and validated natural language extraction algorithms were used to extract statin utilization information. Statins were categorized by generic name and intensity (high, moderate, and low). Lipid values were analyzed and categorized as before or after statin initiation. We compared statin utilization
Factors Associated With Stenosis on Invasive Coronary Angiography for Persons Living With Human Immunodeficiency Virus (PLWH): The HIV Electronic Comprehensive Cohort of CVD Complications (HIVE-4CVD)

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Background: Persons living with HIV (PLWH) have greater risks for atherosclerotic cardiovascular disease (ASCVD) than uninfected persons. However, data are sparse regarding HIV-specific factors associated with coronary atherosclerosis.

Methods: HIVE-4CVD is an electronic data repository of demographic and clinical data collected during the routine clinical care of 5041 PLWH and 10082 uninfected controls frequency matched on age, sex, race, zip code, and clinic location receiving care at Northwestern Medicine from 1/1/2000 to 5/17/2017. Using validated natural language extraction algorithms, we analyzed data on coronary stenosis severity for the 286 PLWH and 266 uninfected controls in HIVE-4CVD who underwent coronary angiography. Stenosis severity was recorded as the highest percentage of stenosis noted for each patient in each artery (LAD, LCx, RCA). Multivariable logistic regression models adjusted for demographics and CVD risk factors were used to evaluate odds of significant (≥50%) coronary stenosis (1) for PLWH versus uninfected controls and (2) across different levels of HIV viremia and immune suppression among PLWH.

Results: Of the 286 PLWH and 266 uninfected controls undergoing coronary angiography, 205 (55.4%) PLWH vs. 165 (44.6%) uninfected controls had diagnoses of myocardial infarction (p=0.02). The location and severity of coronary stenoses did not differ significantly for PLWH vs. uninfected controls; mean maximal overall stenosis and mean maximal LAD, RCA, and LCx stenoses were 52.3% vs. 50.2% (p=0.52), 44.5% vs. 42.3% (p=0.48), 37.0% vs. 36.1% (p=0.78)


Funding: Yes

Funding Component: National Center
There was no significant difference in odds of having significant coronary stenosis for PLWH vs. uninfected controls (multivariable-adjusted OR 1.15, 95% CI 0.79-1.70). Among PLWH, peak HIV viral load was associated with borderline significantly greater odds of ≥50% coronary stenosis after adjustment for demographics, CVD risk factors, and HIV therapies (OR 1.07 per 10-fold greater peak HIV viral load, 95% CI 1.00-1.14, p=0.04), but lower Nadir CD4+ T cell count (<200 vs. ≥200 cells/mm³) was not (OR 1.05, 95% CI 0.74-1.48, p=0.79).

Conclusions: There was no consistent or significant difference in severity of coronary artery stenosis among PLWH and uninfected controls undergoing invasive coronary angiography in the course of routine clinical care. Higher peak HIV viral load is associated with borderline significantly greater odds of having significant coronary stenosis among PLWH undergoing invasive coronary angiography.


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P190

Triggering of Coronary Heart Disease by Infection Type: The Atherosclerosis Risk in Communities Study

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Introduction:
Acute infections are known triggers of coronary heart disease (CHD). It is unclear how the strength of the association varies by infection type.

Hypothesis:
We hypothesized that all acute infections increase CHD risk but the level of increased risk varies by infection type.

Methods:
Incident CHD (myocardial infarction and fatal CHD) cases were identified and adjudicated in the ARIC cohort. ARIC participants were linked to Medicare claims data. We used ICD-9 codes to identify 4 infection types based on infection frequency: cellulitis, pneumonia, urinary tract infections (UTI), and bloodstream infections. We used a case-crossover design and conditional logistic regression to compare infections among CHD cases 90 days before the event with two corresponding control periods 1 year and 2 years prior. The Wald test was used to assess differences between infection types.

Results:
A total of 1,312 CHD cases were identified. Among cases, 43 had cellulitis, 102 had pneumonia, 116 had a UTI, and 28 had a bloodstream infection within 90 days of the CHD event. All infection types were associated with higher CHD risk within 90 days of the infection; (odds ratios and 95% CIs) (cellulitis = 1.41 (0.93, 2.15), pneumonia = 5.60 (3.72, 8.43), UTI = 2.62 (1.92, 3.57), bloodstream infections = 4.77 (2.34, 9.71)) although cellulitis was not statistically significant (Figure). The association between infection and CHD was significantly stronger for pneumonia, UTI, and bloodstream infections compared to cellulitis (p<0.05). Pneumonia and bloodstream infections were stronger CHD triggers compared to cellulitis (p<0.05).

Conclusions:
Patients with pneumonia or bloodstream infections may be at particularly elevated CHD risk. Clinical trials of CHD preventive therapies during and immediately following infection to reduce the otherwise elevated CHD risk are needed. Healthcare providers should consider
CHD risk during and immediately after infection and optimize preventive therapies.


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P192

Improving LDL Documentation and Control in Coronary Artery Disease Patients

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Background: Obtaining a fasting lipid profile prior to a scheduled clinic visit can facilitate decision making at the time of the visit. However, this places extra burden on patients and can decrease compliance. Purpose: To assess the frequency of lipid measurement in patients asked to have blood draw a week before clinic visit versus on the same day of clinic visit, and assess how this will affect achieving lipid targets. Methods: A University-based cardiology clinic notes were examined. Patients were scheduled for a fasting lipid profile a week prior to the clinic visit in year 1. Poor compliance was noted and prompted a same day as clinic visit measurement of lipids if a patient could not comply with laboratory appointment (fasting or non-fasting) in year 2, with further lipid management conducted by phone. Patients with documented coronary artery disease were included. A total of 200 encounters (100 in each year) were analyzed. Results: Only 64 (64%) of patients in year 1 had lipid measurements, compared to 84 (84%) of patients in year 2. LDL level in year 1 was 116 ± 36 mg/dL compared with 97 ± 32 mg/dL in year 2 (P < 0.01). Only 34% (22/64) of the patients in year 1 achieved LDL of < 100 mg/dL, compared with 56% (47/84) in year 2. No differences were observed in HDL, triglycerides or blood pressures during the concurrent visits. Conclusion: Improving documentation and control of LDL is achievable if lipid levels are done on clinic visit day, with less burden on patients who cannot comply with a separate laboratory appointment. Although there were many non-fasting levels as a result, the triglyceride levels where not significantly different among the two groups, probably reflecting an overall more intensive lipid management in year 2. Therefore, as has been shown by others, a lipid profile in most cases does not necessarily have to be fasting, especially in patients being treated for stricter targets such as our cohort, which may decrease the burden on patients unable to comply with a fasting state or added clinic visits.


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P193

High Density Lipoprotein is Superior to Triglyceride as a Biomarker of Physiologic Stress in African Immigrants: The Africans in America Study

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Introduction: For Africans living in the United States, the extent to which stress-induced physiologic dysfunction varies by reason for immigration is unknown. Allostatic load score (ALS) is used to assess physiologic stress. ALS
has biomarkers in 3 domains: cardiovascular, metabolic and immune. However, there are many ALS equations and the number of biomarkers in each domain varies. In the cardiac domain of ALS, equations use either triglyceride (TG) or high density lipoprotein (HDL). A specific problem for African descent populations is that HDL may be superior to TG as a marker of insulin resistance and cardiac risk. **Objective:** Our primary goal in 95 African immigrants (71% male, age 42±10, (mean±SD), range 22-62y) was to determine if ALS varied by reason for immigration. Our secondary goal was to evaluate 4 different ALS equations to determine if there was a difference in ALS performance depending on whether HDL or TG was the included biomarker. **Methods and Results:** For all 4 equations, the reasons for immigration from lowest to highest ALS were: family reunification, lottery for self and immediate family, marriage, asylum, work and study (Figure 1). As the first 3 reasons for immigration promoted family unity, they were grouped together (Group 1). The Africans who came for other reasons were grouped together (Group 2). Equations 1 and 2 included HDL as a biomarker. For these equations, ALS in Group 1 vs. Group 2 were: 1.7±1.3 vs. 2.8±1.7, \(P<0.01\) and 1.4±1.2 vs. 2.3±1.7, \(P<0.01\) resp. Equations 3 and 4 used TG. For these two equations ALS in Group 1 vs. Group 2 were: 2.2±1.6 vs. 2.9±2.0, \(P=0.08\) and 2.1±1.4 vs. 2.9±2.0, \(P=0.03\) resp. In Equations 1 and 2, when HDL was replaced by TG, the significant difference in ALS between groups declined. In Equations 3 and 4, when TG was replaced by HDL, the significant difference in ALS between groups increased. **Conclusions:** ALS varies by reason for immigration and is easier to detect in ALS equations which use HDL rather than TG.


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P194

**LDL-Cholesterol Reduction and Efficacy of Statin Intensity Over One Year in Veterans With the Familial Hypercholesterolemia Phenotype**

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**Introduction:** Severe elevations of LDL-Cholesterol (LDL-C) \(\geq190\text{mg/dl}\) in adults, representing the familial hypercholesterolemia (FH) phenotype, have been associated with increased risk of cardiovascular disease (CVD). The 2013 AHA/ACC guidelines recommend high intensity statin therapy to reduce LDL-C by \(\geq50\%\). We identified patients with FH phenotype in the Veterans Health Administration (VHA) who were statin-naïve and determined the degree of LDL-C reduction over one year after statin initiation and the efficacy of statin intensity on
≥50% reduction.

Methods:
Patients receiving care at the VHA from 2002-2007, ≥21 years of age, with baseline LDL-C measurement of ≥190 mg/dl (LDL-C₀), and statin-naïve were included. Statin initiation was required within 90 days of LDL-C₀, and a follow up level (LDL-C₁) had to be collected within one year ± 90 days. All participants were free of clinical CVD at baseline. Baseline characteristics were ascertained from patient charts. LDL-C reduction was defined as the difference between LDL-C₀ and LDL-C₁. Multivariable logistic regression models, adjusted for age, sex, race, diabetes, kidney disease, hypertension, and hypertension treatment were constructed to determine the odds of goal LDL-C (≥50%) reduction by statin intensity. We defined statin intensity per the 2013 AHA/ACC guidelines. High intensity statins included Simvastatin 80mg, Atorvastatin 40-80mg, and Rosuvastatin 20-40mg.

Results:
We included 35,894 Veterans (Men: N= 33,049 (92.1%), Age=55±10 years; Women: N=2845 (7.9%), Age=50±11 years). The mean duration between LDL-C₀ and LDL-C₁ was 52±7 weeks. The population was predominantly white (78.1%). Mean LDL-C₀ was 210±22 mg/dl, triglycerides were 175±126 mg/dl. At baseline, 0.3% had kidney disease, 14.1% diabetes, and 52.8% hypertension. Mean absolute LDL-C reduction in the population was 70.2±41.9 mg/dl. A total of 6718 (18.7%) patients achieved an LDL-C reduction of ≥50%. Among these patients, 5.2% were on low, 62.2% were on moderate, and 32.6% were on high intensity statins. In multivariable-adjusted logistic regression models using moderate intensity statins as the comparator, high intensity therapy resulted in 97% higher odds of achieving goal LDL-C (≥50%) reduction (Odds ratio [OR]=1.97; 95% Confidence Interval [CI]=1.85–2.09), and low intensity statins resulted in 42% lower odds of achieving goal LDL-C reduction (OR= 0.58; 95%CI= 0.52–0.65).

Conclusions:
In a large veteran population with the FH phenotype, though there was a marked reduction in LDL-C with statin therapy, most patients did not achieve goal LDL-C reduction of ≥50%. This may be related to statin intensity, individual response to statin therapy, or lack of adherence to treatment. In multivariable-adjusted logistic regression models, patients on high intensity statins had 2-fold odds of goal LDL-C reduction compared to moderate intensity statins.


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P195

High-density Lipoprotein Subfractions Are Associated With Low-grade Inflammation, Insulin Resistance and Metabolic Syndrome Components: The Brazilian Longitudinal Study of Adult Health (ELSA-Brasil)

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Background: HDL cholesterol (HDL-C) can be divided into subfractions, which may have variable association with atherogenic process. There are mixed results about the association between HDL-C subfractions and risk factors for cardiovascular disease.

Hypothesis: HDL-C subfractions have different associations with metabolic syndrome, low-grade inflammation and insulin resistance.

Methods: 4,532 individuals between 35 and 74 years without previous cardiovascular disease not in use of fibrates were enrolled. HDL-C subfractions were separated by vertical ultracentrifugation (Vertical Auto Profile - in mg/dl) in HDL2-C and HDL3-C. HDL2-C/HDL3-C ratio, insulin resistance (HOMA-IR) and high-sensitivity C-reactive protein (CRP) were also included in the analysis.

Results: The mean age was 51 ± 9 years, and 54.8% were women. In univariate analysis, HDL-C, HDL2-C, and HDL3-C were all inversely associated with each of the MetS defining factors, HOMA-IR values, and serum CRP. It was also observed a negative association between HDL2-C/HDL3-C ratio with the variables mentioned above even after adjusting for smoking, alcohol use, physical activity, and HDL-C levels (p <0.01).

Conclusion: HDL-C and both subfractions are inversely associated with all the factors that define MetS, insulin resistance and low-grade inflammation. Additionally, the HDL2-C/HDL3-C subfractions ratio assessed by VAP is also significantly associated with the former factors even after further adjustment for total HDL-C and other confounding variables.

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P196

A Large Genetic Effect of APOC3 A43T SNP on Serum Triglycerides is Mediated by Serum APO-CIII Levels in Amerindians

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Introduction: Using a population-based linkage analysis approach, we previously identified a major locus for serum triglyceride (TG) levels in Pima Indians, which largely reflects the effect of a functional SNP (p.(Ala43Thr), A43T, or rs147210663) in the APOC3 gene. This nonsynonymous SNP is extremely rare in non-Amerindian populations and more common in the Pima Indians (frequency of the T43 allele≈3%). This SNP alters the structure of APO-CIII, which leads to loss of its function and to lower circulating levels of APO-CIII. Its effect size reduces TG level by approximately 1 SD unit (per allele), which is among the largest effects for any complex trait reported to date.

Hypothesis: To further explore the functional mechanism underlying this association, we analyzed the relationships among A43T, TG and APO-CIII levels; we hypothesized that the
**APOC3 A43T SNP effect on TG is mediated through circulating APO-CIII in the blood.**

**Methods:** We measured serum APO-CIII level in 411 randomly selected Amerindian subjects from a larger cohort study with both the A43T genotype and TG levels measured; this included 22 carriers of a T43 allele (frequency=2.7%). All analyses were modeled using linear regressions based on cross-sectional data, with age, sex, diabetes status, and population admixture included as covariates. The natural logarithms of APO-CIII and TG levels were taken to reduce skewness.

**Results:** The phenotypic correlation between APO-CIII and TG was 0.68. We found a strong association between the A43T SNP and TG levels ($\beta=-0.78 \pm 0.21$ SD unit per copy of the T43 allele, $p=0.00026$, explaining 3.2% variance) that was greatly attenuated with further adjustment for APO-CIII levels ($\beta=-0.04 \pm 0.17$ SD unit, $p=0.81$, explaining 0.01% variance). On the other hand, there was also a strong association between the A43T SNP and APO-CIII levels ($\beta=-1.22 \pm 0.21$ SD unit, $p=1.2 \times 10^{-7}$, explaining 6.5% variance), which remained significant even after adjustment for the TG effect ($\beta=-0.61 \pm 0.16$ SD unit, $p=0.00016$, explaining 3.4% variance). Formal mediation analysis, conducted by the Sobel method, suggested significant and virtually complete mediation of the A43T effect on TG through APO-CIII levels ($p=5.2 \times 10^{-7}$, percent mediation=95%).

**Conclusion:** Our results suggest that the APOC3 A43T SNP effect on TG may be primarily mediated through APO-CIII, and lend further strength to the possibility of making APO-CIII a therapeutic target for CVD interventions. We are in the process of expanding our analysis to a much larger sample.

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**P197**
highest levels of TSH (5th quintile) with the highest levels (3rd tertiles) of VLDL-C, OR=1.55 (95%CI, 1.18-2.04); triglycerides, OR=1.71 (95%CI, 1.30-2.24); VLDL-3-C, OR=1.48 (95%CI, 1.13-1.94); TC/HDL-C ratio, OR=1.37 (95%CI; 1.04-1.81) and TG/HDL-C ratio, OR=1.71 (95%CI; 1.29-2.26). A positive association between the lowest levels of HDL3-C (1st tertile) and the highest of TSH was also verified with OR= 1.43 (95%CI, 1.10-1.87). In women, we found positive associations with the 5th TSH quintiles and the 3rd tertiles of VLDL-C, OR 1.68;(95%CI 1.18-2.41); non-HDL-C, OR,1.50; (95%CI,1.04-2.16); Triglyceride-rich Lipoprotein Cholesterol,OR 1.42 (95%CI 1.00-2.02); VLDL3-C (OR,1.68;95%CI 1.16-2.45), TC/HDL-C ratio (OR 1.86;95%CI 1.29-2.69) and TG/HDL-C-ratio (OR 1.62;95%CI 1.12-2.35). In men, we found associations between the 5th quintile of TSH and the 3rd tertiles of TG (OR 1.59; 95%CI 1.07-2.36) and TG/HDL-C-ratio (OR 1.71; 95%CI 1.15-2.55). Conclusions: In this sample of middle-aged participants from ELSA-Brasil, an unfavorable lipid profile, which included triglyceride-rich lipoproteins and their remnants were mostly associated with high levels of TSH. In the other hand, we observed a risky association between the lowest levels of HDL3-C and the highest levels of TSH. The majority of our findings were mainly reproduced among women.


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P198
HDL$_2$-C/HDL$_3$-C ratio were negatively associated with cIMT after adjustment for race/ethnicity, age, and sex (all $p<0.001$) and further for smoking status, alcohol use, physical activity, LDL-C, systolic blood pressure, waist circumference, fasting serum glucose, body mass index, triglycerides and antihypertensive use (HDL-C: $p = 0.003$, HDL$_2$-C: $p = 0.01$; HDL$_3$-C: $p = 0.003$; HDL$_2$-C/HDL$_3$-C ratio: $p = 0.02$). When stratified by diabetes status, both HDL$_2$-C ($p=0.03$) and HDL$_2$-C/HDL$_3$-C ratio ($p = 0.01$) showed a negative association with cIMT in people with diabetes (n=531) after adjusting for confounding variables. These associations were not observed in individuals without diabetes ($p = 0.11$ and $p = 0.30$, respectively).

**Conclusion** HDL$_2$-C and HDL$_3$-C subfractions, as well as the HDL$_2$-C/HDL$_3$-C ratio, are inversely associated with cIMT after adjustment for traditional risk factors. This association of HDL$_2$-C/HDL$_3$-C ratio and HDL$_2$-C is modified by the presence of diabetes, where it is more pronounced.

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**P199**

**Alcohol Consumption Modified the Effect of Leptin on Blood Lipids: A Mendelian Randomization Study**

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**Objective:** The current study aimed to evaluate the relation between leptin and serum lipids, and to explore whether alcohol consumption modifies the effect of leptin on lipids.

**Method:** We conducted a Mendelian randomization analysis to the baseline data for 3,780 participants of the Framingham Heart Study Generation III cohort. A genetic risk score (GRS) for leptin was generated by summing leptin increasing alleles of 3 single-nucleotide polymorphisms, weighted by their corresponding effect sizes on leptin reported by Kilpelainen et al. For those taking lipid lowering medications, total cholesterol (TC) was adjusted as TC/0.8, and low density lipoprotein (LDL) was imputed by replacing the adjusted TC into the Friedewald equation. Leptin and triglycerides (TG) were log transformed. Associations between the GRS and leptin, leptin and imputed lipids, and GRS and imputed lipids were assessed, respectively, by multivariate linear regression models, controlling for age and sex in basic model and additionally controlling for education, smoking, drinking, and physical activity in the fully adjusted model. Interactions between the GRS and alcohol drinking was evaluated by adding an interaction term, GRS*drinking, in the fully adjusted model. Sensitivity analyses were performed among those not taking lipid or glucose lowering medications.

**Result:** In univariate analyses, the GRS was significantly associated with leptin (Beta=1.44, $P=4.55E-4$), but not with age ($P=0.33$), sex ($P=0.62$), education ($P=0.37$), smoking ($P=0.59$),
drinking ($P=0.42$), or physical activity ($P=0.80$). Leptin was significantly associated with age and sex adjusted LDL (Beta=7.29, $P=5.95E-38$), high density lipoprotein (HDL) (Beta=-4.30, $P=4.35E-62$), TG (Beta=0.22, $P=1.05E-119$), and TC (Beta=8.06, $P=1.72E-36$). The GRS for leptin was associated with HDL (Beta=-16.72, $P=0.01$), but not LDL (Beta=2.64, $P=0.85$), TG (Beta=-0.35, $P=0.16$), or TC (Beta=-23.34, $P=0.15$), in partially adjusted model. In the fully adjusted model, association between the GRS and HDL was still significant (Beta=-16.70, $P=0.01$). When stratified by drinking status, the GRS for leptin was significantly associated with reduced LDL (Beta=-99.26, $P=0.02$), TG (Beta=-2.4, $P=0.002$), and TC (Beta=-156.10, $P=0.005$) among non-current drinkers, and reduced HDL (Beta=-19.98, $P=0.005$) among current drinkers, adjusting for age and sex. After further adjustment, these associations were still significant. In the fully adjusted model, significant interactions between the GRS and alcohol drinking were identified for LDL ($P=0.02$), TG ($P=0.005$), and TC ($P=0.008$). Sensitivity analyses among those not taking lipid or glucose lowering medications revealed similar associations.

**Conclusion:** Our study provided evidence for a causal relationship between leptin and lipids, and an interaction effect of alcohol drinking on leptin and lipids associations.

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P200

**Elevated Triacylglycerols and Diacylglycerols Had Association With Increased Carotid Arterial Stiffness, Independent of Cvd Risk Factors, in Women With or at High Risk of HIV Infection**

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**Background:** Metabolomics has provided new insights into mechanistic knowledge of CVD. However, this approach has limited use for studying arterial disease in high-risk women with and without HIV infection. **Methods** Using liquid chromatography-tandem mass spectrometry, we profiled plasma levels of 114 cationic polar and 211 nonpolar lipid metabolites among 411 women (72% HIV+; 60% Black and 31% Hispanic) aged 35-50 from the Women’s Interagency HIV Study. Carotid arterial distensibility, a direct measure of carotid stiffness, was calculated from ultrasound measurements of the right common carotid artery diameter at systole and diastole and brachial artery pulse pressure measured. We performed partial least squares discriminant analysis (PLS-DA) to identify metabolite clusters associated with carotid stiffness (lowest vs. the other 3 quartiles of distensibility index). We used multivariate linear regression models to examine associations of individual metabolites with the distensibility index. **Results** PLS-DA identified two major metabolite clusters associated with carotid stiffness. In the lipid metabolite cluster, triacylglycerols (TAGs 52:3, 52:4, 54:4), diacylglycerols (DAGs 36:2, 36:3) and sphingomyelins (16:1, 18:1, 18:2) were associated with decreased distensibility, while lysophosphatidylcholines (18:2, 20:5) were associated with increased distensibility. In the cationic polar metabolite cluster, urate, C4-OH carnitine, C5-DC carnitine, pseudouridine and 1-methyladenosine were associated with decreased distensibility, while lysophosphatidylcholines (18:2, 20:5) were associated with increased distensibility. In the cationic polar metabolite cluster, urate, C4-OH carnitine, C5-DC carnitine, pseudouridine and 1-methyladenosine were associated with decreased distensibility. The associations of TAGs 52:3, 52:4, 54:4 and DAG 36:3 with carotid stiffness remained significant after further adjustment for conventional CVD risk factors (Table). No interaction by HIV infection was found. **Conclusions** Among women with or at
risk of HIV infection from predominantly race-ethnic minority groups, plasma TAGs and DAG of higher carbon number and double bond content are associated with carotid stiffness independent of conventional CVD risk factors.


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P201

Associations of Plasma Acylcarnitines With Incident Carotid Artery Plaque in Individuals With or at Risk of HIV Infection

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Introduction: Altered acylcarnitine concentrations may reflect impaired mitochondrial metabolism and are implicated in cardiovascular disease (CVD). Disturbances in carnitine metabolism have been observed in HIV infection, but it is unknown whether this is related to CVD risk in HIV infected people. Methods: Twenty-six acylcarnitine species were profiled with ultrahigh-performance liquid chromatography/tandem mass spectrometry in 705 men and women with or at risk of HIV infection in the Multicenter AIDS Cohort Study and the Women’s Interagency HIV Study. Using a weighted score approach to define aggregate levels of plasma acylcarnitines, we assessed the associations of short-chain (C2-C7), medium-chain (C8-C14) and long-chain acylcarnitine (C16-C26) with incident carotid plaque, over 7-year follow-up, defined as a carotid artery region with focal intima-media thickness>1.5mm among those with no baseline carotid plaque. Results: The mean age was 45 years and 70% were non-white. The majority (70%) had HIV, and 68% of 394 participants on antiretroviral therapy (ART) had undetectable HIV viral load. Over 7 years, 108 participants developed carotid plaque. Comparing HIV-infected with HIV-uninfected participants, some individual acylcarnitines were higher (C3, C16, C20, C26) while others were lower (C8, C10, C20:4) (all \( P < 0.05 \)), but no significant differences were found in aggregate levels of short-chain, medium-chain, or long-chain acylcarnitines. After adjusted for demographic, behavioral, and HIV infection related factors (HIV serostatus, CD4 cell count and ART), plasma levels of short-chain (risk ratio [RR] = 1.26 [95% CI 1.06-1.50] per standard deviation increment; \( P=0.008 \)), medium-chain(RR=1.20 [1.01-1.43]; \( P=0.04 \)) and long-chain acylcarnitines (RR=1.18 [1.00-1.40]; \( P=0.05 \)) were associated with increased risk of carotid plaque. After further adjusting for traditional CVD risk factors (BMI, total- and HDL-cholesterol, blood pressure, lipid-lowering medication and antihypertensive medication use), the association of short-chain acylcarnitines, but not medium-chain or long-chain acylcarnitines, with carotid plaque remained significant (RR=1.23 [1.04-1.46]; \( P=0.01 \)). Results were consistent between men and women. Further analyses indicated that the association of short-chain acylcarnitines and carotid plaque was stronger in individuals with HIV infection (RR=1.29 [1.08-1.54]) than those without HIV infection (RR=0.98 [0.66-1.45]), and stronger among HIV+ individuals with
detectable viral load (RR = 1.42 [1.15-1.75]) than those who had continuous virus suppression (RR = 1.02 [0.71-1.47]). Conclusion: Plasma short-chain acylcarnitines were associated with increased risk of carotid plaque formation, independent of traditional CVD risk factors, especially in HIV-infected individuals and those with poor control of HIV viral load.


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P202

Non-targeted Metabolomics Study Identify Multiple Metabolites Associated With Body Mass Index

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Background Non-targeted metabolomics technology provides a powerful tool to examine the complex etiology of obesity and the underlying mechanisms for its health consequences. The current study aimed to examine the associations of metabolites, quantified by non-targeted metabolomics technology, with body mass index (BMI) in the Bogalusa Heart Study.

Methods The study included 1,261 participants (825 White and 436 Blacks) aged 34-58 years. General linear models were used to examine the associations of BMI with the 1,202 metabolites that passed rigorous quality control measures, adjusted for age, sex, smoking, drinking, education, and total physical activity in Blacks and Whites, separately. Weighted correlation network analysis (WGCNA) was used to build metabolites modules according to pair-wise correlations (signed positive correlation and unsigned correlation regardless of correlation direction) among all metabolites; partial correlation was used to assess the link between each module and BMI. Results Six-eight metabolites showed Bonferroni-corrected (P < 4.16E-5) associations with BMI in both Blacks and Whites. The most significant metabolite was glutamate (P = 1.52E-12 in Blacks and P = 1.47E-37 in Whites). Among the 46 significant metabolites with known identities, a majority were involved in pathways of lipids (22 metabolites) and amino acids (13 metabolites). Fifteen unsigned metabolites modules were identified and six of the modules showed significant correlation with BMI (absolute r = 0.11-0.14); ten signed metabolites modules were identified and five of them were significantly correlated with BMI (absolute r = 0.14-0.31). Conclusion We have identified multiple metabolites robustly associated with BMI, which have novel biological implications for obesity and its health consequences.

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P203

Serum Metabolites Associate With Blood Pressure Phenotypes in the Bogalusa Heart Study

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We conducted a metabolome-wide association study to identify blood pressure (BP)-related metabolites among 825 white and 436 African-American Bogalusa Heart Study (BHS)
participants. After quality control, 1,202 metabolites were tested for association with systolic BP (SBP), diastolic BP (DBP), and hypertension in race-stratified analyses. Multiple regressions were used to adjust for age, sex, education, cigarette smoking, alcohol drinking, physical activity, and body mass index. Weighted correlation network analysis was utilized to identify modules of co-abundant metabolites that associated with covariable adjusted BP phenotypes. After Bonferroni corrections, 16 metabolites from amino acid, cofactor and vitamin, lipid, carbohydrate, and peptide pathways in whites and one from the carbohydrate pathway in African-Americans significantly associated with BP phenotypes. Two novel and one previously reported metabolite consistently associated with hypertension across race groups (Table). Among whites, modules consisting primarily of lipid metabolites including phosphatidylcholines, phosphatidylinositol and lysosphospholipids ($P=1.0\times10^{-3}$ and $6.0\times10^{-4}$ for SBP and DBP, respectively), monoacylglycerols and lysosphospholipids ($P=3.0\times10^{-4}$ and $7.0\times10^{-5}$ for SBP and DBP, respectively), and phosphatidylethanolamines, mono- and diacylglycerols, and lysosphospholipids ($P=4.0\times10^{-4}$ and $4.9\times10^{-4}$ for SBP and hypertension, respectively) were identified. In addition, modules consisting primarily of amino acids and peptides such as gamma-glutamyl amino acid metabolites and those involved in leucine, isoleucine and valine metabolism were significant in both African-Americans ($P=2.0\times10^{-3}$ and $1.5\times10^{-3}$ for DBP and hypertension, respectively) and whites ($P=7.1\times10^{-4}$ for hypertension). In aggregate, the current analysis identified novel metabolites and metabolite modules involved in BP regulation. These data add to the accumulating evidence that serum metabolites may play an important role in BP.

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P204

**Growth and Moderators of Pulse Wave Velocity From Childhood to Adulthood**

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**Background:** Increased arterial stiffness measured by pulse wave velocity (PWV) has been shown to be an important parameter in the assessment of cardiovascular risk. However little is known about its longitudinal development from childhood to adulthood and its possible sociodemographic, anthropometric, hemodynamic and behavioral moderators.

**Methods and results:** Individual growth curves of carotid-distal PWV across age were created for 559 African American and European American males and females with a maximum of 5 assessments over a 13-year period (age, 13.7-37.3). African Americans and males had significantly higher PWV than did European Americans and females ($P<0.01$), respectively. A 3-way interaction ($P<0.01$) between age, gender and ethnicity was observed with African American males displaying a larger rate of increase in PWV with age than the other 3
ethnic and gender groups. The ethnicity and gender effects on PWV persisted when controlling for other moderators. Waist circumstance was the strongest anthropometric predictor but its effect on PWV was only significant in females. Mean arterial pressure was the strongest hemodynamic predictor, marital status of parents was the strongest socioeconomic predictor, and illegal drug use was the strongest behavioral predictor of PWV. The best-fitting full model explained in total 61.6% of the between-subject variance in PWV with ethnicity, gender and age explaining 25%. Conclusion: We observed significant ethnic and gender differences in longitudinal trajectories of PWV in youth and young adults. Apart from these ethnicity and gender effects, individual differences in PWV growth can largely be explained by mean arterial pressure, waist circumstance, marital status and illegal drug use.


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P205

Quality of Reporting and Methods of Systematic Reviews and Meta-analysis Addressing High-intensity Interval Training Efficacy on Cardiorespiratory Fitness: A Meta-Epidemiological Study

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Introduction The efficacy of high-intensity interval training (HIIT) for cardiorespiratory fitness (VO2max) has been increasingly investigated in different populations, resulting in efforts to summarize intervention effects through generation of systematic reviews and meta-analysis (SRMAs). Despite of many available SRMAs, the quality of methods and reporting of these syntheses is still unknown. Thus, we aimed to quantify it by a meta-epidemiological design, in order to cover all eligible SRMAs.

Hypothesis We hypothesized that SRMAs would have low quality of reporting and methodology, based on previous findings on overall biomedical literature.

Methods We searched four electronic databases, grey-literature, and hand-searched relevant SRMAs. Eligibility criteria were any SRMA having HIIT/SIT on VO2max as one of addressed meta-analysis from individual studies including apparently healthy subjects as well as patients with cerebrovascular (stroke) or cardiovascular (CVD) diseases (coronary artery disease, heart failure, heart attack, and peripheral artery disease). No restriction was made regarding publication status or language. Eligibility assessment and data extraction were done in duplicate and discordances were solved by consensus. We used 14 items adapted from PRISMA and AMSTAR tools to assess methodological, quantitative and reporting practices in SRMAs. This SR is registered (CRD42017067269) and all documentation and raw data are available at https://github.com/lhelal/srma-hiit.git and osf.io/6xzyf. This abstract is the first report regarding our final analysis.

Results From 141 retrieved titles, 47 duplicates were excluded and 94 full-texts were assessed, resulting in 13 eligible SRMAs. Of these, 7 SRMAs were on CVD and 6 on apparently healthy patients. Median AMSTAR score was 4/11 (median ± IQR, 4 ± 2). Regarding reporting,
none of the SRMAs reported registry (0%), 39% (5/13) self-reported as in accordance to PRISMA, 8/13 (62%) reported disclosure status, 46% (6/13) reported full eligibility and extraction process and 100% (13/13) referred to a comparator group. For methodology, database median number was 4 (4 ± 5), where 92% (12/13) restricted to English and 61.5% (8/13) restricted to publication status on their primary study eligibility criteria. Moreover, 69% (9/13) had a comparator group, 31% (4/13) provided full-search strategy that allows replication and 62% (8/13) analyzed primary study risk of bias.

Conclusions Only a low to modest proportion of SRMAs followed practices to provide adequate literature coverage, methodological transparency and assessment of potential biases. Since such syntheses are useful to decision making regarding exercise interventions, increased adherence to approaches that enhance methodological and reporting quality is warranted from authors and journal editors.


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P206

The Risk for Cardiovascular Disease Attributable to Traditional Risk Factors Increases

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Background: Cardiovascular disease (CVD) is a major cause of mortality and morbidity. Traditional risk factors include systolic blood pressure, diabetes, adiposity, cholesterol and smoking. The prevalence and distribution of these risk factors in the population have changed within the last decades and CVD mortality rates have been declining. However, the impact of these changes on the contribution of the single risk factors to overall CVD risk remains to be investigated.

Hypothesis: We assessed the hypothesis that the population attributable risk (PAR) of traditional risk factors changes from 1985 to 2000.

Methods: The sample comprises 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. Participants were followed up for incident CVD events for ten years. We analyzed the traditional risk factors hypertension, defined as systolic blood pressure ≥ 140 mmHg or treatment with antihypertensive medication; diabetes mellitus; obesity, defined as a Body Mass Index ≥ 30 kg/m²; hypercholesterolemia, defined as total cholesterol levels ≥ 200 mg/dL; and smoking. We calculated the PAR first according to Levin’s formula using both crude relative risks as well as adjusted hazard ratios and second as an average of all single sequential PARs according to the formulæ by Ferguson.

Results: Temporal trends in prevalence varied for the respective risk factors. The prevalence of hypertension decreased slightly for women (from 25.0% in 1985 to 23.0% in 2000) and increased slightly for men (32.3% to 33.3%), whereas the prevalence of diabetes and obesity increased for both women and men. Prevalence of hypercholesterolemia decreased slightly for women (from 73.4% to 71.4%) and more pronounced for men (80.5% to 74.5%). Prevalence of smoking increased for women (20% to 23.6%), but decreased for men (36.4%
to 32.4%). CVD events occurred in 2.4% of women in 1985 and 2.3% in 2000; for men, event rates were 6.2% and 6.3%, respectively.

For both women and men the risk factor with the highest PAR in 1985 was hypertension (64.0% and 43.3%, respectively according to Levin’s formula). However, in 2000 the risk factor with the highest PAR was hypercholesterolemia (78.2% and 57.0%, respectively). The PAR for diabetes declined for women and increased for men. The PAR for smoking varied substantially between the studies without a discernible trend. According to Ferguson’s formulae, the PAR of all risk factors taken together increased from 74.3% to 84.2% in women and from 70.8% to 81.8% in men.

Conclusion: In conclusion, the CVD risk attributable to traditional risk factors has increased within the last decades. However, different methods of calculating the PAR have to be taken into account. These trends might influence public health policies focusing on the management of these risk factors in order to effectively prevent CVD.


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P207

An Interpretation-Friendly Approach for Model Comparison of Risk Scores for Adult Obesity in the International Childhood Cardiovascular Cohort (I3c) Consortium

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INTRODUCTION Continuous Net Reclassification Improvement (NRI) compares risk prediction between 2 models, but the NRI scale is hard to interpret as a difference of differences of correct vs. incorrect reclassification. We developed Discrimination Improvement Analysis (DIA), a mathematically-related alternative. We illustrate DIA in i3C comparing P(adult obese) estimated from childhood either using body mass index (BMI; base model) or BMI percentile (CDC Chart 2000; alternative model). METHODS In both DIA and NRI (described in the Table), reclassification is based on the regression discriminant to assess reclassification up when predicted risk is increased under the alternative model (>0), and down when the opposite is true (≤0). The DIA metric is the “added spread”: observed P(adult obese) in those reclassified up minus in those reclassified down. Using Bayes rule, continuous NRI is a weighted average of the P(adult obese) in those reclassified up minus in those reclassified down. We used first childhood BMI (age 3-19 y) and last adult BMI (age 30-50 y) in i3C. Logistic regression estimated P(adult obese) in the base model and the alternative model. RESULTS Of 8864 participants (47% men, 89% white, mean child BMI age 11 y (SD 4), mean adult age 38 y (SD 6)), 2436 were obese adults (last adult BMI≥30 kg/m²). Both absolute BMI and BMI percentile were independent predictors (Table). Average P(adult obese) in the base model was 24.1%. The alternative model significantly added spread of 11.2%; observed P(adult obese) 30.2% in those reclassified up vs 19.0% in those reclassified down, P<0.001). Using the
continuous NRI yields a result qualitatively similar to DIA: 0.28 (95% CI: 0.25, 0.31).

**CONCLUSIONS** The DIA and NRI agreed that prediction of \( P(\text{adult obese}) \) was improved using BMI percentile over using absolute BMI, although DIA and NRI may disagree due to different weighting. The DIA method of quantifying added spread in prediction has the advantage of being on the natural scale. The DIA principle may also be applied to a continuous dependent variable.


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**P208**

**Validation of a New Cardiovascular Risk Model: Performance of a Neural Network and the ACC/AHA Pooled Cohort Equations Across Four Diverse US Prospective Cohort Studies**

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**Introduction:** The American College of Cardiology/American Heart Association developed Pooled Cohort equations to predict the incidence of atherosclerotic cardiovascular disease (ASCVD). However, validation studies have shown that these equations may overestimate risk in more heterogeneous populations. Moreover, the equations do not fully consider lifestyle behaviors.

**Objective:** To build a more accurate prediction model for ASCVD using a more holistic set of predictors by applying machine learning techniques that leverage the natural multi-dimensionality of risk factors across diverse cohorts.

**Methods:** We pooled measured metabolic indicators including total triglycerides, high- and low-density lipoprotein, C-reactive protein, plasma glucose level, systolic blood pressure, height and weight, dietary consumption data, and other established behavioral risk factors from a total of 4 cohort studies: Atherosclerosis Risk in Communities Study, Cardiovascular Health Study, Framingham Heart Study Offspring Cohort, and Multi-Ethnic Study of Atherosclerosis. Individuals with an ASCVD at baseline measurement, as well as those with missing covariates were excluded. Outcomes were defined as an ASVCD event within ten years of study inception. We built and trained a neural network model and evaluated out of sample performance by age, gender, and race. We considered feature interactions and performed hyperparameter tuning using grid search with cross-validation.

**Results:** Our pooled dataset contained over 26,000 individuals with 4,066 events (15.4%), over an average follow-up time of 16.2 years. Our final risk model outperformed the pooled cohort equations across all demographic subgroups. Predicted incidence of ASCVD showed good discrimination and calibration with an area under the receiver operating characteristic curve of 0.75 for females and 0.74 for males.

**Conclusion:** Our risk model demonstrates improved accuracy on held-out validation data over the ASCVD set of equations. By taking into account more proximal and modifiable risk factors, this model helps identify high-risk individuals with greater precision and inform CVD prevention efforts.

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P209

Heterogeneity of Absolute/Relative Measures of Cardiovascular Mortality Among Cohorts in an Individual Participant Data Meta-Analysis: An EPOCH-JAPAN Study

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Introduction: Individual participant data (IPD) meta-analyses involve participant-level data from multiple cohort studies. However, these cohorts have different periods (years) of follow-up, target regions, and distributions of risk factors (including patient age). It remains unclear if these variations affect the heterogeneity of absolute/relative measures of mortality in cardiovascular disease (CVD), stroke, and coronary heart disease (CHD) among cohorts. Hypothesis: There is diverse heterogeneity in absolute measures of mortality, but negligible heterogeneity in relative measures among cohorts in IPD meta-analyses. Methods: The Evidence for Cardiovascular Prevention from Observational Cohorts in Japan (EPOCH-JAPAN) study is an IPD meta-analysis of cardiovascular epidemiology. This project comprises 14 cohort studies with 105,945 Japanese subjects (total CVD deaths: 5,314). First, we examined the correlation between the follow-up periods of the baseline surveys and multivariate-adjusted mortality rates (CVD, stroke, and CHD) among the cohorts. Next, we estimated the cohort-specific mortality rates that adjusted for the stated follow-up periods, regions, age, and other risk factors using Poisson regression. Finally, we explored the heterogeneity of multivariate-adjusted mortality rates, mortality rate ratios, and rate ratios of 10-mmHg increases in systolic blood pressure using Higgins’s $I^2$, which measures heterogeneity in meta-analyses. Results: High correlations were observed between the stated follow-up periods of the cohorts and their mortality rates (CVD [men, -0.70; women, -0.79], stroke [men, -0.65; women, -0.73], CHD [men, -0.24; women, -0.89]). In the multivariate-adjusted mortality rates, we observed clear heterogeneity in mortality rates among the cohorts (CVD [I$^2$: men, 98.6%; women, 99.3%], stroke [I$^2$: men, 98.5%; women, 98.3%], and CHD [I$^2$: men, 98.2%; women 92.4%]). In the rate ratio comparison of 10-mmHg increases in systolic blood pressure, no heterogeneity was detected among the cohorts (CVD [I$^2$: men, 0.0%; women, 17.9%]). Our results indicated that the ratio measure, which shows the magnitude of each risk factor, was stable even in the heterogeneity of absolute measures. Conclusions: A clear heterogeneity in mortality was observed in absolute measures, but not in relative measures, among cohorts after adjusting for the periods of follow-up, regions, and other risk factors.


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P211

A Method to Impute Life-course Trajectories of Cardiovascular Risk Factors from Pooled Cohorts Data

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Introduction. Cumulative exposure to cardiovascular disease (CVD) risk factors during young adulthood is associated with later life CVD risk. Few prospective cohort studies measured exposures in young adulthood. We sought to develop and validate a method to impute trajectories of CVD risk factors across the life course.

Methods. 36,546 participants (55% women, 25% black, average exams 5.1/participant) from 6 studies (ARIC, CARDIA, CHS, Framingham Offspring, Health ABC, and MESA) were included. Demographics and CVD risk factors (BMI, smoking, BP, lipids, glucose, medications for BP, lipids and glucose) were collected at each exam and harmonized across cohorts. We multiply imputed complete risk factor trajectories from age 18 to 99 years for each participant using an extension of linear mixed modeling (for continuous variables) and interval-censored survival modeling (for categorical variables), taking into account the multilevel structure of data. For validation, we randomly selected 25% of all participants and deleted their observed data for exam age 20-35, 50-65, or 80-95 years. We then imputed risk factor values for deleted age periods and compared imputed values with directly observed values.

Results. Imputed values were relatively consistent with observed values for BMI, SBP, LDL, and glucose, particularly in young and middle ages (Figure). The mean (standard deviation) of the difference between imputed vs. observed values for BMI, SBP, LDL, and glucose were 0.1 (2.7) kg/m², 0.9 (16.3) mm Hg, -1.1 (30.2) mg/dL, and -0.6 (23.0) mg/dL. The prevalence of imputed smoking, diabetes, and medications were also consistent with observed data.

Conclusions. We demonstrated a validated method for estimating CVD risk factor trajectories across the life course. This approach may advance understanding of potential impact of cumulative early risk factor exposures on later life CVD risk, and inform primary prevention strategies over the life course.

Figure. Mean and prevalence of observed vs. imputed risk factors by age periods


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P212

Combined Analysis of Longitudinal Cohorts With Case-only Sample Sets for Detecting Genetic Effects on Venous Thromboembolism in Topmed

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BACKGROUND: The Trans-Omics for Precision Medicine (TOPMed) program is performing whole-genome sequencing across multiple studies, including longitudinal cohorts, case-control, and case-only sample sets. Detecting the effects of low frequency variants requires large sample sizes, which can only be achieved by combining data across diverse study designs, including matching of case-only sample sets with controls from other studies. Here we present a strategy for combined analysis of venous thromboembolism (VTE) case status in 3 longitudinal cohorts and 3 case-only sample sets, in the context of whole-genome association studies.

METHODS: For each cohort study, we sampled ‘pure’ controls (without replacement) from the risk set of each incident case, within strata defined by sex, ancestry and birth-cohort. Pure controls had no event throughout their period of observation. A case’s risk set was defined as controls with no prior VTE history and under observation through an age at least as old as the case. For case-only sample sets, controls for each case were sampled from a cohort study, using the same risk set definition. Because of limited overlap in birth years between the cohort studies and the case-only sample sets, this matching was done within strata defined only by sex and ancestry group. Mixed model logistic regression will be used to account for relatedness as a random effect. Although conditional logistic regression is not practical for whole-genome association studies, case-control matching is implicitly recognized by a fixed effect for age-at-event for each matched set (1 case and >=1 matched controls). Additional fixed effects will include sample set and sex. We will also adjust for variations in case-control ratio among the matched sets.

RESULTS: In two cohort studies, we matched 1,231 cases to 4,820 controls (overall ratio = 1:3.9); only 500 controls and 5 cases could not be matched. For the case-only sample sets we matched 2,141 cases to 2,780 controls from one cohort study (overall ratio = 1:1.3); zero controls and only 14 cases could not be matched.

CONCLUSIONS: We were successfully able to match nearly all cases to controls, and more than 90% of controls were also matched. By matching controls to cases based on age at event, we can account for the different risk of VTE by age clusters. Although this strategy does not provide an asymptotically unbiased estimated of the hazard ratio, compared to classical risk set sampling, it uses a large portion of the available data, it provides odds ratio estimates yielding the correct sign of association, and it reduces the potential influence of resampling subjects with rare variants. This strategy also enables combined analysis of multiple studies with different designs.


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P213

Change in Diet Quality and Risk of Incident Diabetes: The Atherosclerosis Risk in Communities Study

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**Introduction:** Despite the well-established association between diet and chronic disease risk, there is limited evidence on the association between diet change and long-term risk of diabetes in a community-based setting.

**Hypothesis:** Decline in diet quality is associated with an increased risk for incidence of diabetes in the Atherosclerosis Risk in Communities (ARIC) Study.

**Methods:** We included 8285 ARIC participants who had complete dietary intake assessments by food frequency questionnaire (FFQ) at both visits 1 (1987-1989) and 3 (1993-1995) and had no prevalent diabetes, cardiovascular disease, or cancer prior to visit 3. Change in diet quality was assessed using the Healthy Eating Index (HEI)-2015 and the Alternative HEI (AHEI)-2010 scores calculated at the two study visits. Change in scores was classified into five categories from moderate/large decrease to moderate/large increase. We used adjusted Cox models to estimate hazard ratios (HR) and 95% confidence intervals (CI) for the association between HEI-2015/AHEI-2010 score changes and incidence of diabetes, which is defined using doctor diagnosis, medication use, or elevated glucose.

**Results:** There were 2,136 cases of incident diabetes during a median of 18.05 years of follow-up (124,639 person-years). For HEI-2015, there were no statistically significant association between dietary score change and diabetes risk, comparing the five categories of changes (adjusted HRs and 95% CIs for the five categories from decrease to increase were 1.06 [0.90-1.25], 1.04 [0.90-1.21], 1.00 (ref.), 0.91 [0.79-1.05], 1.04 [0.91-1.20]). Similar trends were found in AHEI-2010 scores changes, but for the moderate to large decrease group, the decrease in dietary scores was associated with a higher diabetes risk (HR 1.23, 95%CI 1.03 to 1.46), compared to the stable group.

**Conclusion:** The results suggest that deterioration of diet quality is associated with a higher risk of diabetes.

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**P214**

**Dietary Adherence and Dietary Quality Are Associated With Weight Loss Success Among Those Following Low-fat and Low-carbohydrate Diets**

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**INTRODUCTION:** Dietary modification is the cornerstone of most successful weight loss strategies. Low-fat and low-carbohydrate diets are among the most studied approaches, but neither has been shown to be consistently superior for weight loss in the general population. Previous studies suggest that eating a high-quality diet or adhering to a given dietary strategy may influence weight loss, however these two factors have not been examined concurrently for those following macronutrient-limiting diets.

**OBJECTIVE:** To determine whether improvement in dietary quality, change in dietary macronutrient composition or the combination of these factors leads to differential weight loss for those instructed to follow a healthy low-fat (HLF) or healthy low-carbohydrate (HLC) diet.

**METHODS:** Generally healthy, non-diabetic adults, aged 18-50 years, BMI 28-40 kg/m², were randomized to HLF or HLC diets for 12 months (n=609) as part of the DIETFITS weight loss study. Participants that provided complete 24-hour dietary recall data at baseline and 12
months were included in this secondary analysis (n=448; n=224 HLF, n=224 HLC). Within each diet assignment arm, our analysis divided participants into four subgroups according to 12-month change in diet quality score (HEI-2010, above the median was defined as high quality (HQ); below the median was defined as low quality (LQ)) and 12-month change in macronutrient intake (below the median was defined as high adherence (HA) and above the median was defined as low adherence (LA) for fat (g) or digestible carbohydrate (g) for HLF and HLC, respectively). Multiple linear regression adjusted for age, sex, baseline weight and baseline fat (or digestible carbohydrate) intake was used to compare the primary outcome, baseline to 12-month change in mean BMI (kg/m²), for those in the HQ/HA, HQ/LA, LQ/HA subgroups versus the LQ/LA subgroup within HLF and HLC.

RESULTS: For HLF, changes (95% CI) in mean BMI were -1.11 kg/m² (-2.10, -0.11) for HQ/HA, -0.26 (-1.26, 0.75) for HQ/LA, and -0.66 (-1.74, 0.41) for LQ/HA compared with the LQ/LA subgroup. For HLC, changes (95% CI) in mean BMI were -1.15 kg/m² (-2.04, -0.26) for HQ/HA, -0.30 (-1.22, 0.61) for HQ/LA, and -0.80 (-1.74, 0.14) for LQ/HA compared with the LQ/LA subgroup.

CONCLUSIONS: Within both the HLF and HLC diet arms, the 12-month decrease in BMI was significantly greater for those in the High Quality/High Adherence subgroups relative to the Low Quality/Low Adherence subgroups. Neither High Quality nor High Adherence alone were significantly different than the Low Quality/Low Adherence subgroups. While further investigation is needed, the results of this secondary analysis support the importance of the combination of dietary adherence and high-quality diets for weight loss.


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dietary LA ranged from 3.5 to 8.8 percent of energy and the proportion of plasma LA ranged from 43.7 to 56.3%. Plasma and dietary LA were weakly correlated (Spearman \( r = 0.14 \), \( P < .0001 \)). During a median follow-up of 3.4 years, 171 cases of T2DM occurred. Plasma LA was associated with a significantly lower risk of T2DM (HR\(_{Q5vsQ1}\): 0.45; 95% CI: 0.27 - 0.76; \( P \) for trend = 0.002). Dietary LA was not associated with T2DM risk (HR\(_{Q5vsQ1}\): 0.97; 95% CI: 0.53 - 1.76; \( P \) for trend = 0.85).

**Conclusion:** Plasma LA but not dietary LA was associated with lower T2DM risk in post-MI patients. The utility of plasma LA as a biomarker of dietary LA warrants further investigation.

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**P216**

**Elevated Blood Glutathione Does Not Reduce Arterial Stiffness or Central Blood Pressure in Healthy Males and Females**

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**Intro:** Glutathione is endogenous within human plasma, erythrocyte lysate and is also bound to the protein within plasma. Glutathione mediates redox chemistry and prevents oxidative damage within and around cellular components via reduction of reactive species (e.g. reactive oxygen, nitrogen, or sulfur species). Polyphenols and antioxidants have been shown to improve NO bioavailability which may reduce long term incidence of endothelial dysfunction. Less is known about whether changes in antioxidant capacity augments the risk of developing hypertension.

**Hypothesis:** We hypothesized that acute glutathione supplementation would decrease arterial stiffness and reduce both brachial (bBP) and central blood pressure (cBP) in healthy male and female volunteers. **Methods:** Six males and six females (25 ± 3 and 22 ± 1 years, respectively) participated in a randomized, double blind, placebo controlled, crossover protocol. On two visits separated by 1 week, following a 12-hour fast, participants consumed either a placebo or glutathione (negligible and 200 mg, respectively) supplement via 90 second sublingual absorption which was then swallowed. Concentrations of oxidized (GSSG) and reduced glutathione (GSH) were spectrophotometrically measured in plasma (protein-bound) and erythrocyte lysate using a kinetic, enzymatic assay. Arterial stiffness was measured via pulse wave velocity (PWV) using applanation tonometry, and cBP was determined non-invasively using pulse wave analysis. All data were recorded before supplementation (baseline) and at 10, 30, 60 and 120 minutes post-consumption. **Results:** Linear mixed effect models revealed a significant (\( p<0.01 \)) increase in total glutathione (GSH+GSSG) in the supplement group compared to placebo across all post-supplementation time points with the greatest increase occurring at 120 minutes (mean 99.0; 95%CI: 7.9,190.1). At 120 minutes post-consumption, no difference was present between glutathione and placebo groups for PWV (5.86 ± 1.19 and 6.08 ± 1.25 m/s, respectively; \( p=0.43 \)), resting heart rate (52.95 ± 3.55 and 55.83 ± 6.36, respectively; \( p=0.16 \)), systolic bBP (123.05 ± 12.75 and 123.13 ± 14.52 mmHg; \( p=0.22 \)), diastolic bBP (71.81 ± 7.87 and 74.21 ± 6.53; \( p=0.48 \)), systolic cBP (108.05 ± 10.45 and 108.68 ± 11.14 mmHg, respectively; \( p=0.11 \)) and diastolic cBP (72.03 ± 7.82 and 74.94 ± 6.42 mmHg, respectively; \( p=0.46 \)). **Conclusion:** Young healthy males and females experienced an increase in circulating
humoral antioxidants in response to glutathione supplementation. However, supplementation had minimal effects on resting hemodynamics. Future research should examine glutathione supplementation’s effect in participants with decreased antioxidant capacity and increased oxidative stress including patients with known disease such as hypertension or peripheral artery disease.

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**Dietary Habits Associated With 6- and 24-month Weight Loss Maintenance in Primary Care Patients**

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**Introduction:** Though weight loss can improve health, weight regain is common. Primary care physicians are uniquely positioned to provide counseling for weight loss maintenance given their longitudinal care of patients, yet evidence of simple lifestyle recommendations for maintaining weight loss in primary care patients is lacking. Our objective was to characterize longitudinal associations between diet habits and weight change among primary care patients with recent, intentional weight loss of at least 5%. **Methods:** This was a secondary analysis of data from a weight loss maintenance clinical trial in a primary care setting that compared two interventions delivered through the electronic health record: continued coaching vs. tracking only. Dietary habits [fried foods, desserts, fruits and vegetables (F&V), and sugar-sweetened beverages (SSB)] were measured by the Connor Diet Habits Survey. Linear regression models were used to evaluate associations (overall and by randomized group) between changes in dietary habits and weight separately at 6- and 24-month follow-up, adjusted for baseline diet habit, age, gender and clinic location. **Results:** Participants (n=192) were 74% female, 87% white and had baseline mean (SD) age of 53 (12) years, body mass index of 30.4 (5.9) kg/m², and recent weight loss of 11 (8) percent. Overall, participants had mean (SD) weight loss of 0.18 (5.04) kg at 6 months (n=169) and weight gain of 3.26 (7.60) kg at 24 months (n=140). At 6 months, a 1 serving per week increase in dessert intake was associated with 0.53 kg (p=0.030) greater weight gain. Fried foods, F&V, and SSB were not associated with 6-month weight changes. However, by 24 months, an increase of 1 serving per week was associated with greater weight gain of 0.54 kg (p=0.043) for fried foods, 0.80 kg (p=0.031) for desserts, and 2.01 kg (p=0.002) for SSB. A decrease of 1 F&V serving per day was associated with a 0.82 kg (p=0.008) greater weight gain at 24 months. When stratified by randomized group, associations were stronger in the continued coaching vs. tracking only arm. **Conclusions:** Increased consumption of desserts was associated with weight regain at 6 and 24 months, while increased fried foods and SSB, and decreased F&V were associated with weight regain at 24 months. These data suggest that simple strategies such as improving or at least maintaining dietary intake of fried foods, desserts, F&V, and SSB could help facilitate long-term weight loss maintenance in primary care patients.

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P218

Fish Consumption is Not Associated With the Risk of Coronary Heart Disease or Stroke

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Introduction: Many studies have shown an inverse association of omega-3 polyunsaturated fatty acid (PUFA) from fish intake and supplementation with coronary heart disease (CHD) mortality. However, findings on the relationship of omega-3 PUFA with nonfatal CHD and stroke are less consistent. Higher doses or prolonged intake may be needed to affect non-fatal cardiovascular events. We hypothesized that among Veterans, greater baseline fish intake is associated with a lower risk of nonfatal CHD and stroke, particularly among those who regularly use omega-3 supplements.

Methods: The Million Veteran Program (MVP) is an ongoing nation-wide longitudinal cohort study of U.S. Veterans with self-reported survey, biospecimen, and electronic health record data. Participants who were free of CHD or stroke at the time of the baseline food frequency questionnaire were included in this analysis. Separate Cox proportional hazard models were used to assess the associations of fish intake with non-fatal incident CHD and stroke, defined from electronic health records using validated algorithms. Fish intake (serving=3-5 oz.) within the past year was categorized as <1 serving/month, 1-3 servings/month, 1 serving/week, 2-4 servings/week, 5-6 servings/week, and 1+ serving/day. We assessed whether omega-3 fatty acid supplementation (yes/no) modifies these relationships by testing its interaction with fish intake. Multivariable models included demographics and known CHD and stroke risk factors: age, sex, race, smoking status, alcohol use, physical activity, education, overall dietary pattern, BMI, family history of CHD or stroke, and baseline diabetes, hypertension, and use of statins and fibrates.

Results: Among 508,699 MVP participants to date, 210,180 (mean age 66±12 years, 92.1% male) were free of CHD or stroke and had data from the food frequency questionnaire at baseline. Median fish intake was 1 serving/week and 21.7% (45,552 out of 210,180) regularly took omega-3 supplements. Over a median follow-up of 2.9 years, there were 5,991 and 4,244 incident cases of non-fatal CHD and stroke, respectively. Using <1 fish serving/month as the reference, multivariable adjusted HR (95% CI) for CHD were 0.99 (0.91-1.07) for 1-3 servings/month, 1.06 (0.98-1.15) for 1 serving/week, 1.06 (0.96-1.16) for 2-4 servings/week, 1.26 (1.03-1.53) for 5-6 servings/week, and 0.96 (0.68-1.34) for 1+ serving/day, (p-trend=0.08); corresponding values for stroke were 0.95 (0.87-1.05) for 1-3 servings/month, 0.96 (0.87-1.06) for 1 serving/week, 0.99 (0.88-1.11) for 2-4 servings/week, 1.05 (0.83-1.34) for 5-6 servings/week, and 1.23 (0.87-1.74) for 1+ serving/day, (p-trend=0.60). Intake of omega-3 fatty acid supplements did not modify the fish-CHD/stoke relations (p-interaction=0.32 and 0.82, respectively).

Conclusions: We observed no consistent association between fish intake and non-fatal CHD or stroke.


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Funding Component:

P219

Changes in Dental Health and Coronary Heart Disease Risk: Two Prospective Cohort Studies in Men and Women


Introduction: Dental health problems such as tooth loss are related to inflammation and detrimental dietary changes, and may be linked to elevated risks of future heart disease. Most previous studies only investigated pre-existing tooth loss at baseline; hence, whether incident (more recent and later in life) tooth loss is associated with an increased risk of future coronary heart disease (CHD) remains unclear.

Hypothesis: We prospectively investigated how recent tooth loss was associated with subsequent risk of CHD in middle-aged adults.

Methods: This prospective study included women from the Nurses’ Health Study (NHS) and men from the Health Professionals Follow-Up Study (HPFS) who were initially free of CHD and cancer. Participants were asked about the number of natural teeth first in 1986 in the HPFS, and in 1992 in the NHS. On follow-up questionnaires, participants reported whether they had any recent tooth loss. We calculated cumulative tooth loss during an 8-year assessment period (1992-2000 in the NHS; 1986-1998 in the HPFS) among participants aged 45-69 y. Hazard ratios (HRs) for the incidence of CHD (fatal CHD or non-fatal MI) were examined across categories of the number of tooth loss (none, 1 loss, and 2 or more loss). Follow-up time was calculated after the assessment of tooth loss until the end of follow-up in 2012. We examined risks of CHD separately among individuals with 25-32 natural teeth at the initial examination (n=41939, among whom 1754 incident cases of CHD accrued during 540,744 person-years of follow-up), as well as among all eligible participants (n=60967, among whom 2440 incident cases of CHD accrued during 760,351 person-years of follow-up).

Results: Among participants with 25-32 natural teeth at baseline, men and women who lost 2 or more teeth had a significantly increased risk of CHD (Pooled: HR 1.23; 95% CI: 1.06, 1.42) as compared to those with no tooth loss, after adjustment for hypertension, dyslipidemia, diabetes, dietary habits (including the Alternative Healthy Eating Index (AHEI) score, alcohol, multivitamin supplement use), lifestyle and demographic factors. The association was also independent of concurrent changes (during the same period of tooth loss assessment) in AHEI score, physical activity, body weight, and status of hypertension, dyslipidemia, and diabetes (pooled HR 1.22, 95% CI: 1.06, 1.41). When we examined the risk of CHD among all the eligible participants, greater loss of teeth (2 or more loss vs. no loss: pooled HR: 1.16; 95% CI: 1.04, 1.30) and having fewer natural teeth (less than 17 vs. 25-32 teeth: pooled HR: 1.25; 95% CI: 1.08, 1.46) were independently and significantly associated with increased risk of CHD.

Conclusions: Our results suggest that among middle-aged adults, a higher number of teeth lost in the recent past may be associated with subsequent risk of CHD, independent of the baseline number of natural teeth and traditional risk factors.

Elevated De Novo Lipogenesis Fatty Acids and Lower Omega-6 Fatty Acids Are Associated With Markers of Insulin Resistance and Respond to Changes in Dietary Carbohydrate Intake in Overweight Individuals on Weight Loss Diets

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Background: High blood levels of certain fatty acids (FAs) in the de novo lipogenesis pathway (DNL; i.e., 16:0, cis-16:1n7) and low levels of omega-6 FAs (n-6 FA; i.e., 18:2n6) have been related to increased risk for type 2 diabetes. We hypothesized that individuals with insulin resistance (IR) would have higher DNL and lower n-6 FA plasma levels than insulin sensitive (IS) individuals, and that DNL FA levels would decrease on a low-carbohydrate (LC) diet and not change on a low-fat (LF) diet.

Methods: Plasma FAs were measured as a % of total FA in subjects (n=61) with varying degrees of obesity and IR before and after 6 months of LF or LC weight loss diets. IR metrics were calculated pre- and post from oral glucose tolerance tests and fasting blood samples. FA medians (Interquartile Range), Spearman correlations (R) and Mann-Whitney test results are presented.

Results: All differences shown are significant at P<0.05 unless reported as not significant (NS). Compared to the IS group, IR individuals had higher 16:0 (IR: 22.9% [22.2, 24.3] vs IS: 21.7% [20.2, 22.5]) and 16:1n7 (IR: 1.8% [1.4, 2.2] vs IS: 1.3% [1.1, 1.6]), and lower 18:2n6 (IR: 30.8% [27.8, 31.6] vs IS: 32.5% [30.0, 34.6]) levels at baseline. 16:0 and 16:1n7 were directly related to BMI (0.40, 0.28), fasting insulin (0.40, 0.33), HOMA-IR (0.40, 0.43), TG:HDL (0.38, NS) and indirectly to Matsuda Index (-0.35, -0.34). 18:2n6 was directly related to the Matsuda Index (0.35) and indirectly to HOMA-IR (-0.37) and TG:HDL (-0.45). Diet x IR status analyses were not significant, thus FA changes on LC and LF diets were compared. 16:1n7 decreased on the LC diet and did not change on the LF diet (LC: -0.5% [-0.7, -0.3] vs LF: -0.1% [-0.3, 0.2]). 18:2n6 levels increased on the LC diet and decreased on the LF diet (LC: 0.9% [-0.3, 2.7] vs LF: -0.5% [-2.4, 0.6]). Changes in dietary carbohydrate (% of calories) correlated with changes in 16:1n7 directly (0.38) and 18:2n6 indirectly (-0.37). Changes in 16:1n7 were directly related to changes in weight (0.55) and TG:HDL (0.65), and changes in 18:2n6 were indirectly related to TG:HDL changes (-0.51).

Conclusions: Elevated plasma DNL FA and lower 18:2n6 were evident in IR vs. IS individuals, and individual markers of IR were related to FA levels accordingly. DNL and 18:2n-6 responded to changes in carbohydrate intake. FA patterns may be a useful tool to identify IR individuals and track carbohydrate consumption.

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P221

Combined Low Vitamin D and K Status is Associated With Greater Left Ventricular Mass

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Introduction: Low vitamin D and vitamin K status are both associated with cardiovascular disease 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 combined low vitamin D and low vitamin K status is prospectively associated with unfavorable measures of cardiac structure and function. Methods: In the Hoorn Study, a population-based cohort study of 598 participants, mean age 70.1±6.6 years, 51% female, had physical examinations in 2000-2001 (baseline for the current analyses), and of these 265 had a follow-up in 2007-2009. In baseline samples, 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. We studied the combined association of 25(OH)D and dp-ucMGP with echocardiographic measures of left ventricular mass index, left ventricular ejection fraction and left atrium volume index after 8 years of follow-up using linear regression analyses. The group high 25(OH)D/low dp-ucMGP was the reference group. We adjusted our analyses for potential confounders including follow-up time and baseline echocardiographic measures. Results: Mean 25(OH)D was 57.8 nmol/L and median was dp-ucMGP was 567 pmol/L. The low 25(OH)D/high dp-ucMGP category was associated with a greater left ventricle mass index:4.8 g/m².7 (95% CI 0.6, 9.1) at follow-up compared to the reference group, in the fully adjusted model (Table 1). No associations were observed between 25(OH)D and dp-ucMGP categories with systolic and diastolic function after 8 years of follow-up. Conclusion: In conclusion, these results suggest that high levels of 25(OH)D and low levels of dp-ucMGP are associated with a greater left ventricle mass index. Vitamin D and K supplementation trials are the next step to assess a causal relationship with cardiac structure.

Consumption of Sugar-Sweetened Beverages, but Not 100% Fruit Juice, is Associated With Fasting High-density Lipoprotein and Triglyceride Concentrations in U.S. Adults


Introduction: Dyslipidemia, characterized by high triglyceride (TG) and low HDL concentrations, is a risk factor for cardiovascular disease (CVD). Decreasing dietary sugar consumption is one dietary modification that may influence dyslipidemia...
risk to reduce the risk for CVD. Two major sources of dietary sugar in the US are sugar-sweetened beverages (SSB) and 100% fruit juices, and both can contribute to excess caloric intake. Based on current observational data, there is limited evidence linking these dietary exposures to lipid levels in population-based studies.

**Hypothesis**: We hypothesize that SSB and 100% fruit juices may differentially associate with TG and HDL concentrations in adults due to differences in both beverage consumption patterns and nutrient content.

**Methods**: We conducted a cross-sectional analysis of data from the Framingham Heart Study (1998-2005; n=6,802). Fasting plasma TG and HDL concentrations were measured using standard assays. Consumption of SSB (sodas and fruit drinks; 1 serving = 12 oz.) and 100% fruit juice (1 serving = 8 oz.) was estimated using the Harvard-Food Frequency Questionnaire. Participants were grouped by category of intake. Using mixed-effect linear regression models accounting for family structure, we examined the associations between SSB intake and 100% fruit juice intake with TG and HDL concentrations, adjusting for potential confounding factors related to demographics, lifestyle, and diet.

**Results**: After multivariate adjustment for potential confounding factors, SSB intake was positively associated with TG concentrations [β ± SE: 0.12 ± 0.03 [ln] mg/dl comparing the highest category of intake (median = 8.5 servings/week) with the lowest category (median = 0 servings/day); p for trend < 0.0001] and inversely associated with HDL concentrations [β ± SE: -2.90 ± 0.69 mg/dl comparing the highest category of intake with the lowest category; p for trend < 0.0001]. Fruit juice intake was not significantly associated with TG concentrations [β ± SE: 0.04 ± 0.02 [ln] mg/dl comparing highest category of intake (median = 11 servings/week) with the lowest category (median = 0 servings/day); p for trend = 0.15] or HDL concentrations [β ± SE: -0.18 ± 0.60 mg/dl comparing the highest category of intake with the lowest category; p for trend = 0.73].

**Conclusions**: Higher intakes of SSB are significantly associated with lower HDL and higher TG concentrations, which supports dietary recommendations to limit SSB intake. Fruit juice consumption patterns, up to 1.5 servings/day, were not significantly associated with TG and HDL concentrations in this study.


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**P223**

**Cardiometabolic Disease Costs Associated With an Unhealthy Diet in the United States**

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**Introduction**: Despite the clear association between poor diet and cardiometabolic diseases (CMD) and the overall economic burden of such conditions, the costs of an unhealthy diet pattern have not been assessed for the US population.

**Aim**: Estimate the costs of CMD related to suboptimal intakes of 10 specific dietary factors in the US adult population.

**Methods**: A validated microsimulation model (CVD PREDICT) was populated by weighted sampling (with replacement) of individuals aged 35–85y from the 2009-2010 and 2011-2012
National Health and Nutrition Examination Surveys (NHANES), in order to create an US representative model population. Consumption of 10 foods/nutrients associated with CMD were assessed: fruits, vegetables, nuts/seeds, whole grains, unprocessed red meats, processed meats, sugar-sweetened beverages, polyunsaturated fats, seafood omega-3 fats, and sodium. Cardiovascular disease progression and events were simulated and annual healthcare costs estimations were calculated. The model compared reported consumption of the 10 food/nutrients in the NHANES surveys to a hypothetical situation in which the consumption level of these nutrients were optimal. Each food/nutrient was assessed individually and combined. Estimates were stratified by gender, age, race and insurance.

**Results:** The 2012 annual cost of an unhealthy diet was $USD 280 (Acute $USD 236, Chronic $USD 40 and Drug $USD 4) per adult. Individually the food/nutrient consumed below optimal levels that imposed the highest CMD economic burden was nuts/seeds ($USD 75) while non-optimal red meat consumption was associated with the lowest cost per person ($USD 3). Unhealthy diet costs of CMD by gender, age group, race and insurance are provided in table 1. The annual unhealthy diet cost of CMD in the US was $USD 44.9bn in 2012. Acute care costs represent 84.3% of this total ($USD 37.9bn).

**Conclusions:** Suboptimal diet accounts for substantial CMD costs in the US, highlighting the need for timely implementation of diet policies to address these burdens.

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the Health Professionals Follow-up Study (1986-2012) who were free from cardiovascular disease (CVD), cancer and diabetes at baseline. Diet was assessed using food frequency questionnaires at baseline and updated every 2 to 4 years.

**Results**

Our study documented 28,333 deaths during follow-up. The 3rd quintile of fruit and vegetable intake was associated with the lowest hazard ratio (HR) of total mortality (HR, 0.87, 95% CI, 0.83-0.90, $P_{\text{nonlinear}} <0.001$) compared to the 1st quintile. The nonlinear dose-response relationship plateaued at about 5 servings/day (svg/d), but above that level, higher intake was not associated with additional risk reduction. We found similar nonlinear associations for CVD, cancer and respiratory disease mortality. Compared to fruit and vegetable intake <1.5 svg/d, the intake level ≥5 svg/d was associated with HRs (95% CI) of 0.84 (0.75-0.93), 0.82 (0.72-0.93) and 0.55 (0.44-0.67) for cancer, CVD and respiratory disease mortality, respectively. Among individual fruits and vegetables, the associations of intakes with mortality were heterogeneous. Higher intakes of most fruit and vegetable subgroups were associated with lower total mortality, whereas higher intake of starchy vegetable such as peas and corn was not associated with total mortality.

**Conclusions**

Higher fruit and vegetable intake was associated with lower mortality; the lowest mortality was observed among those who consumed 5 servings of fruit and vegetables per day (2 servings of fruit and 3 servings of vegetables daily). Our findings also suggest the presence of heterogeneity in the health benefits of individual fruits and vegetables.

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**P225**

The Associations of Dietary and Biomarkers of Linoleic Acid Intake and All-cause and Cardiovascular Mortality: A Systematic Review and Meta-analysis

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**Background** Previous studies on intake of linoleic acid (LA), a predominant n-6 fatty acid, and risk of mortality from all-cause and cardiovascular disease (CVD) have generated inconsistent results. We performed a systematic review and meta-analysis of prospective cohort studies to summarize the evidence regarding the relation of LA and all-cause and CVD mortality.

**Methods** We searched MEDLINE and EMBASE databases through June 2017 for prospective cohort studies reporting association of LA (assessed by dietary survey or biomarker in blood or adipose tissue) with all-cause and CVD mortality. In addition, unpublished data from pooling projects were included. We pooled the multivariate-adjusted Hazards ratios (HRs) using random-effect meta-analysis, which allowed for between-study heterogeneity.

**Results** 27 studies covering 37 prospective cohorts were identified; these included 274,565 individuals with dietary assessment (34,597 all-cause and 10,636 CVD deaths) and 54,794 individuals with biomarker measurements (6,767 all-cause and 5,311 CVD deaths). Comparing the highest category with the
lowest, dietary LA intake was associated with a 14% lower risk of all-cause mortality (95% confidence interval [CI], 2%-25%, $I^2=71\%$) and a 20% lower risk of CVD mortality (95% CI, 13%-26%, $I^2=0$). Baseline health status (i.e. general population, CVD/high risk for CVD, or cancer) might be a main source of heterogeneity for the association of dietary LA intake with all-cause mortality. As for biomarkers, 1 SD increment in LA was associated with a 9% lower risk of all-cause mortality (95% CI, 4%-14%, $I^2=61\%$) and a 10% lower risk of CVD mortality (95% CI, 5%-14%, $I^2=13\%$). Heterogeneity was presented across tissue types and between genders.

**Conclusions** In prospective cohort studies, LA intake, assessed by either dietary survey or biomarkers, was inversely associated with all-cause and CVD mortality in a dose-response manner. These data support the current recommendations on polyunsaturated fat intake for prevention of CVD and early death.

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P226

**HEalth Nutritional Index (HENI): A Health Burden Based Tool for Food and Diet Nutritional Evaluation**

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**Introduction:** The role of diets on human health is crucial and depends on the quality of the food we eat. A number of indexes help rank food items and evaluate diets based on their nutrient profiling and meeting dietary guidelines, respectively. Existing nutritional indexes fail to quantify the varying effects of major food groups and nutrients on human health. We introduce the HEalth Nutritional Index (HENI), a health burden-based scoring system in disability adjusted life years (DALYs) that uses epidemiological evidence from the Global Burden of Disease (GBD) to rank and evaluate food items and diets.

**Methods:** HENI accounts for the health effects of 8 major food groups (nuts and seeds, whole grains, fruits, vegetables, milk, sugar-sweetened beverages, red meat, and processed meat) and 6 nutrients (omega-3, calcium, fiber, polyunsaturated fatty acids, trans fat, and sodium), identified by the GBD as dietary risk factors. The HENI factors are estimated by coupling age- and gender-adjusted outcome-specific incidence rates with risk ratios (RR) and severity factors, measuring positive or detrimental effects in avoided μDALY/g. We determine the food group and nutrient profile for each of the 5000+ consumed food items in the What We Eat in America 2009-2014 dataset, using multiple databases such as the Food Patterns Equivalents Database (FPED), the Food and Nutrient Database for Dietary Studies (FNDDS), and the USDA National Nutrient Database for Standard Reference (SR). We then derive the HENI scores for 100 kcal, 100 grams or 1 serving of each food item by multiplying the food group and nutrient composition by their respective HENI factors.

**Results:** HENI factors for food group and nutrient range between -8 μDALY/g for sodium, up to 57 μDALY/g for omega-3 from fish and seafood. HENI score typically ranges from -30 avoided μDALY/100kcal for e.g. soft drinks, up to +50 avoided μDALY/100kcal, for beneficial food items such as fish, fruits, vegetables, and nuts. The majority of the health effect is associated with cardiovascular diseases, with some food items affecting certain cancers (e.g. health benefit for colorectal cancer with milk). Absolute HENI scores and ranking of food items vary substantially when using 100 kcal, 100 grams or 1 serving as a basis for comparison. In
a sensitivity study, we consider the indirect effect of saturated fat via total blood cholesterol is considered which can play an important role for animal-based food items, requiring further investigation. The HENI factors are applicable under the assumption that the overall dietary intake of each GBD food group and nutrient is within the effective intake range, below the theoretical risk level limit. 

**Conclusion:** The proposed HENI index enables to quantify the human health impact of thousands of food items, bringing on the same scale different nutritional impacts, allowing for a comprehensive assessment of food items and diets.

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**P227**

**Circulating and Dietary Linoleic Acid and Prevalent Diabetes in Post-Myocardial Infarction Patients**

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**Background:** Circulating linoleic acid 18:2n-6 (LA) has been considered to reflect LA intake, but its utility as a dietary biomarker could be affected by metabolism.

**Objective:** To study the associations of plasma and dietary LA with T2D prevalence in drug-treated patients with a history of myocardial infarction (MI).

**Methods:** Cross-sectional analysis of baseline data in 4,072 Dutch post-MI patients of the Alpha Omega Cohort. Circulating LA (as % of total fatty acids) was assessed in plasma cholesterol esters (CE) in the total cohort and in plasma phospholipids (PL) in a random subset of 833 patients. LA intake was assessed by a 203-item validated food frequency questionnaire. Prevalence ratios of T2D and associations with metabolic parameters were estimated in plasma and dietary LA quintiles using multivariable generalized linear models adjusted for demographic, lifestyle and dietary factors.

**Results:** Patients were on average 69 years old, 79% was male and 77% were overweight or obese. Most patients used statins (86%), antihypertensive drugs (90%) and antiplatelet drugs (84%). A total of 813 patients (20%) had T2D. Mean LA intake (±SD) was 5.7±2.2 energy%, and circulating LA was 49.9±5.0% in CE and 18.7±3.0% in PL. Spearman’s correlations of dietary LA with circulating LA in CE and PL were 0.16 and 0.10, respectively. Higher plasma LA, but not dietary LA, was significantly associated with a lower diabetes prevalence (Table 1). BMI (β= -0.07, p<0.001), log non-fasting triglycerides (β= -0.01, p<0.001), log non-fasting glucose (β= -0.01, p<0.001), and log alcohol intake (β= -0.03, p<0.001) were significantly associated with circulating LA in plasma CE. Similar associations were found for LA in plasma PL. Dietary LA was not significantly associated with T2D prevalence and metabolic parameters (all p>0.05).

**Conclusions:** Circulating LA may reflect both LA intake and metabolic state in drug-treated post-MI patients. This bears restrictions for its use as a biomarker of dietary LA intake in epidemiological studies.

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P228

Milkfat Consumption, Dyslipidemia, and Body Weight in Children

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Background Dietary guidelines recommend consumption of 1% or skim (i.e. non-fat) milk for children >2 years due to concerns about the role of saturated fat in raising low-density lipoprotein cholesterol (LDL) levels and cardiovascular disease risk. Low- or non-fat milk is also recommended to promote energy balance and reduce obesity risk. While more recent evidence in adults suggests no association between milkfat and cardiovascular disease risk, this association has not been well studied among children who tend to be the highest consumers of milk. No known studies have demonstrated an association between milkfat consumption and lipid levels in children. Our objective was to determine if there is an association between milk fat consumption and risk of dyslipidemia and obesity among U.S. children.

Methods We used cross-sectional data from children 2-19 years from the National Health and Nutrition Examination Survey (NHANES) 2011-2014 (n=7261). Usual milkfat intake (i.e. never/rare milk consumption, non-fat, 1%, 2%, or whole) was self-reported by parent or child. Lipid levels (12-19 years only) and adiposity (BMI z-score and weight category [underweight, normal, overweight, or obese] in all ages) were assessed by trained staff using standardized methods. Covariates included child age, sex, household income, race/ethnicity, physical activity, dieting, and total energy intake. We used multivariate linear and logistic regression models to examine the association between milkfat consumption and our outcomes and conducted pairwise comparisons to assess differences between different milkfat consumers.

Results Most children consumed 2% milk (42.3%), followed by whole (26.1%), 1% milk (11.7%), never/rare consumption (10.2%), and nonfat (9.7%). We found no significant trends in mean cholesterol (total, HDL, LDL) with consumption of milk with greater fat content. There was a significant trend towards higher triglycerides as milkfat intake increased (p=0.01) though this association was stronger among 2% milk compared to whole fat consumers. We found no significant trend in prevalence of each BMI category across milk fat intake. Pairwise comparisons demonstrated that usual consumption of 1% and 2% milkfat was associated with both higher BMI Z-score and odds of obesity compared to whole milk. Conclusions We found no significant linear trend between usual %milk fat consumed and indicators of cardiovascular disease (BMI-Z and lipid levels) in children, except for triglycerides which rose as milkfat intake increased. However, triglycerides were higher among the 2% compared to whole milkfat consumers. Overall, whole milk was not associated with increased indicators of cardiovascular disease risk in children.

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P229
Cost-Effectiveness of a US National Sugar-Sweetened Beverage Tax Using a Multi-Stakeholder Approach

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Introduction. Taxes on sugar-sweetened beverage (SSB) purchases have emerged as a policy tool to lower obesity, diabetes and CVD risks. Prior cost-effectiveness analyses included SSB tax administration costs yet ignored tax payments as mere transfers from a societal perspective. Yet, tax payments could count as revenues for the government and as costs for consumers and the SSB industry. Corresponding health and economic impacts for different stakeholders, essential to guide decision-making, are not established.

Aim. To estimate the health impact and cost-effectiveness of a national penny-per-ounce SSB tax from the healthcare perspective, societal perspective, and across 9 stakeholder groups: 6 consumer categories classified by insurance status (and reflecting varying SSB intake and risk factors), the government, the beverage industry, and other private sector.

Methods. A validated microsimulation model (CVD PREDICT) was used to estimate CVD reductions, quality-adjusted life-years (QALYs) gained, costs, and cost-effectiveness among US adults (35+ years), evaluating both 100% and 50% price pass-through to consumers. Model inputs included dietary and demographic data from NHANES, policy effects on consumer intake and SSB-disease effects from meta-analyses, policy costs for tax administration based on the Berkeley tax, and validated healthcare costs. Findings were evaluated over a lifetime, with costs inflated to constant 2017 US dollars and outcomes discounted annually by 3%.

Results. With 100% pass-through, the tax prevented 518,000 CVD events among US adults 35+ years over a lifetime and was cost-saving from a societal perspective. Lifetime discounted healthcare cost savings ($31.5bn) were 24 times as large as tax implementation costs ($1.3bn). Evaluating cost-effectiveness by stakeholder, for the 6 consumer categories, the tax was not cost saving, but incremental cost-effectiveness ratios (ICERs) each were <$50,000/QALY. For the government, tax revenues and healthcare savings were positive, netting $73.7bn in savings. For the beverage industry, net costs were $0.63bn (limited to tax compliance costs). With 50% pass-through, the tax would prevent 279,000 CVD events over a lifetime and remained cost-saving from a societal perspective. Government healthcare savings were approximately half as large, while consumer ICERs all remained <$50,000/QALY. For the beverage industry, tax costs were $33.64bn, much larger than with 100% pass-through, reflecting lower producer revenue per unit sold. Findings were robust to a range of sensitivity analyses.

Conclusions. A national SSB tax would improve health and be cost-saving nationally, with varying health impacts and costs across major stakeholders. These novel findings are relevant and timely for policy decisions on continuing expansion of SSB taxes.

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**P230**

**Vitamin E Supplementation and Cardiovascular Disease: Is There Effect Modification by Baseline Diet Quality and Vitamin E Intake?**

**Susanne Rautiainen**, J. Michael Gaziano, William G Christen, Vadim Bubes, Gregory Kotler, Robert J. Glynn, JoAnn E Manson, Julie E Buring, Howard D Sesso, Brigham and Womens Hosp, Boston, MA

**Background**: Large-scale trials have not supported a role of vitamin E supplementation in reducing the risk of cardiovascular disease (CVD). We investigated whether baseline diet quality and vitamin E intake modified the effect of randomized vitamin E supplementation on the risk of CVD in the Physicians’ Health Study II (PHS II).

**Methods**: The PHS II was a randomized, double-blind, placebo-controlled trial testing 400 IU synthetic α-tocopherol on alternate days. 14,641 men aged ≥50 years were included. 13,316 men (91%) completed a 116-item food frequency questionnaire and were included in our intention-to-treat analysis. We examined effect modification by baseline diet quality as assessed by dietary patterns (tertiles of the Alternate Healthy Eating Index [AHEI] and Alternate Mediterranean Diet [AMED]), and by dietary and supplemental vitamin E intake.

**Results**: During a mean 8.0 years of follow-up, baseline diet quality or vitamin E intake did not modify the effect of vitamin E use on the primary endpoint of major CVD events (Table). However, AHEI modified the effect of randomized vitamin E use on the secondary endpoint of MI (P, interaction=0.02), with a statistically significant 39% lower risk among men in the lowest tertile of the AHEI. A similar and statistically significant 37% lower risk of MI was observed in the lowest category of the AMED (P, interaction=0.08). There was no evidence that diet quality modified the effect of vitamin E use on risks of stroke or CVD mortality, and baseline dietary and supplemental vitamin E intake did not modify the effects on any outcome.

**Conclusion**: Diet quality did not modify the effect of vitamin E supplementation on most CVD outcomes but did modify its effect on MI. Given concerns about multiple comparisons and the need for replication, our findings should be interpreted with caution.

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**P231**

**Alcohol Consumption and Hospitalization Risk: Prospective Results From the Moli-sani Study**

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Introduction: To evaluate the broad impact of alcohol on health and healthcare utilization, the dose-response relationship of alcohol intake with all-cause and cause-specific hospitalizations was examined. Methods: In the Moli-sani study, an Italian population-based cohort, we followed 20,682 initially healthy individuals (48% men, age ≥35 y) free of CVD or cancer. Alcohol intake in the year before enrolment was assessed by the Italian EPIC-FFQ and classified as: abstainers (referent), ex-drinkers, occasional drinkers (<1 gr/day), 1-12, 12.1-24, 24.1-48 and >48 gr/day. We identified hospitalizations by linkage to the regional hospitalization registry. Cause-specific hospitalizations were assigned by the ICD9 code of the primary admission diagnosis. We estimated incidence rate ratios (IRR) for admission by Poisson regression, accounting for repeated hospitalizations. Results: At baseline, 27% of participants were abstainers, 3% ex-drinkers, 6% occasional drinkers and 64% regular current drinkers. During a median follow-up of 6.3 y, 12,996 hospital admissions occurred. In multivariable analyses, occasional consumption and intake up to 48 gr/day were associated with a lower risk of all-cause hospitalization than was abstention. There was a roughly dose-dependent association with lower risk of hospitalization for vascular disease. Excessive alcohol consumption was associated with a higher risk of hospitalization for alcohol-related diseases (IRR: 1.92, 95% CI: 1.43-2.59) and for cancer (IRR: 1.33, 95% CI: 1.08-1.63). Former drinkers were at higher risk for vascular and alcohol-related hospitalization. No association was observed with hospitalization for trauma. Conclusions: Heavy alcohol consumption is associated with higher risk of hospitalization for alcohol-attributable conditions and cancer, but intake up to 48 gr/day is associated with lower risk of all-cause and vascular hospitalization. These estimates highlight the different healthcare burden imposed by varying levels of alcohol intake.


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P233

Changes in Diet, Lifestyle Behaviors, and Body Weight Over Two Years in Mexican Women

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Background: Some prospective observational studies have evaluated baseline diet and lifestyle behaviors, rather than changes in diet and lifestyle in relation to weight gain. Evaluating changes in diet and lifestyle on changes in adiposity may more appropriately identify effective strategies aimed at preventing weight gain.

Methods: In a prospective cohort of Mexican female teachers (n=11,296) aged 35-65 y, we evaluated how two-year changes in diet and lifestyle behaviors relate to body weight
change. We excluded women who were pregnant or who had prevalent heart disease, diabetes, or cancer at baseline, and those with implausible energy intake or missing baseline dietary, lifestyle, or weight data. We collected information on habitual consumption of foods and beverages with a validated food frequency questionnaire. Weight was self-reported and previously validated. We obtained data on physical activity, smoking, alcohol use, and TV watching through a self-administered questionnaire. We calculated the change in weight and diet/lifestyle behaviors by subtracting the information obtained in 2008 from that in 2006. We used multivariable linear regression models adjusting for age, state of residence, menopausal status, hormone replacement therapy, and all diet and lifestyle behaviors, simultaneously.

**Results:** Increasing weekly servings of individual food components was positively associated with two-year body weight for intake of potatoes (0.06 kg; 95%CI 0.006, 0.12), corn (0.22 kg; 95%CI 0.006, 0.43), corn tortilla (0.03 kg; 95%CI 0.02, 0.04), sweets and desserts (0.01 kg; 95%CI 0.001, 0.03), Mexican dishes (0.13 kg; 95%CI 0.08, 0.17), and sodas (0.07 kg; 95%CI 0.05, 0.10). We observed an inverse association for intake of fruits (-0.006 kg; 95%CI -0.011, -0.001), vegetables (-0.013 kg; 95%CI -0.019, -0.008), and whole grains (-0.025 kg; 95%CI -0.045, -0.005). Lifestyle behaviors were also independently associated with weight change, including smoking (ever smokers=0.22 kg, starters=-0.24 kg, quitters=0.18 kg; p=0.04), physical activity level (decrease in category=0.14 kg, increase in category=-0.04 kg p=0.03), and TV watching (0.04 kg per hour/d; p=0.04). Changes in consumption of nuts, refined grains, low-fat and whole-fat dairy products, red and processed meats, beans, rice, diet sodas, and alcohol use were not associated with two-year weight change.

**Conclusions:** Two-year changes in specific dietary and lifestyle behaviors were associated with modest changes in body weight. These results may be useful for targeted weight management messages.


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P234

Dairy Fat Intake and Risk of Type 2 Diabetes in 3 Cohorts of US Adults

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**BACKGROUND:** Previous studies have examined the association between dairy fat intake and incident Type 2 Diabetes (T2D) by conducting analyses of dairy products stratified by fat content, although data linking dairy fat intake and incident T2D and their substitution for other nutrients are sparse.

**OBJECTIVE:** The aim of this study is to evaluate the association between dairy fat intake and risk of T2D. We assessed the hypothesis that replacing calories from dairy fat for other animal fat or refined carbohydrates will result in modest increases in T2D risk.

**METHODS:** We followed up 41,670 men in the Health Professionals Follow-Up Study (1986-2010), 84,685 women in the Nurses’ Health Study (NHS; 1980-2012), and 90,325 women in the NHSII (1991-2011). Diet was assessed every 4 years with the use of validated food-frequency questionnaires, and other health and lifestyle covariates were collected biennially. Dairy fat contents were determined for dairy products and food items that contain dairy. Dairy fat intake from all relevant food items was summed to calculate total intake, which was expressed as percent of total energy. Incident T2D cases were identified by self-reports during follow-up and confirmed by a validated supplementary questionnaire. A time-dependent Cox proportional hazards regression was used to estimate the hazard ratio for dairy.
RESULTS: During 4,661,518 years of follow-up, we documented 18,298 incident T2D cases. In multivariate models, a 5% increase in energy dairy fat was associated with a 2% risk increase in T2D (RR: 1.02; 95% CI: 1.00, 1.05). In isocaloric substitution models, the replacement of 5% of calories from dairy fat with the equivalent energy from other sources of animal fat or carbohydrate from refined grains was associated with an 7% [RR: 1.07; 95% CI: 1.04, 1.09], and a 7% [RR: 1.07; 95% CI: 1.04, 1.11] increased risk of T2D, respectively. Conversely, a 5% calorie substitution of carbohydrate from whole grains was associated with 7% lower risk of T2D [RR: 0.93; 95% CI: 0.89, 0.97].

CONCLUSIONS: In conclusion, dairy fat intake was modestly associated with a higher T2D risk. The replacement of dairy fat with carbohydrates from whole grains may decrease incident T2D risk. Further research is warranted to elucidate the role of other components in dairy products that may contribute to previously reported null associations with T2D.

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P235

Sugar-Sweetened Beverage and Food Intake and Mortality Risk Among U.S. Adults

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Introduction: Multiple studies have shown a positive association between consumption of sugar-sweetened beverages (SSBs) and increased obesity and cardiovascular disease risk but few have examined their impact on mortality.

Hypothesis: The purpose of this study was to examine the impact of (non-milk) sugars on CVD-related mortality and all-cause mortality, and to determine if this impact differs by the form in which they are consumed (beverages vs. foods).

Methods: This study used data from the Reasons for Geographic and Racial Differences in Stroke (REGARDS) study, a US based longitudinal cohort of 30,183 black and white men and women over the age of 45. We excluded those with a self-reported history of CVD, stroke, TIA, and type II diabetes at baseline, yielding a final study population of 17,930. Added sugar consumption (in grams) from beverage and from foods were estimated separately using self-administered Block 98 food frequency questionnaires. Sugar-sweetened beverages included those pre-sweetened, such as sodas as well as beverages to which sugar had been added at the point of consumption, such as coffee, or juices. Sugar-sweetened foods included desserts, candy and sweetened breakfast foods as well as foods to which caloric sweeteners (sugars, syrups) had been added. Quartiles of consumption were used for the purposes of analysis, with the lowest category as the reference. Cox proportional hazard models were used to evaluate the association between consumption and all-cause mortality, CHD-related mortality, and CVD-related mortality. Model I adjusted for sociodemographic and behavioral risk factors (age, sex, education, household income, region, smoking, and physical activity). Model II additionally adjusted for possible mediators, including total energy intake, BMI, hypertension, and dyslipidemia.

Results: In Model I, we observed increased hazard ratios for CVD, CHD-related and all cause related mortality. These results were attenuated but remained significant when adjusting for possible mediators in Model II: HR=1.7, 95%CI 1.1-2.7 for CVD-related mortality; HR=2.5, 95%CI 1.3-4.8 for CHD-related mortality, and HR=1.27, 95%CI 1.02-1.58 for all-cause mortality, when comparing the highest quartile of SSB consumption to the
lowest quartile of SSB consumption. We observed similar but attenuated effects between the comparisons for the third and second quartiles of SSB consumption. We did not observe any increased risk with sugar-sweetened foods.

**Conclusions**: Older adults who are high consumers of SSBs are at an increased risk of CVD-related and all-cause mortality.

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**Association Between Alcohol and Ideal Cardiovascular Health: The Multi-Ethnic Study of Atherosclerosis**

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**Introduction**: Alcohol intake is associated with cardiovascular disease (CVD), with moderate drinkers having a decreased CVD risk compared to non- and heavy drinkers. However, this association is yet to be examined using the AHA Life’s Simple 7 (LS7) metrics as a proxy for cardiovascular health (CVH). We explored associations between alcohol intake and CVH in a multi-ethnic population. **Methods**: Our cross-sectional analyses included 6,506 MESA participants, free of CVD, aged 45 to 84 years. The LS7 metrics (smoking, physical activity, body mass index, diet, blood pressure, total cholesterol and blood glucose) were each scored 0-2, with 2 indicating “ideal”, 1 “intermediate” and 0 “poor”. Total LS7 score ranged from 0-14. Alcohol data was obtained from personal history and food frequency questionnaires. Participants were classified as never, former or current drinkers. Current drinkers were categorized as <1 (light), 1-2 (moderate) and >2 (heavy) drinks/day.

**Results**: Mean (SD) age was 62 (10) years, 53% were women; 20% were never, 24% former and 56% current drinkers. Among current drinkers, 44% had <1, 9% 1-2 and 3% >2 drinks/day. Additionally, 47% had inadequate LS7 scores, 33% average and 20% optimal. Compared to never drinkers, those who drank <1 drink/day were more likely to have average and optimal scores, although most of the associations were not significant. Women with 1-2 drinks/day were more likely than men to have optimal scores. Overall and in men, those who drank >2 drinks/day were less likely to have average or optimal scores. Whites and Hispanics with >2 drinks/day were less likely to have optimal and average scores, respectively (Table). **Conclusion**: Light alcohol intake tended to show favorable CVH, whereas heavy alcohol intake was unfavorable. For moderate alcohol intake, the associations with CVH varied by sex and race/ethnicity.


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Moderate and Heavy Alcohol Consumption Are Associated With Decreased Systolic Function After 8 Years of Follow-up

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Introduction: Excessive alcohol consumption is an important risk factors for cardiovascular disease, however, the underlying mechanisms are not well understood. Hypothesis: We assessed the hypothesis whether alcohol consumption is prospectively associated with unfavorable measures of cardiac structure and function. Methods: We used data from the Hoorn Study, a population-based, prospective cohort study. Data on self-reported alcohol consumption were collected with a validated food frequency questionnaire in 2000/2001 (baseline for the current analyses). Echocardiography was performed in 2000/2001 in 582 participants and in 2007/2009 in 339 participants. Participants were classified into 5 categories based on self-reported alcohol consumption (glasses per week): 0 (non-drinkers), 0-3 (light-drinkers), ≥3-7 (light to moderate drinkers), ≥7-14 (moderate drinkers) and ≥14 (heavy drinkers). Light drinking was considered the reference group. We studied the association of alcohol consumption with echocardiographic measures after 8 years of follow-up using linear regression analyses, adjusting for potential confounders. Results: The mean age was 69.8±6.5 years and 50% was female. After 7.4±0.5 years follow-up, moderate and heavy alcohol consumption were associated with a decreased left ventricular ejection fraction of -5.1% (-8.7, -1.4) for moderate and -4.8% (-8.8, -0.8) for heavy drinkers (Table). Light drinking was also associated with a decrease in left atrial volume index: -3.9mL/m² (-7.6, -0.2). No longitudinal associations were found between alcohol consumption and left ventricular mass index. Conclusion: Both moderate and heavy drinking were associated with decreased systolic function after 8 years follow-up. The toxic effect of alcohol could lead to underfilling of the left atrium which could lead to lower systolic function. These findings may explain the increased cardiovascular risk among people with excessive alcohol use.


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P238

Remission/Cure of Autoimmune Diseases by a Lectin Limite Diet Supplemented With Probiotics, Prebiotics, and Polyphenols

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All autoimmune diseases are highly associated with increased rates of coronary artery and vascular disease secondary to immune cell attack on epithelial cells. The causes of autoimmune disease (AID) seem to be multifactorial. However, the idea that derangement of the microbiome, breaches of the intestinal barrier (leaky gut) and introduction into the human diet of plant defense molecules such as lectins, which are capable of molecular mimicry, prompted our group to investigate the application of a lectin limited diet, coupled with probiotics and prebiotics (The Pant Paradox Protocol) to impact biomarker proven autoimmune disease
activity in humans and their impact on endothelial biomarkers of inflammation. One hundred and two consecutive patients with immunoassay markers of autoimmune disease activity, i.e., RF, anti-CCP, ANA, Histone, etc, and signs and symptoms of RA, Lupus, Sjogrens, Crohns, Colitis, Scleroderma, Mixed Connective Tissue Disease, and biomarkers of endothelial inflammation, were enrolled into a program of elimination of major dietary lectins, consisting of all grains and pseudo grains, beans and legumes, peanuts, cashews, nightshades, squashes, and Casein A1 milk products (The Plant Paradox Program), supplemented with probiotics and prebiotics including resistant starches and polyphenol supplements. All pts initially low Vit D levels and low Omega 3 index and adiponectin levels above 16mg/dl. Biomarkers of inflammation, hs-CRP, TNF-alpha, IL-6, fibrinogen, myeloperoxidase and autoimmune markers were measured every 3 months. 95/102 patients achieved complete resolution of autoimmune markers and inflammatory markers within 9 months. The other 7/102 patients all had reduced markers, but incomplete resolution. 80/102 patients were weaned from all immunosuppressive and/or biologic medications without rebound. We conclude that a lectin limited diet, supplemented with pro and prebiotics, and polyphenols are capable of curing or putting into remission most autoimmune diseases.

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P239

Adipose Tissue Palmitoleic Acid is Inversely Associated With Nonfatal Acute Myocardial Infarction in the Costa Rica Heart Study

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Background: Animal models have shown that adipose-derived palmitoleic acid may act as a lipokine by conferring resistance to diet-induced obesity; however, human epidemiologic studies investigating this relationship thus far have not provided data in support of this hypothesis. Because metabolic syndrome and cardiovascular disease are intricately linked with the former being a major risk factor for the latter, we hypothesized that adipose-derived palmitoleic acid may be inversely associated with myocardial infarction.

Objective: We examined whether adipose tissue palmitoleic acid was associated with nonfatal acute myocardial infarction in a representative population of Costa Rican adults.

Methods: Odds ratios of nonfatal acute myocardial infarction by quintiles of adipose tissue palmitoleic acid were calculated using conditional logistic regression in a case-control study of 1,828 cases and 1,828 controls matched by age, sex, and area of residence.

Results: We observed an inverse relationship between nonfatal acute myocardial infarction and adipose tissue palmitoleic acid (OR for highest quintile compared to lowest quintile of palmitoleic acid: 0.54; 95% CI: 0.37, 0.79; P for trend: 0.0007). We additionally observed a significant positive association between adipose tissue palmitoleic acid and high-density lipoprotein (HDL) cholesterol, an important cardiometabolic risk factor for myocardial infarction.

Conclusions: These data support the conclusion that adipose-derived palmitoleic acid may behave as a lipokine in the context of human myocardial infarction. This protective association may be partially explained by the increase in HDL cholesterol across quartiles of palmitoleic acid in our population of Costa Rican adults.

Eating Behavior and Body Composition in Chilean Young Adults: Results From the Santiago Longitudinal Study

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Introduction: Causes of obesity, a leading risk factor for chronic disease morbidity/mortality, are multi-faceted and encompass behavioral and psychological factors. Understanding eating behavior can help target behavioral obesity interventions. The aim of this cross-sectional study was to examine cognitive restraint (CR), uncontrolled eating (UE) and emotional eating (EE) behaviors and body composition in a sample of Chilean young adults.

Methods: Using data from 429 participants of the Santiago Longitudinal Study (mean age 22.5±0.4 years), evaluated from 2016-2017, linear and logistic regression models assessed the independent associations between three eating behavior dimensions, using the Three Factor Eating Questionnaire (1-4 range per dimension), and BMI, % body fat (measured by dual-energy x-ray absorptiometry), and central obesity, accounting for demographic covariates, stratified by sex.

Results: The sample was 51% female and had a mean BMI of 26.9±6.1. Mean % body fat was 30.5±7.6 in males and 41.8±6.9 in females. CR and EE eating behaviors were associated with body composition measures as shown in the Table 1. CR was related to a 2.4 (95% CI 1.2, 4.8) and 2.5 (95% CI 1.4, 4.5), respectively, greater odds of being an obese male (>25% body fat) and obese female (>37% body fat). The EE dimension was also significantly associated with percent body fat in both sexes. The greatest effect size in the linear regression models was observed for central obesity. For every point increase in CR, waist circumference increased by 5.1 cm (95% CI 2.1-8.1) and 4.1 cm (95% CI 1.5-6.7) in males and females, respectively. EE was positively associated with central obesity in females.

Conclusions: In this sample of Chilean young adults, CR and EE eating behavior dimensions were associated with obesity, central obesity and % body fat. The UE dimension was not associated with body composition. Understanding the dynamics of and interplay of eating behaviors and body composition can provide evidence for future effective interventions.

improving heart health. Bioactive compounds of culinary herbs and spices have been found to exert potential health benefits in people at risk of CVD, but no recent review has been conducted to evaluate the types of herbs and spices and their effects in this population.

Objectives: The purpose of the review was to evaluate the effects of culinary herbs and spices on biomarkers of cardiovascular disease in adults with risk factors for CVD.

Methods: A systematic literature search was conducted using six electronic databases, including Medline (Ovid), Scopus, Cochrane Database of Systematic Reviews, CINAHL (EBSCOhost), Cochrane Central Register of Controlled Trial and Web of Science in February 2017. Studies including subjects who had associated non-modifiable risk factors (older people >70 y, menopausal women), cardiovascular disease or an associated cardiovascular event (stroke or heart attack) and associated liver or kidney complications or disease, were excluded from the review. Seventeen studies were eligible for inclusion in the review. The Cochrane Collaboration risk of bias tool was used to assess bias of the included studies.

Results: Twelve randomized controlled trials, 2 randomized trials, 1 non-randomized trial, 1 randomized crossover trial and 1 single-arm met inclusion criteria. In patients with Type 2 diabetes, Cinnamon at 1-1.5g/d and dichrostahys glomerata (DG), at 0.8g/d showed significant decreases in fasting blood glucose, systolic and diastolic blood pressure, triglycerides and LDL-cholesterol and HDL-C while cinnamon showed increased HDL-C while DG showed significant decrease in total cholesterol. Fenugreek at 10g/d doses resulted in significant reductions in fasting glucose and total cholesterol. Nigella satvia (NS) at doses of 1-3g/d showed significant reductions in triglycerides, LDL-cholesterol, total cholesterol and increases in HDL-cholesterol. Ginger at 1-2g/d doses significantly reduced fasting glucose, triglycerides, MDA, Apo B and increase Apo A-1. In obese subjects DG and ginger resulted in significant decreases in TG and DG significantly reduced systolic blood pressure, fasting glucose, total cholesterol, LDL-cholesterol and increased HDL-cholesterol. In subjects with hyperlipidaemia and hypercholesterolemia garlic at 5g/d and 20g/d doses resulted in significant decrease in TG, cholesterol and increases in HDL-C and 20g/d doses resulted in significant reductions in FBG.

Conclusion: The evidence does suggest that the use of culinary herbs and spices may have beneficial effects on risk factors for CVD. Due to the presence of bias of studies there is insufficient evidence to conclude that culinary herbs and spices have significant benefits on biomarkers for CVD and that higher quality studies are needed in future research.

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Dietary Nitrate Does not Reduce Resting Metabolic Rate or Oxidative Stress in Healthy Males

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Introduction: Nitric oxide (NO) is a vasodilator that increases blood flow by promoting relaxation of endothelium. Dietary nitrate supplementation increases plasma nitrite, a marker of overall NO bioavailability. Previously, acute dietary nitrate supplementation has been shown to reduce oxygen consumption and improve tolerance during submaximal exercise in healthy populations. Less is known about the
effect of dietary nitrate on oxygen consumption at rest.

**Hypothesis:** We hypothesized that dietary nitrate supplementation would reduce resting metabolic rate (RMR) and oxidative stress (8-isoprostane) at rest, via enhanced NO bioavailability via the oxygen independent Nitrate-Nitrite-Nitric Oxide pathway in healthy, young males. **Methods:** In a randomized, double-blind, cross-over study, ten healthy, young males (21 ± 2 years) visited the laboratory on 5 separate occasions. Participants completed informed consent paperwork and underwent protocol familiarization during visit 1. Prior to visits 2 and 4, participants fasted for 12 hours and adhered to an NIH-approved low-nitrate diet for 48 hours. During visits 2 and 4, an initial blood draw was performed to analyze baseline plasma nitrite and 8-isoprostane. Participants then completed a 30-minute resting metabolic rate (RMR) test. Two hours prior to visits 3 and 5, participants consumed either a placebo or dietary nitrate supplement (negligible and 6.2 mmol nitrate, respectively). During visits 3 and 5, participants also had blood drawn for analysis of the previously stated measurements, and completed an RMR test. Visits 2 and 3 were on consecutive days, followed by a week-long washout period between visit 3 and visit 4, while visit 4 and 5 also occurred on consecutive days.

**Results:** Plasma nitrite significantly increased following dietary nitrate consumption compared to baseline values (27.56 ± 7.58 and 1.25 ± 1.51 arbitrary units, respectively). No difference was present between nitrate and baseline measurements for 8-isoprostane (155.75 ± 57.01 and 198.42 ± 66.44 pg/mL, respectively; p=0.55) and RMR (2086.60 ± 202.23 and 2050.00 ± 209.23 kcal/day, respectively; p=0.13).

**Conclusion:** Dietary nitrate supplementation increases plasma nitrite, but does not change resting metabolic rate following an acute dose of dietary nitrate in healthy males. Individuals consuming dietary nitrate as an ergogenic aid during exercise may not, however, experience similar changes in their resting metabolism. The lack of change in oxidative stress may have been associated with the overall health of the cohort examined. Future research should investigate the clinical implications of dietary nitrate in populations with decreased NO bioavailability and associated endothelial dysfunction (and elevated oxidative stress). In such populations, dietary nitrate may provide benefit. However, in a healthy cohort, dietary nitrate exerts minimal effects.

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P243

**Endothelial Function, Arterial Stiffness and Central Blood Pressure are Not Affected by a Single Dose of Dietary Nitrate in Healthy Normotensive Females**

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**Intro:** Hypertension is a prominent risk factor for cardiovascular disease and arterial stiffness is a related predictor of both mortality and longitudinal onset of hypertension in normotensive individuals. Both vascular compliance and blood pressure have been shown to improve following dietary nitrate supplementation in some healthy and diseased individuals. Dietary nitrate supplementation increases plasma nitrite and may, therefore, enhance bioavailability of endothelium derived...
nitric oxide. Chronic increased flow mediated dilation (FMD) and reduction of pulse wave velocity (PWV) reduce a person’s long-term risk for developing endothelial dysfunction, atherosclerosis and hypertension. **Hypothesis:** We hypothesized that an acute dose of dietary nitrate would improve FMD, decrease PWV and reduce central blood pressure (cBP) in healthy, young females. **Methods:** Seven healthy, young (21 ± 2 years) females participated in a randomized, double blind, placebo controlled, crossover protocol. Participants had endothelial function measured via FMD, arterial stiffness via PWV and applanation tonometry, and cBP was determined non-invasively using pulse wave analysis following a 12-hour fasting period and 48-hour NIH approved low nitrate diet. Baseline values were measured the day before each treatment visit (placebo or nitrate-rich, separated by a 1-week washout period). Participants consumed either a placebo or nitrate-rich supplement (negligible and 6.2 mmol nitrate, respectively) 2 hours prior to their laboratory visit. Upon arrival, blood was drawn and participants assumed a supine position for 15 minutes. Then brachial artery FMD was assessed via high definition ultrasound imaging following 5 minutes of proximal forearm occlusion, followed by PWV and central blood pressure measurements. **Results:** Plasma nitrite was elevated following consumption of the nitrate rich supplement compared to placebo (26.33 ± 15.76 and 1.18 ± 0.96 arbitrary units, respectively; p<0.05). However, there was no difference between nitrate rich and placebo treatments for endothelial function as measured by FMD (10.33 ± 1.82 and 9.11 ± 5.43%, respectively; p=0.70). No difference was present between nitrate and placebo groups for PWV (5.99 ± 0.85 and 6.16 ± 0.80 m/s, respectively; p=0.90), systolic cBP (101.57 ± 9.29 and 96.90 ± 20.95 mmHg, respectively; p=0.40) and diastolic cBP (72.57 ± 7.67 and 73.20 ± 5.01 mmHg, respectively; p=0.97). **Conclusion:** While a single dose of dietary nitrate does increase plasma nitrite, supplementation has minimal effects on FMD, PWV and cBP in young healthy females. Future research should examine longer duration supplementation protocols as well as the changes in vascular health of patients with known disease such as hypertension or peripheral artery disease.

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**P244**

**Relations Between Residential Fast-food Environment and Individual Risk of Cardiovascular Disease**

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**Background:** The food environment has been hypothesized to influence cardiovascular diseases (CVD) such as hypertension and coronary heart disease (CHD). This study determines the relation between fast-food outlet density (FFD) and the individual risk for CVD, among a nationwide Dutch sample. **Methods:** After linkage of three national registers, a cohort of 2,472,004 adults (≥35 year), free from CVD at January 1st 2009, and living at the same address for ≥15 years was constructed. Participants were followed for one year to determine incidence of CVD, including CHD, stroke and heart failure. FFD within 500m, 1000m and 3000m from residential addresses was related to CVD using logistic regression, stratifying models by degree of urbanisation and adjusting for age, sex, ethnicity, marital status, comorbidity, neighbourhood-level income and population density. **Results:** In urban areas, fully adjusted models indicated that the incidence of CVD and CHD was
significantly higher within 500m buffers containing one or more fast food outlets compared to areas without outlets. An elevated FFD within 1000m was associated with a significantly increased incidence of CVD and CHD. Evidence was less pronounced for 3000m buffers, or for stroke and heart-failure incidence. **Conclusions:** Elevated FFD in the urban residential environment (≤1000m) was related with an increased incidence of CVD and CHD. To better understand how FFD is associated with CVD, future studies should account for a wider range of lifestyle and environmental confounders than was achieved in this study.

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**High Consumption of Caffeinated Tea is Associated With Increased Risk of Coronary Artery Disease but Caffeinated Coffee Consumption is Not**

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**Introduction:** Prior studies have suggested a link between diet and Coronary Artery Disease (CAD), but there have been mixed findings on the risks and benefits of coffee and tea consumption. We assessed whether there is an association and dose response between coffee and tea intake on CAD incidence among Veterans.

**Methods:** Million Veteran Program (MVP) is a national, representative longitudinal study of Veterans for genomic and non-genomic research that combines data from self-reported surveys, electronic health records, and biospecimens. Using food frequency data collected from 2011-2017 and CAD outcomes obtained from electronic health records, we used cox proportional hazard ratios (HR) to evaluate the association of coffee or tea intake with CAD incidence among Veterans with complete data. Follow-up began at the completion of the food frequency survey. Tea and coffee were evaluated separately, with intake categorized as never or less than one cup/month, 1-3 cups/month, one cup/week, 2-4 cups/week, 5-6 cups/week, one cup/day, 2-3 cups/day, 4-5 cups/day, or 6+ cups/day. For tea, the last two categories were combined to obtain stable estimates. Multivariate models were adjusted for known CAD risk factors (age, smoking status, physical activity, and education) and other caffeine use (e.g. tea for coffee). We plan to use restricted cubic splines to assess dose-response relationships.

**Results:** Among 139,549 participants (90.3% male, mean age 64 ± 12 years), 74.2% consumed 1+ cups of coffee a month and 53.7% consumed 1+ cups of tea a month. During a median follow up of 3.2 years, we observed 4,715 new cases of CAD. Compared to those who drank less than one cup of coffee/month, adjusted HRs (95% CI) for CAD were 1.06 (0.92-1.22) for 1-3 cups/month, 1.09 (0.91-1.29) for one cup/week, 0.96 (0.84-1.10) for 2-4 cups/week, 0.92 (0.81-1.04) for 5-6 cups/week, 0.93 (0.85-1.01) for one cup/day, 0.99 (0.91-1.07) for 2-3 cups/day, 1.05 (0.93-1.19) for 4-5 cups/day, and 1.08 (0.92-1.28) for 6+ cups/day (p-linear trend=0.24). Compared to those who drank less than one cup of caffeinated tea/month, adjusted HRs (95% CI) for CAD were 1.08 (0.99-1.17) for 1-3 cups/month, 1.11 (0.99-1.23) for one cup/week, 1.01 (0.91-1.12) for 2-4 cups/week, 1.03 (0.89-1.17) for 5-6 cups/week, 1.04 (0.93-1.17) for one cup/day, 1.12 (0.98-1.28) for 2-3 cups/day, and 1.27 (1.04-1.58) for 4+ cups/day (p-linear trend=0.14).

**Conclusion:** While coffee intake was not associated with incidence of CAD, there was an
intake below the EAR was positively associated with metabolic syndrome (OR: 1.23, 95% CI: 1.05-1.44) after adjustment for energy intake, age, gender, and Hispanic/Latino background, and was primarily driven by an association with high blood pressure (1.24, CI: 1.04-1.47). Manganese intake below the AI was also associated with metabolic syndrome (1.16, CI: 1.01-1.32), with the strongest associations observed for high fasting glucose levels (1.20, CI: 1.04-1.38) and abdominal obesity (1.19, CI: 1.05-1.36). **Conclusion:** Consuming less than the recommended amounts of copper and manganese was associated with a greater prevalence of metabolic syndrome. Future prospective studies are needed to confirm the importance of achieving copper and manganese adequacy and synergistic aspects of foods containing these minerals for optimal cardiometabolic health.

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Under-reporters of Caloric Intake Have Worst Cardiometabolic Risk Profile Among Children at Risk of Obesity

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Introduction: Misreporting of dietary data in nutritional epidemiology is a major concern for information bias, as they rely on subjects’ ability to accurately remember and report the foods they consumed. In children, underreporting is common and tends to occur differentially according to certain characteristics. We sought to describe characteristics of under-reporters (UR) within a cohort of children with a parental history of obesity, and to examine the bias introduced with underreporting in children.

Methods: Data stem from the QUALITY cohort of 630 children, 8-10 years at recruitment with at least one obese parent. Three separate 24-hour dietary recalls were administered by a dietitian at baseline. Child and parent characteristics were obtained through direct measurement (blood pressure, blood lipids, anthropometrics) or questionnaires (socio-economic characteristics). Goldberg’s cut-off method identified UR, by comparing a ratio of reported energy intake and basal metabolic rate to a calculated cut-off value. We used logistic regression to identify correlates of UR. We examined the bias resulting from underreporting by comparing the coefficients from the linear regression of BMI z-score after 2 years on glycemic load (GL) at baseline in all participants and in the adequate reporters (AR) subset, after excluding UR.

Results: We identified 167 UR and 408 AR in the QUALITY cohort based on a calculated Goldberg’s cut-off of 1.11. UR had a tendency to be older (9.9 vs. 9.5), had a higher BMI z-score (1.5 vs. 0.4) and had poorer cardiometabolic health indicators including higher SBP, DBP, triglycerides and LDL and lower HDL. UR had a lower family income (38,561 vs. 44,078 $CAN), parents were less educated (47.3% vs. 56.9% with a university education) and had a higher BMI compared to parents of AR. In logistic regression, age per year (OR: 1.48, 95%CI: 1.15-1.91), BMI z-score (OR: 2.04, 95% CI: 1.17-3.54), percent fat mass (OR: 1.06, 95%CI: 1.01-1.12) and family income (OR: 0.86 per 10,000$, 95%CI: 0.76-0.98) were the strongest correlates of underreporting. Linear regressions showed that the association between BMI and GL was null when all participants were included, but became significantly positive (β=0.06 per 10 units, 95%CI: 0.05-0.07) after exclusion of the UR.

Conclusion: In the QUALITY cohort, UR were different from AR. Underreporting is an important source of error in nutritional epidemiology that can bias measurement of nutritional exposures and the assessment of exposure outcome relationships. To prevent this bias, UR must be identified and an appropriate correction method must be used.


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Nightly Fasting Duration is Associated With Cardiometabolic Risk Profiles Among Hispanic/Latina Women in the Hispanic Community Health Study/Study of Latinos

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**Introduction:** Animal studies and limited human research suggest that nightly fasting duration (NFD) and timing of food intake may influence cardiometabolic risk through behavioral and physiological mechanisms. Research is needed to clarify these associations in diverse populations including Hispanic/Latina women, who have elevated cardiometabolic risk.

**Hypothesis:** We hypothesized that longer NFD would be associated with lower body adiposity, inflammation, blood pressure (BP) and lipids, and glucose regulation indicators and with healthier lifestyle behaviors that may explain associations with cardiometabolic risk.

**Methods:** We examined associations of NFD with cardiometabolic risk among n= 9,781 diverse Hispanic/Latina women, aged 18-76y, from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL), recruited from four US cities between 2008-2011. Pregnant women and those treated for diabetes were excluded. NFD, defined as time from last meal on one day to first meal on the next day, was calculated from two 24-hour recalls. BMI, waist size (WS), BP, blood lipids, glucose, insulin, homeostatic model assessment of insulin resistance, hemoglobin A1c, and C-reactive protein measurements were used in linear and logistic regression models to evaluate associations of NFD with cardiometabolic risk. Models accounted for sample weights and design effects and were adjusted for age, marital status, education, employment, income, health insurance, race, Hispanic/Latino background, acculturation level, BMI, and percent caloric intake consumed after 8PM.

**Results:** The mean NFD was 12.9±2.3 hours. In linear regression models, longer NFD was associated with higher BMI (β=0.19,p<0.0001), WS (β=0.42,p<0.0001), systolic BP (β=0.20,p=0.012) and lower HDL (β=-0.25,p=0.006). In logistic models, NFD ≥13h vs.<13h was associated with elevated odds of overweight and obesity (OR:1.34,95%CI:1.16-1.54), obesity alone (OR:1.26,95%CI:1.11-1.42), and an “at-risk” WS (OR:1.25,95%CI:1.09-1.43). NFD ≥13h vs.<13h was also associated with higher odds of hypertension (OR:1.20,95%CI:1.02-1.42) and low HDL (OR:1.28,95%CI:1.13-1.46), respectively. When examined in relation to lifestyle, longer NFD was associated with longer self-reported sleep (β=0.05,p<0.0001) and lower caloric intake (β=-37.3,p<0.0001), and null results were observed for diet quality and objectively-measured physical activity.

**Conclusions:** This large cross-sectional population-based study in U.S. Hispanic/Latina women showed null associations between NFD and glycemic control and inflammation, contrary to previous findings in Caucasian women, but uniquely evaluated and demonstrated deleterious associations between prolonged NFD and other cardiometabolic risk factors. Future studies should investigate longitudinal associations of NFD with cardiometabolic outcomes in this population group.


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**P249**

**Differential Response to a Lifestyle Intervention Between Parents and Non-parents**

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**Background:** Understanding and preventing cardiovascular disease among parents is
important for reducing intergenerational transfer of cardiovascular disease. Prior research has not examined the effect of lifestyle interventions among parents compared to non-parents. We performed a retrospective analysis of the Look AHEAD (Action for Health in Diabetes) trial to assess outcome differences between participants with children younger than 18 years living in the home (referred to as parents) and those without (referred to as non-parents).

**Methods:** Look AHEAD randomized adults aged 45-75 years with type 2 diabetes and BMI>25kg/m² to an intensive lifestyle intervention aimed at weight loss, or to a diabetes support and education (control) arm. We examined effects of the intervention at 12 months on objectively measured change in weight (percent of baseline) and cardiovascular risk factors, and change in self-reported dietary intake. To determine whether parenting modified these outcomes, we used linear regression (continuous outcomes) or logistic regression (categorical outcomes) with a multiplicative interaction term for parenting status and treatment arm, adjusted for sociodemographic and clinical characteristics. Modeled results of the interaction are presented.

**Results:** Among 4,547 participants at baseline, 699 (15%) were parents. Parents were younger than non-parents (54.1 vs 59.0 years, p<0.001); more likely to be black (20.2% vs 15.4%) or Hispanic (19.3% vs 12.5%), p<0.001; and more likely to have a professional degree (6.7% vs 5.0%) or no high school education (8.5% vs 5.7%), p<0.001. Age-adjusted baseline prevalence of chronic disease was similar for parents and non-parents. In response to the intervention (treatment minus control arm), parents lost less weight than non-parents, (-7.1% vs -8.3%, p=0.019); and had less improvement in waist circumference (-5.6cm vs -7.2cm, p=0.008). There were trends towards parents having less improvement in triglycerides (-6.0mg/dl vs -17.7mg/dl, p=0.060) and servings of sweets/fats consumed per day (-0.4 vs -0.6, p=0.055).

**Conclusions:** In a clinical trial of an intensive lifestyle intervention for patients with type 2 diabetes, participants with children living in the home had less favorable response to the intervention for change in weight and waist circumference. More research is needed to understand the association of parenthood with health behaviors to optimize cardiovascular risk reduction interventions for parents.


**Funding:** No

**Funding Component:**

**P250**

**Insulin Resistance During Pregnancy is Inversely Associated With Gynoid Fat Distribution Postpartum**

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An association between abdominal adiposity and insulin resistance is well-established. Recent research indicates that subcutaneous fat accumulation in the lower body may be associated with higher levels of insulin sensitivity.

**Hypothesis:** This pilot study tested the hypothesis that the distribution of body fat in the lower body after pregnancy is negatively associated with gestational insulin resistance.

**Methods:** In 32 nulliparous pregnant women (age 27±4.5, BMI 29.5±7.9, 69% non-hispanic white), the Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) was computed from fasting glucose and insulin at 24-28 weeks gestation. Body composition was assessed at mid-gestation (18-20 weeks) and at four weeks post-partum. Total body fat was estimated via bioelectrical impedance (InBody 720) and skinfold thicknesses were measured at seven sites. Dual-energy xray absorptiometry (DXA)
measures of regional fat (gynoid, visceral, and leg) were obtained post-partum only. Gestational weight gain was monitored by medical records. Partial correlation analyses were controlled for age and race and then analyses were repeated controlling for baseline (mid-gestation) body fat percent. HOMA-IR was log-transformed for normality.

**Results:** HOMA-IR was associated with post-partum body fat ($r=0.45$, $p < .05$) and adiposity in the trunk region ($r=0.58$, 0.57 and 0.52 for DXA visceral fat, suprailiac skinfold, and abdominal skinfold, respectively, $p < .01$), but not with gestational weight gain ($r=0.07$, $p = ns$), DXA gynoid region ($r = 0.26$, $p = ns$), or any other leg measure. When analyses were further controlled for baseline body fat, post-partum measures of lower-body adiposity were strongly and negatively correlated with HOMA-IR ($r = -0.66$, -0.48, and -0.48 for thigh skinfold, DXA gynoid, and DXA leg, respectively, $p < .05$ for all). Neither DXA visceral fat ($r = .23$; $p = ns$) nor any other post-partum fat measures were associated with HOMA-IR when controlling for baseline body fat.

**Conclusions:** Gestational insulin resistance was negatively associated with post-partum thigh fat accumulation, independent of overall body fat. These data indicate that insulin sensitivity may be associated with the ability to store fat in the lower body and should warrant further study of subcutaneous leg fat as a metabolically “healthy” storage depot.

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**P251**

**Relationship Between Body Size of Social Network Members and Body Size Norms of South Asian Adults**

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**Objective:** Perceptions of a healthy body weight may be influenced by social norms within a social network. This study tested the hypothesis that social network body size is associated with body size norms in South Asian adults from the Mediators of Atherosclerosis in South Asians Living in America (MASALA) study.

**Methods:** South Asian adults ($n=700$) were asked to list their personal social network members, defined as the “people who you regularly talk with about things that are important to you,” at the social network ancillary study examination (2014-2017). Participants’ perceptions of their network members’ body sizes, their own body size (self-body size), and a healthy body size (body size norm) for men and women were assessed using the Stunkard 9-figure scale. The Stunkard scale is a silhouette figure rating scale consisting of 9 male and 9 female figures of increasing body size (range 1-9). Participants’ height and weight were measured, and body mass index (BMI) was calculated. The average body size of network members was the main independent variable. Body size norm was the dependent variable in a regression model that controlled for age, sex, gender of Stunkard figure, cultural identity, self-body size, participants’ measured BMI, and social network size. A random intercept term was included at the participant level to account for clustering of male and female body size norms within participants.

**Results:** Participants’ average age was 59 years (SD+/−9 years) and 43% were female. The average body size norm for male and female Stunkard images was 3.6 (SD+/−1.0) and 3.4 (SD+/−0.8), respectively. Participants’ average self-body size was 4.7 (SD+/−1.5). There were 2,991 social network members identified (mean
number of network members=4, SD=1), and the majority (70%) were kin. The average network body size was 3.9 (SD +/-1.1). For every unit increase in their networks’ average body size, participants’ perceptions of body size norms increased 0.31 points on the Stunkard scale (p<0.01; 95% CI: 0.25, 0.36), independent of self-body size and BMI. Perception of a healthy body size norm was 0.25 points lower for female Stunkard figures than for male figures (p<.01; 95% CI: -0.30, -0.20).

Conclusions: Having social network members with larger body sizes was associated with a higher body size norm in South Asian adults. Norms for female body images were smaller than for male images. Long-term follow-up of the MASALA cohort will determine if network members’ body size and body size norms are associated with weight change and weight-control behaviors in South Asians.

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P252

The Effects of Sodium Reduction on Metabolism and Thirst

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Background Recent studies challenge the traditional understanding of sodium physiology. Some animal studies suggest that high sodium intake may induce catabolism, leading to weight loss. Other studies suggest that high sodium intake might reduce, rather than increase, thirst.

Hypothesis Higher sodium intake increases thirst, fluid intake, and sodium excretion without altering energy intake or lowering weight.

Methods In the DASH-Sodium feeding study, adults with pre- or stage 1 hypertension without antihypertensive medications, were randomly assigned to the DASH diet or a control diet. On their assigned diet, participants consumed each of three sodium levels for 4 weeks (randomized crossover design). Participants were provided all meals, but could drink water freely. Throughout the trial, calorie intake was adjusted to keep weight constant. The three sodium levels (at 2100 kcal/d) were: low (1150 mg), medium (2300 mg), and high (3450 mg). Weight, energy intake, self-reported thirst, urine volume, plasma renin, serum aldosterone, urine osmolality, and urine sodium excretion were assessed at the end of each period.

Results Among 412 participants (57% women, 57% black, mean age 48 yrs), weight increased slightly with higher sodium on the control diet, but not the DASH diet; energy intake did not vary across sodium levels in both diets (P-trends > 0.34) (Table). In contrast, participants reported more thirst with high vs low sodium (both diets P-trends < 0.001) and potentially higher fluid intake (urine volume) during the control diet (1,566 vs 1,491 ml on high vs low sodium; P-trend = 0.07). On both diets, plasma renin and serum aldosterone were lower with higher sodium (each P-trend < 0.001). Likewise, both urine osmolality and sodium excretion were higher with higher sodium intake (all P-trends < 0.001).

Conclusions Higher sodium intake did not alter
energy intake, but did increase thirst and sodium excretion. These findings are consistent with the traditional understanding of the physiology of excess dietary sodium intake.


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P253

Adiposity Indicators and Blood Pressure in South Asian Children and Adolescents

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Background: The prevalence of childhood obesity is increasing globally. This has severe implications for cardiometabolic risk including hypertension. South Asian children are particularly vulnerable given their unique phenotype which results in higher body fat at similar body mass index (BMI) levels compared to Europeans. As a result, we sought to explore the association between adiposity indicators and blood pressure, and to compare the strength of these indicators in determining hypertension in South Asian children and adolescents. Methods: Children ages 7-8 and 14-15 with South Asian origin were recruited from two Canadian cities. They were then assessed for height, weight and waist circumference (WC). Waist to height ratio (WHtR), and BMI were calculated. Body fat percentage was determined by bioelectrical impedance analysis. Blood pressure (BP) was assessed three times using an automated device. All variables (except body fat percentage) were transformed to z-scores using published standards. Unadjusted and adjusted (age, sex, household income, exposure to bullying or violence) logistic regression was used to explore associations between adiposity and hypertension. Subsequently, area under the curve (AUC) analysis was used to explore the strength of the adiposity metrics in determining hypertension. Results: This study consisted of 306 boys and 402 girls (n=762) with mean age 9.5 (S.D 3.2) years. Significant association were detected in unadjusted models between the adiposity indicators with systolic and diastolic hypertension (p<0.0001 for all). In the fully adjusted model, the association between adiposity with systolic and diastolic hypertension remained after adjusting for covariates (p<0.01 for all). BMI was the strongest predictor of systolic hypertension (AUC= 0.791), while body fat percentage was the strongest for diastolic hypertension (AUC= 0.712). The other indicators were within close ranges in their ability to predict both systolic and diastolic hypertension. Conclusion: Significant associations were observed between adiposity indicators and hypertension. Moreover, the adiposity indicators were observed to be strong predictors of hypertension in AUC analysis. This highlights the relationship between adiposity and hypertension, and suggests that BMI, WC, WHtR and body fat percentage are good indicators of hypertension in South Asian children.

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P254

Is Obesity Associated With the Predicted 6-Month Mortality in Patients With Atrial Fibrillation and Acute Coronary Syndrome?
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Introduction: The blunting of the expected improvement in cardiovascular health over the past decade has been attributed in part to the substantial increase in the prevalence of obesity. Atrial fibrillation and heart failure are among the cardiovascular diseases with increasing incidence in the US. We sought to evaluate the effect of obesity on the predicted 6-month mortality in our patients with atrial fibrillation [AF] and acute coronary syndrome [ACS] utilizing the GRACE score [GS], a validated risk assessment model for predicting death within 6-months of hospital discharge.

Methods: Eighty patients, 88% black, 54% female, mean age 68, +/-12, h/o AF admitted with ACS were included.

Results: An extraordinarily high prevalence of DM and HTN [46% and 95% respectively] and obesity [46%] were noted. The mean weight: 87 Kg, +/-23. The mean BMI was 31 kgm², +/-10; median BMI 29 kgm² and 25% had a BMI of 35 kgm² or greater, (Chart). Seventy-five percent of the cohort had clinical or radiographic evidence of congestion. Ejection fraction: mean 45%, +/-17. B-type natriuretic peptide [BNP] level: mean 765 pg/ml. BNP was significantly and negatively related to obesity [BMI p= 0.0001; r= -0.422; weight p= 0.001; r= -0.359]. This inverse relationship of BNP and obesity was most apparent when comparing the level of BNP in patients who were at or above the median BMI (29.3 kgm²), p= 0.001, (Fig). Although we found a significant direct association of the GS with age [p<0.001; r=.62], troponin [p=0.001; r=.74] and BNP [p= 0.018; r=.41], no independent significant relationship was apparent with obesity [weight p = 0.54; r= -0.11, or BMI p= 0.11; r= -0.28].

Conclusions: In a traditionally high risk cohort with AF and ACS a high prevalence of obesity was recorded. Clinical or radiographic evidence of congestion was present in the majority. We found no significant link between obesity in this population and the GS—predictor of 6-month mortality. Can this be another cardiovascular paradox? Lengthier outcome studies of larger cohorts are warranted.


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P255

Long-term Associations Between Non-High Density Lipoprotein and Apolipoprotein B in Young Adulthood and Coronary Artery Calcification in Adults With Nonalcoholic Fatty Liver Disease in Middle Age: The CARDIA Study

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Background: Cardiovascular disease (CVD) is the leading cause of death in nonalcoholic fatty liver disease (NAFLD). Apolipoprotein B (apoB) and non-high density lipoprotein-C (NHDL-C) are positively associated with NAFLD in small studies. High apoB predicts atherosclerotic CVD even when NHDL-C is low, suggesting that apoB may be the strongest predictor of atherosclerotic risk in adults.

Objective: To quantify associations between apoB, NHDL-C and the discordance between
apoB and NHDL-C levels in young adulthood with prevalent NAFLD, and coronary artery calcium (CAC) in adults with NAFLD in midlife.

**Methods:** CARDIA recruited young adults ages 18 to 30 years in 1985-86. Participants with complete baseline CVD risk factor data and year 25 (Y25) NAFLD assessment and CAC score were included. NAFLD was defined as noncontrast computed tomography (CT) liver attenuation ≤40 Hounsfield Units after exclusions for other causes of liver fat. Presence of CAC was defined as Agatston score >0 on CT. Baseline NHDL-C or apoB values were divided into tertiles and 4 mutually exclusive concordant/discordant groups, stratified based on being above or below median NHDL-C or apoB levels.

**Results:** Analysis included 2,508 participants (baseline age: 27 ± 4 years; body mass index: 25 ± 4 kg/m²; 58% women; 53% white). Y25 NAFLD prevalence was 10%. Compared with the lowest tertile, higher odds of NAFLD were seen in the middle and high tertiles of both apoB and NHDL-C in separate adjusted models. High NHDL-C and low apoB, but not high apoB and low NHDL-C, discordance was associated with Y25 NAFLD in adjusted models. Among NAFLD participants (n=261), NHDL-C/apoB discordance was not associated with Y25 CAC. Highest odds of CAC were observed in NAFLD participants with high NHDL-C (TABLE).  

**Conclusion:** High NHDL-C is a strong early risk marker for both NAFLD and atherosclerosis among adults with NAFLD in midlife. Based on our study findings, the additional benefit of measuring apoB levels for risk stratification in adults with NAFLD is not apparent.

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**Stability of Obesity and Metabolic Health and the Risk of Cardiovascular Disease**

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**Introduction:** Metabolic syndrome (MetSyn) reportedly confers higher risk of cardiovascular disease (CVD) than its individual components. Although typically defined as a binary exposure, each of its component factors can vary over time. Little is known about whether CVD risk differs according to MetSyn stability.

**Methods:** We defined longitudinal states of obesity and metabolic health among 2,952 Framingham Offspring Study participants for whom we had sufficient data to define MetSyn at ≥4 exams between Exams 2 (1979-1983) and 9 (2011-2014). Obesity was defined as BMI ≥30 kg/m², high triglycerides as ≥150 mg/dL/taking lipid-lowering medication, low HDL as <40 mg/dL for males/ <50 mg/dL for females; high blood pressure as systolic blood pressure ≥130 mm Hg/diastolic blood pressure ≥85 mm Hg/taking antihypertensive medication, and high blood glucose as ≥100 mg/dL/taking antidiabetic medication. Metabolic health was defined as having <2 metabolic conditions. Obesity and metabolic health were classified as *unstable* if there was a change from one state to the other in ≥33% of observations occurring before a CVD event or end of follow-up, stable obese/metabolically unhealthy if not unstable and >50% of observations were classified as stable obese/metabolically unhealthy, or stable non-obese/metabolically healthy otherwise. CVD was defined as any of the following:...
coronary death, myocardial infarction, coronary insufficiency, angina pectoris, stroke, transient ischemic attack, intermittent claudication, or congestive heart failure. We estimated hazard ratios (HRs) and 95% confidence intervals (95% CIs) using Cox proportional hazards regression with age as the time scale.

Results: We classified 332 participants (11.3%) as having unstable metabolic health, and 130 (4.4%) as having unstable obesity. We observed 1,206 events in 75,673 person-years of follow-up (median 30 years). Participants classified as stable metabolically unhealthy had the highest CVD risk (HR 1.77, 95% CI 1.47, 2.13, compared to stable metabolically healthy). Stable obesity was associated with a 48% (95% CI 24, 80) increase in CVD risk relative to stable non-obese. Unstable metabolic health and obesity were associated with moderate increases in risk compared to stable metabolically healthy and stable non-obese (HRs: 1.32, 95% CI 1.03, 1.71 and 1.25, 95% CI 0.88, 1.77, respectively). There was no interaction between obesity- and metabolic health stability (pinteraction=0.23).

Conclusions: In our sample, stability of obesity and of metabolic health influenced CVD risk, with the highest risk of CVD observed among stable metabolically unhealthy participants. Instability of both obesity and metabolic health convey a risk intermediate between the stable obese/metabolically healthy and stable non-obese/metabolically unhealthy conditions.


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P258


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Background: Obesity prevalence has been increasing while cardiometabolic mortality has been decreasing. The reasons for this paradox are not fully understood. Aim: To test the hypothesis that the prevalence of metabolically healthy obesity (MHO) in the U.S. adult population increases over time. Methods: The study included 16,459 participants of the National Health and Nutrition Examination Survey (NHANES) 1999-2014. MHO was defined as central obesity (waist circumference≥102 cm for men and ≥88 cm for women) without any of the following conditions: elevated levels of blood pressure (<125/85 mm Hg), glucose (<100 mg/dL), and triglycerides (<150 mm/dL), reduced levels of high-density lipoprotein cholesterol (≥40 mg/dL for men and ≥50 mg/dL for women), and any medication use for high cholesterol, hypertension, or diabetes. Results: The prevalence of central obesity increased from 45.17% in 1999-2000 to 56.72% in 2013-2014 (P=0.003). MHO prevalence increased from 4.95% in 1999-2000 to 8.92% in 2013-2014. Among those with central obesity, the proportion of MHO increased from 11.0% in 1999-2000 to 15.7% in 2013-2014. Female gender, a younger age, being Hispanic and non-Hispanic Black, and high education (some college or above) were associated with higher prevalence of MHO. Conclusions: While the prevalence of central obesity in the U.S. population has increased, the prevalence of MHO and the proportion of MHO among those who are centrally obese have also increased since 1999, which may partly contribute to the paradox between increased obesity prevalence and reduced cardiometabolic mortality.

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P259
**Improvements in Diet Quality Are Associated With Reduced Abdominal Adipose Tissue: A Prospective Study**

**Rachel Hennein**, Jiantao Ma, NHLBI, Framingham, MA; Michelle Long, Boston Univ, Boston, MA; Chunyu Liu, Daniel Levy, NHLBI, Framingham, MA

**Objectives.** Visceral adipose tissue (VAT) and abdominal subcutaneous adipose tissue (SAT) are associated with cardiometabolic diseases. The relationship between diet quality and abdominal fat accumulation, however, has not been well studied. We aimed to examine the long-term association of change in diet quality and change in abdominal adipose tissue.

**Methods.** In 1,677 participants who attended two consecutive Framingham Heart Study examinations, we measured the volume of VAT and SAT using multi-detector computed tomography at two time-points (median interval of 6 years). The ratio of VAT/SAT was calculated to reflect the relative abundance of these two fat stores, i.e., abdominal fat distribution. We created two scores to represent overall diet quality, the Mediterranean-style diet score (MDS) and the Alternative Healthy Eating Index (AHEI) score, using food frequency questionnaires at baseline and follow-up exams. We analyzed the association between change in the dietary scores and change in VAT, SAT, and VAT/SAT ratio with adjustment for baseline covariates including sex, age, dietary score, VAT, SAT, or VAT/SAT ratio, BMI, energy intake, smoking status, physical activity score, and change in energy intake, smoking status, and physical activity. **Results.** For each standard deviation increase in ΔMDS (diet quality improved), VAT volume reduced by 53±19 cm$^3$ (P=0.005) and SAT volume declined by 52±20 cm$^3$ (P=0.01). Similarly, for each standard deviation increase in ΔAHEI (diet quality improved), VAT volume declined by 45±18 cm$^3$ (P=0.01) and SAT volume fell by 57±19 cm$^3$ (P=0.003). In addition, an increased MDS was associated with a decline in VAT/SAT ratio (P=0.04), but there was no association between ΔAHEI and change in VAT/SAT ratio (P=0.06). We also observed that improved intake of nuts (P=0.04), whole grains (P=0.02), and meat (P=0.005) for MDS and fruits (P=0.02) and meat (P=0.03) for AHEI were associated with a decline in VAT/SAT ratio.

**Conclusions.** The present study demonstrates that longitudinal improvements in diet quality were associated with reduced abdominal fat accumulation, both VAT and SAT. In addition, improved dietary intake of fruits, nuts, whole grains, and meat may affect abdominal fat distribution, i.e., more likely to reduce fat accumulation in VAT relative to SAT.

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**Can Metabolic Syndrome Predict the Incidence of Silent Myocardial Infarction? An Analysis From the Atherosclerosis Risk in Communities (ARIC) Study**

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**Introduction:** Diabetes patients are at risk for clinical Myocardial Infarction (MI) and have a larger proportion being silent Myocardial Infarction. However, less is known about the impact of Metabolic Syndrome (MetS, also known as prediabetes) on the incidence of silent MI. Here, we studied whether the degree of MetS severity can be predictive for future risk of silent MI.

**Methods:** 12,527 ARIC study participants who are free of coronary heart diseases (CHD) and diabetes at baseline (1987-1989) were included for the analysis. Silent MI was determined by ECG serial changes of MI without prior clinical history of MI. A continuous MetS severity score
was formulated from the integration of MetS components to assess its prediction for future silent MI and clinical MI.

**Results and Conclusions:** 458 participants (3.7%, 458 of 12,527) developed clinical MI and 87 (0.7%, 87 of 12,527) were diagnosed with silent MI until ARIC visit 4 (1996-1998). Within the 10 years follow-up period, gender, smoking status, MetS components (waist circumference, blood pressure, HDL cholesterol) and the integrated MetS severity score were identified as significant risk factors for the incidence of both silent MI and clinical MI. Participants with MetS had a significant adjusted HR for incident silent MI (HR = 1.98, 95% CI: [1.30, 3.02], p=0.0015) as compared to clinical MI (HR = 1.67, 95% CI: [1.39, 2.00], p<0.0001). The 10-year risk scoring equations of silent MI and clinical MI were constructed as a multivariate predictive tool based on MetS severity score. In conclusion, higher MetS severity score is associated with further risk of both clinical and silent MI, identifying the potential clinical application of MetS severity score in MI prevention.

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**P261**

**Associations of Left Ventricular Mass, Total Body Weight, and Fat-Free Mass With Body Mass Index: The Framingham Heart Study**

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**Introduction:** Increased left ventricular mass (LVM) predicts excess cardiovascular morbidity and mortality. LVM is often indexed to height (HT) or body surface area (BSA). HT-indexation ignores weight and thus obesity. The relationship of indexed LVM with weight, obesity, and adiposity is unclear. We investigated the association of LVM with total-body mass (TBM, i.e. weight) and fat-free mass (FFM), hypothesizing that LVM scales better to FFM than TBM.

**Methods:** From the 1794 members of Framingham Offspring cohort who underwent cardiac magnetic resonance (CMR), we identified 845 (aged 65±9y) without any history of hypertension, myocardial infarction, heart failure, or CMR wall-motion abnormality. LVM was measured from cine bSSFP images and indexed to HT, BSA, TBM and FFM (by DEXA). Participants were stratified by sex and body mass index (BMI) category (NL=BMI 18.5 - 24.9; OW=25.0 - 29.9; OB=30.0+ kg/m²). We used sex-specific ANCOVA to test for linear trend across BMI categories, and determined sex-specific Pearson correlation coefficients of LVM with BMI; both sets of analyses were adjusted for age and systolic blood pressure. Data are summarized as mean ± SD.

**Results:** The Table shows that LVM and LVM/HT increase with greater BMI-category in both sexes. LVM/BSA was similar across BMI-categories, while LVM/TBM decreased. There was no linear trend across BMI-categories for LVM/FFM in either sex. On a continuous basis, LVM and LVM/HT were positively correlated with BMI in both sexes (r=0.20 to 0.35, p<0.001 for all); LVM/BSA was weakly inversely correlated with BMI in women only (r=-0.14, p=0.001) but not men (r=-0.08, p=0.18); LVM/TBM was inversely correlated with BMI (M: r=-0.39, W: r=-0.54, p<0.0001 both); LVM/FFM was not correlated with BMI in either sex (M: r=-0.05, p=0.38, W: r=0.08, p=0.055).

**Conclusion:** LVM as a proportion of TBM (weight) actually decreases with greater BMI, while LVM/FFM is not associated with BMI. Whether LVM is better scaled to FFM vs HT, BSA
or TBM for risk stratification purposes remains to be determined.

<table>
<thead>
<tr>
<th>BMI Category</th>
<th>Normal</th>
<th>Overweight</th>
<th>Obese</th>
<th>P (trend)</th>
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</thead>
<tbody>
<tr>
<td>Start, N=115</td>
<td>81</td>
<td>17</td>
<td>0</td>
<td>0.0000</td>
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<tr>
<td>BMI 19.5-25</td>
<td>54.76 (53.75)</td>
<td>70.32 (26.71)</td>
<td>70.40 (20.27)</td>
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<tr>
<td>BMI 25-30</td>
<td>37.16 (46.94)</td>
<td>54.36 (14.17)</td>
<td>71.54 (8)</td>
<td>0.58</td>
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<tr>
<td>BMI &gt;30</td>
<td>37.08 (22.77)</td>
<td>54.95 (14.21)</td>
<td>2.099 (2.099)</td>
<td>0.90</td>
</tr>
</tbody>
</table>

BMI: body mass index, TBM: traditional body mass, P262


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P262

**Association of Weight History With Risk of Diabetes**

**Molly Jung**, Casey M Rebholz, Johns Hopkins Univ, Baltimore, MD; June Stevens, Univ of North Carolina in Chapel Hill, Chapel Hill, NC; Josef Coresh, Chiadi Ndumele, Johns Hopkins Univ, Baltimore, MD

**Introduction**: Weight gain during early adulthood may contribute to diabetes risk above and beyond a single measure in midlife. Nonetheless, most epidemiologic studies have focused on the risks associated with a one body mass index (BMI) value in midlife. **Hypothesis**: Accounting for change in BMI from early to mid-adulthood would add prognostic value for estimating risk of diabetes compared to using a single value. **Methods**: We included 9,857 participants from the Atherosclerosis Risk in Communities (ARIC) Study without diabetes and with BMI ≥18.5 kg/m² in 1996-1998 (visit 4). Participants were followed through 2015 for incident diagnosed diabetes. Current BMI was defined as calculated BMI using measured height and weight at visit 4. Early adulthood BMI was calculated from current height and

self-reported weight at age 25. We classified current and early adulthood BMI into three categories (18.5-<25, 25-<30, and ≥30 kg/m²) and we examined the associations of changes in BMI category with diabetes risk using Cox proportional hazards models. **Results**: Overall, 64% (6,205 of 9,857) of the participants moved from a lower to higher BMI category between age 25 and visit 4 (mean age, 63), 35% (3,446 of 9,857) remained stable, and 2% (206 of 9,857) moved from a higher to lower BMI category. Adding BMI at age 25 to a model with current BMI significantly improved model fit. In analyses using BMI change categories between age 25 and visit 4, relative to persons with normal BMI at age 25 and visit 4, persons who moved from a lower to higher BMI category and those who maintained a high BMI had a higher risk for diabetes (Table). **Conclusions**: Current weight is associated with diabetes risk. Past weight gain from early adulthood did not appear to add information above and beyond current weight. Our findings highlight the importance of weight management at all ages for optimal diabetes prevention.

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P263

**Acid-Base Status as a Modifier of Loss of Lean Mass During Intentional Weight Loss in Older Adults**

**Snezana Petrovic**, Iris Leng, Michael P Walkup, Walter T Ambrosius, W. Jack Rejeski, Barbara J
Weight loss interventions present a unique challenge in older adults: relative loss of lean mass during weight loss, if superimposed on age-related sarcopenia may increase the risk for mobility disability. Relative loss of lean mass (25-30%) during weight loss depends on the severity/duration of caloric restriction, initial body mass, and concomitant exercise training. We hypothesized that subclinical imbalances of acid-base status (reflected in lower serum bicarbonate) may also affect relative loss of lean mass during weight loss. The rationale: even subtle imbalances of acid-base status (e.g. bicarbonate <23 mmol) impact clinical outcomes in older adults such as gait speed or incidence of functional limitation, while bicarbonate supplementation reduces urinary nitrogen wasting and may improve physical function. However, data on acid-base balance and serum bicarbonate during moderate caloric restriction are lacking. We, therefore, analyzed 2 randomized, controlled weight loss trials (including moderate caloric restriction and exercise): The Diet, Exercise, and Metabolism for Older Women [DEMO; (58±5.2 y)] and Cooperative Lifestyle Program; [CLIP; (67±4.7 y)]. Serum bicarbonate was assessed as total CO₂ (in mmol) and whole body lean mass measured by dual-energy X-ray absorptiometry. The analysis showed that 48% of participants had bicarbonate <23. DEMO participants with lower serum bicarbonate at baseline lost more lean mass during the intervention (unadjusted β(SE)=0.32[0.16]; p=0.04; n=92). Adjustments for age, BMI, eGFR, % weight loss, baseline, intervention group, had little effect, but adjusting for protein intake during weight loss attenuated the association (β(SE)=0.17[0.15]; p=0.28.). Similarly, a change in serum bicarbonate during the trial was associated with % lean mass change, but attenuated after controlling for protein intake. This is not unexpected: protein is acid-producing and one of two major determinants of net dietary acid load; higher dietary acid load correlates with lower serum bicarbonate, in older adults. Results from the CLIP trial were remarkably similar, and consistently, baseline serum bicarbonate level was marginally predictive of baseline daily protein intake, with highest baseline serum bicarbonate having the lowest protein intake [bicarbonate: >24 (n=58); >21-24 (n=121); <21 (N=93); protein in g/kg body weight 0.7(0.4); 0.9(0.4); 0.8(0.4) respectively, p=0.057). In conclusion, our analysis suggests that higher serum bicarbonate before and during weight loss may ameliorate loss of lean mass, however, to obtain definitive answer such analysis needs to be conducted under conditions of controlled or randomized protein intake. Importantly, our findings suggest that oral bicarbonate supplementation, a simple and relatively safe intervention, may ameliorate loss of lean mass during weight loss interventions in older adults.


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P264 

Six-Year Incidence of Overweight and Obesity Among Diverse Hispanic/Latino Adults in the US: The Hispanic Community Health Study/Study of Latinos 

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Baseline HCHS/SOL data recently showed that prevalence of obesity varied markedly by sex and Hispanic/Latino background. Despite increasing prevalence of obesity in the US, little data exist on incidence of overweight and obesity in diverse US Hispanic/Latino adults. This study examined ~6-year incidence rate of overweight and obesity in this population by demographic factors.

**Methods.** HCHS/SOL is a multi-center prospective community-based study of 16,415 diverse Hispanic/Latino adults in the US, ages 18-74 at Visit 1 (2008-11). Visit 2 (2014-17) is ongoing, with 10,914 persons reexamined by August 2017. Analyses included 10,427 persons with complete data on body mass index (BMI) at both visits and on other variables of interest; underweight persons were excluded. Age-adjusted incidence rate of overweight (BMI 25.0-29.9 kg/m²; among those normal-weight at baseline), and obesity (BMI>30 kg/m²; in those non-obese at baseline) was computed by sex and Hispanic/Latino background, accounting for the complex study design.

**Results.** In ~6 years, 572 and 765 new cases of overweight and obesity were seen among baseline normal-weight (n=1924) and non-obese (n=5912) participants, respectively. Among men and women, age-adjusted incidence of overweight was 5.45 and 5.33 per 100 person years (PY); age-adjusted obesity incidence was 2.00 and 2.56 /100 PY. Incidence rates varied by background. Among men, overweight incidence was highest in those of Mexican background (6.95 /100 PY), and among women, in those of Puerto Rican background (6.94/100 PY). Incidence of obesity was highest in Dominican-background men (2.35/100 PY) and Cuban-background women (3.85/100 PY) (Table). Incidence rates varied slightly by age group, from 4.06 to 5.98/100 PY in those ages 18-44 and 65+ years.

**Conclusion.** Of every 100 US Hispanic/Latino adults about 5 and 2 became overweight and obese each year, augmenting the existing high prevalence. Greater efforts are needed to prevent onset of overweight and obesity in this population from young adulthood onwards.
risks of non-CVD outcomes is of increasing interest. We investigated the risk of subsequent cancer in persons with clinical CVD compared to those without using a matched cohort study nested in the ARIC study. **Hypothesis:** Persons with CVD may have higher risk of cancer compared to those without. **Methods:** In ARIC participants (aged 45-64 years) without prevalent CVD or cancer at the study baseline (1987-1989), we first identified every participant who developed clinical CVD (myocardial infarction [MI], heart failure, or stroke as a combined outcome and separately) during follow-up (through 2012). For each of them, applying incidence density sampling, we selected up to two participants without clinical CVD matched on key confounders (age, sex, race, diabetes, hypertension, lipid-lowering therapy, and smoking). Then, we used the Cox proportional hazards regression to estimate the risk of total and site-specific cancer comparing CVD to no CVD further adjusting for conventional risk factors for CVD or cancer, socioeconomic status, insurance, and routine physical examination. **Results:** We followed 2,565 with CVD and 4,622 without CVD from the date of sampling for a total of 62,772 person-years (mean of 9 years). The hazard ratio [HR] for total cancer risk was 1.13 (95% confidence interval, 1.00-1.32) for participants with CVD compared to those without. None of the HRs for site-specific cancers were statistically significant. When individual CVD subtypes were analyzed separately, participants with MI and heart failure had 2.1- and 1.3- folds significantly higher risk of total cancer compared to those without, respectively. Participants with MI had significantly increased HR in major types of cancer such as prostate, lung, and breast, with adjusted HR ranging from 2.5 to 3.5. **Conclusion:** Persons with clinical CVD, especially MI, had a modestly increased risk of total cancer following that event compared to those without. Future studies are warranted to better understand its potential reasons.


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P266

**Prevalence and Risk Factors of Thyroid Dysfunction in Older Adults in the Community**

Nermin Diab, Natalie Daya, Stephen P Juraschek, Seth Martin, John W McEvoy, Johns Hopkins Bloomberg Sch of Public Health, Baltimore, MD; Ulla T Schultheiß, Anna Köttgen, Univ of Freiburg Faculty of Med, Freiburg, Germany; Elizabeth Selvin, Johns Hopkins Bloomberg Sch of Public Health, Baltimore, MD

**Context.** Prevalence estimates and evidence informing treatment targets for thyroid dysfunction largely come from studies of middle-aged adults. There are limited data on the prevalence of thyroid dysfunction in older populations. **Objective.** To determine the prevalence of thyroid dysfunction and risk factors for abnormal thyroid tests in older adults. **Methods.** We conducted a cross-sectional analysis of data from participants aged 65 or older in the Atherosclerosis Risk in Communities (ARIC) study who attended visit 5 in 2011-2013. We measured serum concentrations of triiodothyronine (T3), free thyroxine (FT4), thyroid peroxidase antibody (Anti-TPO), and thyroid stimulating hormone (TSH) in 5,392 participants. We used multivariable linear and logistic regression to assess associations of demographic and clinical risk factors with thyroid hormone levels. **Results.** In this population of older adults (mean age 76; 56% women and 22% black), the prevalence of thyroid dysfunction was up to 25% when accounting for treated and untreated thyroid dysfunction categories. 15.6% reported use of medication for thyroid dysfunction. Among those not being treated, the prevalence
of overt chemical hypothyroidism was 6.0% and subclinical hypothyroidism was 0.82%. Overt chemical hyperthyroidism and subclinical hyperthyroidism affected 0.26% and 0.78% of the population, respectively. Multivariable adjusted cardiovascular risk factor associations for TSH, FT4 and T3 levels are presented in Table. Men were less likely to be anti-TPO positive compared to women (OR=0.59, CI: 0.47,0.75, P<0.001).

Conclusions. There is a high prevalence of thyroid dysfunction in this older, community-based population. Prevalence of thyroid dysfunction and thyroid hormone levels vary with sex, race, age group and multiple cardiovascular risk factors. Accounting for these associations in the clinical setting might prove useful in improving thyroid function assessment in this age group.


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P267

Introduction: The relation between brain- and cardiovascular health has been mainly described through cognitive function. Less is known about the relation of ideal cardiovascular health (CVH) and other brain health characteristics. Hypothesis: We assessed the hypothesis that cardiovascular health is associated with brain health constructs: depressive symptoms, sleep quality and duration, self-rated health. As an additional exposure we investigated excessive TV watching, considered an addictive behavior. Methods: We used cross-sectional, baseline data of 10687 participants, age 45 to 64 years free of cardiovascular diseases in an ongoing cohort study (PONS). Data were collected through structured questionnaires and fasting blood samples. Ideal CV health was defined according to the American Heart Association criteria (7 metrics assessed at 3 levels: ideal, intermediate, and poor). Brain health was assessed as: 1) depressive mood (PHQ questionnaire, scale 0-7); 2) sleep hours; 3) self-rated overall health (SRH) (1 item, on a scale from 1 to 10); 4) hours watching TV. We used multivariable logistic models and adjusted for age, sex, education, place of residence, antidepressant medication use and past depressive episodes. Results: The prevalence of poor CVH (0-2 ideal metrics) was 63% and of ideal CVH (6, 7 ideal metrics) was 0.07%. Reporting 4 or more current depressive symptoms was associated with poor CVH (OR, 95%CI 1.13, 1.02-1.27) after multivariable adjustment. The relation was mainly driven by somatic affective rather than cognitive affective depressive symptoms. Difficulties falling asleep or sleep duration were not associated with CVH after controlling for depression. Watching TV more than 20h/week was associated with poor CVH (OR 1.40, 95% CI 1.27-1.55) after multivariable adjustment. A SRH score of 6 or lower was associated with poor CVH (OR 1.33, 95% CI 1.22-1.46) after multivariable adjustment. We observed similar relations in a sensitivity analysis after excluding those taking current antidepressant medication. Conclusion: In this community-based study we found that
there is a moderate association between poor cardiovascular health and current depressive symptoms, independent of past depression episodes or antidepressant treatment. In addition to Life’s Simple 7, monitoring depressive symptoms, sleep, self-rated-health and/or addictive TV-watching may benefit both brain- and heart wellness.

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P268

High Large and Small Artery Elasticity Indexes Decrease the Risk to Develop Hypertension in Women: Skaraborg Hypertension Project


Aims: The aim was to investigate whether non-invasive measurements of the diastolic pulse wave form predicts the incidence of hypertension in population-based cohort.

Methods: Longitudinal observational study. Between 2002-2005 a sample of 2816 subjects (1400 men) was randomly invited in a cohort study with the goal to study early detection of risk factors for cardiovascular disease. The cohort was followed up between 2012-2014. The mean follow-up time was 9.9 years (±1.1) and in a representative sample of 1327 subjects the protocol was completed. Body mass index was calculated based on measurements at the study clinic. Blood pressure was measured with participants in supine position twice after five minutes rest and the mean was used in analyses. Hypertension was defined based on JNC 8, and diabetes on WHO criteria from 1999. C1 and C2 were assessed using HDI/Pulse wave CR-2000 (Eagan, MN) and were based on three repetitive measurements within 5 min with the patient in a rested supine position. The mean value of the three measurements was used for the statistical calculations. The association between C1 and C2 and systolic and diastolic blood pressure was investigated with linear regression and possible confounding was adjusted in the multivariable regression models.

Results: The 99 women and 103 men with hypertension at baseline were excluded from analyses. During the follow-up 73 new cases with hypertension were found in women and 95 cases in men. Systolic and diastolic blood pressure was significantly higher at follow-up in both men and women (Men: Baseline SBP 120 (12) mmHg DBP 71 (9) mmHg; Follow-up SBP 125 (12) mmHg DBP 73 (9) mmHg- Women Baseline SBP 115 (13) mmHg DBP 67 (8) mmHg; Follow-up SBP 121 (14) mmHg DBP 70 (9) mmHg). At baseline a strong association was found between both elasticity indexes (C1 and C2) and systolic and diastolic blood pressure in both men and women. C1 was strongly and negatively associated with systolic blood pressure at follow up (Men .β=- .15 p<0.001, Women β= -.10 p=0.007). Similar results were found for diastolic blood pressure. In similar analyses for C2 was also significantly associated with systolic blood pressure at follow up (Men .β=- .11 p=0.007, Women β=- .10 p=0.013). When analyzing incident cases with hypertension we found that both C1 and C2 could predict hypertension in women but not in men in a model including age, BMI and systolic blood pressure at baseline (C1 Men OR=.97 CI .91, 1.04 Women OR=.87 CI=.79,.97 C2 Men OR=.97 CI .84, 1.03 Women OR=.85 CI=.73,.98)

Conclusions: This study showed that elasticity indexes are strongly associated with systolic and diastolic blood pressure at follow-up regardless baseline blood pressure at baseline in both men and women. Moreover, high indexes of artery elasticity C1 and C2 decrease the risk for future hypertension in women.
Cardio-Ankle Vascular Index and the Risk of Cardiovascular Outcomes and All-cause Mortality: A Systematic Review

Kunihiro Matsushita, Ning Ding, Esther Kim, Johns Hopkins Univ, Baltimore, MD

**Introduction:** Arterial stiffness is widely used as an index of arteriosclerosis and is associated with cardiovascular disease (CVD). Recently, cardio-ankle vascular index (CAVI) was developed as a measurement of arterial stiffness that is independent of blood pressure at the time of arterial stiffness evaluation. The associations of CAVI with CVD events and all-cause mortality have not been extensively assessed. We therefore systematically reviewed the studies reporting CAVI and relevant outcomes. **Methods:** We searched for both prospective and cross-sectional studies using MEDLINE, Embase, and Cochrane from inception to April 11, 2017. Two independent reviewers screened the retrieved papers, extracted relevant data and assessed the risk of bias. Any discrepancy was solved by discussion or a third reviewer. Heterogeneity among studies was assessed using the I² statistic. We pooled the results of studies that were sufficiently homogeneous. **Results:** Among 1,519 records, we identified 9 cohort studies (n=5,292) and 17 cross-sectional eligible studies (n=7,309). All 9 cohort studies reported the outcome of composited CVD (498 cases), but the categorization/modeling of CAVI was not consistent across those studies. The pooled hazard ratio (HR) of CVD for the highest vs. lowest CAVI category in 3 studies was borderline significant (pooled HR=1.34 [0.95, 1.87], p=0.092) (I²= 25.2%, p=0.263). For 3 studies examining the continuous association between CAVI and CVD, 1 standard deviation (SD) increment of CAVI was significantly associated with CVD risk (pooled HR=1.22 [1.03, 1.45], p=0.023) (I²= 27.1%, p=0.253). Only 3 cohort studies investigated CAVI and all-cause mortality, and none of them reported a significant association. All 17 cross-sectional studies reported higher CAVI values in patients with CVD compared to those without CVD, with statistical significance in most studies. **Conclusions:** CAVI was generally higher in patients with CVD compared to their counterparts. In terms of the prospective prognostic value of CAVI, we found a limited number of studies, but they indicated a modest association between CAVI and CVD risk. Our systematic review highlighted the need for large prospective studies to assess the usefulness of CAVI as a predictor of CVD and mortality.
Hypothesis: Since BMI is a strong risk factor for incident VTE, we hypothesized that early life body size as well as other measures of adult adiposity may also be positively associated with VTE risk.

Methods: We evaluated associations of childhood somatotype, BMI at age 18, change in BMI since age 18, and measures of waist and hip circumference with incident VTE among 47,415 women age 40-67 years at baseline from the Nurses' Health Study (NHS), 47,539 women age 29-48 years from the Nurses’ Health Study II (NHS II), and 32,707 men age 39-76 years from the Health Professionals Follow-Up Study (HPFS) without a prior VTE. We calculated multivariable-adjusted hazard ratios (HR) of VTE using Cox proportional hazards models.

Results: Over ≥25 years of follow-up, there were 1,191 incident VTE cases in NHS, 763 cases in NHS II, and 1,350 cases in HPFS. Adult BMI was strongly associated with VTE in all three cohorts (HRs comparing ≥35 kg/m^2 vs. <22.5 kg/m^2: NHS: 3.03 [95% CI: 2.58, 3.55], NHS II: 3.88 [95% CI: 3.36, 4.48], HPFS: 2.49 [95% CI: 1.83, 3.29]; all P<0.01). Waist circumference, hip circumference, and height were associated with greater VTE risk, even after adjusting for adult BMI (all P<0.01) (Table). Somatotype at ages 5 and 10, BMI at age 18, and change in BMI since age 18 were not significantly associated with VTE risk, after accounting for adult BMI.

Conclusions: Adult BMI, waist circumference, hip circumference, and height were independently, positively associated with incident VTE risk. Early life body size was not significantly associated with VTE risk after accounting for adult BMI, indicating that BMI and adiposity are likely more important acutely that cumulatively over time in the etiology of VTE. Clinically, encouraging weight loss in adults


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P271
Women's Reproductive History and Peripheral Arterial Disease in Late Life: The San Diego Population Study

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Background: Total population burden of peripheral artery disease (PAD) is higher for women than men age ≥40 years. Reproductive factors (e.g., early menarche, parity, early menopause) have been linked with later-life cardiovascular risk in women, but whether they influence PAD has been understudied.

Objective: To evaluate associations between reproductive factors with later-life ankle-brachial index (ABI), femoral artery intima-media thickness (fIMT), and femoral plaques.

Methods: Cross-sectional analysis of 707 multiethnic women who participated in a follow-up exam of the San Diego Population Study conducted in 2007-2011. Reproductive exposures included age at menarche, number of live births, age at menopause, surgical menopause, and history of oral contraceptive
use. Dependent variables were ABI and Doppler ultrasound measurements of common fIMT and any femoral plaque presence. We performed multiple linear and logistic regression adjusting for age, race/ethnicity, and cardiometabolic factors. Since 30% (n=201) of women reported surgical menopause, we tested for interactions with reproductive factors and stratified by menopause type (natural vs. surgical). Results: Women were on average 70.6 years old (SD=9.6) and 56% were White. There were no significant associations in the overall sample after adjusting for covariates. We found interactions between surgical menopause and oral contraceptive use (p=0.03) for ABI, and with parity (p=0.05) and age at menopause (p=0.05) for fIMT. Among women with natural menopause, oral contraceptive use was associated with higher ABI (β:0.03, p=0.007) and older age at menopause was related to greater fIMT (β:0.009, p=0.06) (Table 1). Among women with surgical menopause, parity (0 vs. 2) was marginally associated with greater fIMT (β:0.33, p=0.07). Conclusions: Findings suggest that reproductive history may be associated with later-life development of PAD in women. Studies are necessary to confirm findings and examine pregnancy-related exposures in relation to PAD.


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P272

Dietary Intake of Vitamin K and the Risk of Incident Pulmonary Embolism in the Nurses’ Health Study


Introduction: Vitamin K, which is consumed as phylloquinone (K$_1$) and menaquinone (K$_2$), impacts some vitamin-K dependent proteins involved in hemostasis. It is unknown whether dietary intake of phylloquinone and menaquinone are associated with incident pulmonary embolism (PE) risk. Hypotheses: Dietary intake of phylloquinone and menaquinone will be positively associated with the risk of incident PE and, in secondary analyses, idiopathic PE. Methods: Eligible women were Nurses’ Health Study participants free of venous thromboembolism (VTE) at 1984 baseline (n=74,821). Participants completed a food frequency questionnaire every four years (1984-2010) and we calculated intake of phylloquinone and menaquinone. Eligible PE cases were confirmed via medical record review or participant reconfirmation, or self-reported among persons with prior cancer. Cases were defined as idiopathic in the absence of cancer, recent surgery, and trauma. Cox Proportional Hazards models estimated hazard ratios and 95% confidence intervals for PE associated with time-varying energy-adjusted quintiles of phylloquinone, and separately, menaquinone. Two models adjusted for time-varying covariates, first including lifestyle and medical factors and next adding energy-adjusted nutrients. Secondary analyses estimated idiopathic PE risk. Results: We identified 568 incident PE events during 1,328,669 person-
years. In analyses adjusted for lifestyle and medical factors, there was no evidence of a linear association between incident PE risk and energy-adjusted quintiles of phylloquinone intake (linear p-trend across quintile medians = 0.37) or menaquinone intake (linear p-trend = 0.57). Results for idiopathic PE risk were similarly null, as were results after further adjustment for nutrients (Table). **Conclusions:** In this study of U.S. women, there was no evidence of a linear association between energy-adjusted quintiles of phylloquinone or menaquinone intake and incident PE risk, before or after adjustment for other nutrients.


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**Funding Component:**

P273

**Treatment Patterns Among Vorapaxar New Users in a US Outpatient Clinical Setting**

Cathy Anne Pinto, Merck Res Labs, Rahway, NJ; Eileen Fonseca, Gregory P. Hess, Massimiliano Alfonzo Manzi, Symphony Health, Conshohocken, PA; John Acquavella, Aarhus Univ, Aarhus, Denmark

**Introduction:** Vorapaxar is a once daily oral protease-activated receptor-1 (PAR-1) antagonist for the reduction of thrombotic events in patients with a history of myocardial infarction or peripheral arterial disease. Efficacy and safety was evaluated in a large randomized clinical trial (TRA 2°P TIMI 50), with a median follow-up of 30 months. This is the first descriptive study of vorapaxar treatment patterns in routine clinical practice. **Objectives:** To evaluate medication adherence and persistence among vorapaxar new users. **Methods:** Vorapaxar new users ≥18 years of age were identified with an index prescription date between June 2014 and October 2015 with ≥1 year of follow-up through October 2016. The qualifying prescription was identified from Symphony Health’s US outpatient pharmacy claims linked to private practitioner claims and hospital data. Baseline characteristics were assessed using a 1-year look-back prior to the index prescription date. Adherence was defined as a medication possession ratio (MPR) ≥80%, and persistence was defined allowing for up to a 7-day gap in days supply. Sensitivity analysis with 15-day gap to define persistence was performed. **Results:** The 529 vorapaxar new users included in the analysis were predominantly male (67%), 11% African American and 70% Caucasian, and had a mean (SD) age of 65.2 (10.5) years. At the end of 3, 6, and 12 months, 61%, 45%, and 32%, respectively, of new users were adherent on vorapaxar. A majority (68%) of vorapaxar users were persistent at 3 months, 48% at 6 months, and 29% at 12 months. An additional 10% restarted therapy by the end of the first year after a period of supply interruption. Results of the sensitivity analysis for persistence using 15-day allowable gap were within 1-2% of primary analysis. The median (IQR) time to discontinuation of therapy during the first year was 2.6 (1.2-6.1) months. During the first year, a median (IQR) of 5 (3-9) prescriptions per patient were filled- majority 30 day fills. **Conclusions:** Medication adherence and persistence of use decreased over time. One-third of patients were adherent and/or persistent at one year. Further research is warranted to understand treatment pattern differences by indication of use and factors affecting adherence and discontinuation.
Disclosures:  **C. Pinto:** A. Employment; Significant; Employee.  **E. Fonseca:** A. Employment; Modest; Ms. Fonseca is an employee of Symphony Health, whose institution received funding from Merck for the design and conduct of the study.  **G. Hess:** A. Employment; Significant; Dr. Hess is an employee of Symphony Health, whose institution received funding from Merck for the design and conduct of the study. B. Research Grant; Significant; Dr. Hess is a co-investigator for the NIH R01 Grant “Use of Registries, Claims and Health System Data to Enhance the Evaluation of Cardiovascular Therapies in Clinical Trials”.  F. Ownership Interest; Significant; Dr. Hess is Executive Vice President and Chief Medical Officer of Symphony Health.  H. Other; Significant; Dr. Hess is a Member of the Clinical Excellence Committee for Millennium Health, Chair of the Data Analytics Committee for ASCO CancerLinQ, and Advisory Board Member for BioDelivery Sciences.  **M. Manzi:** A. Employment; Modest; Mr. Manzi is an employee of Symphony Health, whose institution received funding from Merck for the design and conduct of the study.  **J. Acquavella:** A. Employment; Modest; Dr. Acquavella is employed by Symphony Health, whose institution received funding from Merck for the design and conduct of the study.

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**P274**

**Cross-sectional Analysis of Baseline Characteristics for New Users of Vorapaxar (PAR-1 Antagonist) and P2Y₁₂ Inhibitors**

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**Introduction:** Vorapaxar is indicated for the reduction of thrombotic events in patients with a prior myocardial infarction (MI) or peripheral arterial disease (PAD), and contraindicated in patients with a prior stroke, transient ischemic attack (TIA), or intracranial hemorrhage (ICH). This is the first descriptive study of vorapaxar in US clinical practice.

**Objectives:** Main objective was to describe baseline characteristics of vorapaxar new users. For context, P2Y₁₂ new users were also examined, with indications summarized in Table 1.

**Methods:** Cross-sectional analysis of vorapaxar new users ≥18 years with ≥1 prescription between June 2014 - June 2016 identified in Symphony Health’s outpatient pharmacy claims database linked to private practitioner claims and hospital data. Concomitant clopidogrel use was defined with overlapping days of supply. Medical history was defined using a 1-year baseline period.

**Results:** The analysis included 1,362 vorapaxar (44% with clopidogrel), 975,023 clopidogrel, 133,724 ticagrelor, and 98,101 prasugrel new users (Table 1). Most ticagrelor (87%) and prasugrel (85%) users had evidence of coronary artery disease (CAD) compared with 52% of clopidogrel and 58% of vorapaxar users. In contrast, <1% of ticagrelor and prasugrel users had PAD but no CAD vs. 6% of clopidogrel and 15% of vorapaxar users. The proportion of vorapaxar users (44%) with PAD, alone or with CAD, was 3-5 times larger than P2Y₁₂ users. PAD was more prevalent for vorapaxar with (50%) vs. without (39%) clopidogrel. Contraindications were infrequent for vorapaxar users - no ICH, <4% with stroke or TIA. Median time from recent MI to therapy start was 6 months for vorapaxar vs. 3 days for ticagrelor and prasugrel and 7 days for clopidogrel. Vorapaxar users were mostly male and on average ~65 years old.

**Conclusions:** The majority of vorapaxar new users had a history of CAD and/or PAD, with PAD prevalence more than twice that of P2Y₁₂ new users. Contraindications were infrequent.
Prescription of PCSK9 Inhibitors in the United States, by Patient, Provider, and Payer Characteristics, 2016

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**Background:** Proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors were approved in 2015 for use by adults with familial hypercholesterolemia (FH) or clinical atherosclerotic cardiovascular disease (ASCVD) requiring additional low-density lipoprotein cholesterol lowering beyond use of diet modification and maximally tolerated statin therapy. This study describes the patient, provider and payer related characteristics of prescriptions filled for this new class of injectable medication during 2016.

**Methods:** 2016 quarterly state-level prescription data were obtained from Symphony Health Solution’s PHAST 2.0. PHAST 2.0 includes data on over 90% of prescriptions filled from US retail and mail order pharmacies and, along with market purchasing data, are used to calculate state and national estimates. PCSK9 inhibitor fills among adults aged ≥18 years were characterized by quarter, patient age, provider type, and payer type. Per-capita fill rates across US states and total and patient spending per 30-day supply were calculated.

**Results:** In 2016, 216,082 PCSK9 inhibitor prescriptions were filled. The number of fills per quarter increased from 20,348, in Q1, to 83,812, in Q4, and fill totals were greatest among those aged 65-74 years (39.3% of fills) (Figure). Cardiologists prescribed the majority of fills (60.5%). Commercial payers (43.3%) and Medicare (43.1%) were the most frequent payers. State per-capita fill rates (per 100,000) ranged from 12.1, in WY, to 191.9, in LA (median: 69.1). Total spending per 30-day supply was $951; patient spending was $58 per 30-day supply.

**Conclusion:** Quarterly fills for PCSK9 inhibitors quadrupled during 2016, with substantial variation in per-capita fill rates across states. Cardiologists prescribed the majority of fills, which aligns with their indicated use among adults with FH or ASCVD. Total spending per 30-day supply was considerable. Tracking of prescribing trends for these medications is warranted as additional information about their efficacy becomes available.
Activity Tracker Increases Daily Step Count Post-Cardiac Rehabilitation Compared to Placebo Device

Introduction: Despite optimal levels of physical activity (PA) among patients immediately post-cardiac rehabilitation, little is known about PA levels long-term. Further, interventions to maintain recommended PA levels and functional capacity achieved during cardiac rehabilitation are lacking. Objective: To test the effect of wearing a Garmin vívofit for 3 months post-cardiac rehabilitation on PA levels and functional capacity compared to a placebo device. Methods: Change in daily step count and 6-minute walk test (6MWT) were assessed over 3 months using the vívofit activity tracker in 35 patients (mean age 62±8 years; 83% male; 94% Caucasian) post-cardiac rehabilitation. Goal was 10,000 steps for all participants. Patients were randomized into the control or intervention group with control devices displaying a digital clock. vívofit step data were recorded continuously; the 6MWT was conducted at 0, 9, 12, and 15 weeks. Comparisons between the 2 groups were made using test of proportions, t-test, and logistic and linear regression. Results: Control and intervention groups were balanced with respect to age, gender, education, baseline step count, and body composition. Although all participants exhibited above average daily step counts (>8,000 steps at 3, 9, and 15 weeks); step counts for intervention group participants were higher at 3, 9, and 15 weeks (by 2,537 steps, 2,022 steps, and 1,545 steps, respectively). Intervention group participants (N=17) increased the distance covered during the 6MWT by 138 feet (sd=28), compared to a 48 foot (sd=18) improvement among control group participants (p=0.500); although not statistically significant, but perhaps clinically relevant. Conclusion: These data provide preliminary support for using wrist-worn activity tracking devices to continuously monitor and maintain PA levels post-cardiac rehabilitation. There is a need for larger trials testing the effectiveness of these devices with a more diverse sample over a longer period of time. Wrist worn activity tracking devices should be coupled with other components known to support long-term behavior change (e.g., social support and text messaging) to develop effective interventions for secondary cardiovascular disease prevention.

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**Objective:** Low physical activity increases cardiovascular disease (CVD) risk. Social context, operationalized through social networks, has been shown to drive health behaviors. This study examined the association between personal social networks and moderate-to-vigorous leisure-time physical activity (LTPA) among South Asian (Indian, Pakistani, Bangladeshi, Sri Lankan, Nepalese) immigrants, a group with high CVD rates.

**Methods:** This study used cross-sectional data from an ancillary study of social networks (2014-2017) in the Mediators of Atherosclerosis in South Asians Living in America (MASALA) study cohort. Participants, free from CVD at baseline and living in the San Francisco Bay-area, CA and Chicago, IL, were administered a detailed social networks questionnaire and physical activity questionnaire adapted from the Cross-Cultural Activity Participation Study. Participants reported on the exercise behaviors of each social network member and if they exercised with the network member. Network members who exercised with a participant were categorized as exercise partners. Moderate-vigorous LTPA was calculated as Metabolic Equivalent of Task (MET) minutes per week. Sex-stratified, linear regression models were used to examine associations between social network characteristics and MET-min/week of LTPA, independent of age, marital status, and network size. The effect of having an exercise partner in the network, above simply having network members who exercised, was tested using a partial F-test to compare nested models.

**Results:** Among the 700 participants, this analysis only included the 89% who reported any LTPA (n=623, 43% female). These individuals reported a median of 1335 MET-min/week of LTPA (IQR=735-2212 MET-min/week) and had an average of 4 network members (SD +/- 1). The proportion of network members who exercised was 0.89, and the proportion of exercise partners was 0.28. Exercise partners were most commonly spouses (56%) and friends (20%). Among South Asian men who exercised, having a social network member who exercised instead of having a non-exercising network member, significantly increased LTPA by 310 MET-min/wk (95% CI=152-470). For men, having a social network member who was an exercise partner instead of a non-exercising network member, was associated with an additional 520 MET-min/wk of LTPA (95% CI= 344-696). The effect on LTPA of having an exercise partner in the network was significantly greater than the effect of simply having a network member who exercised (p-value < 0.001). Results were similar for women, but not statistically significant (p-value=0.05).

**Conclusions:** Among South Asian immigrants, having an exercise partner in one’s personal social network was associated with significantly more LTPA. Social network support, in the form of an exercise partner, may be an effective component of interventions to promote LTPA in South Asians.

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**P278**

**Impaired Nighttime Sleep Negatively Effects Next-Day Physical Activity: Results From an Ecological Momentary Assessment Study**

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Introduction: Intention to engage in physical activity (PA) is an important concept in behavior change theories. However, age, body mass index (BMI), and sleep may influence one’s intention to engage in PA and intention might not predict actual activity.

Purpose: This secondary analysis examined predictors of intention to engage in PA and if the factors associated with intention predicted objectively measured moderate-to-vigorous physical activity (MVPA) in adults who were overweight or obese and enrolled in a weight loss study.

Methods: We used 6- and 12-mo data from the EMPOWER Study, an observational study examining triggers of lapse following intentional weight loss. Objective measures included up to 7 days of overlapping accelerometer and actigraphy data to assess daily MVPA and sleep. Self-report data included responses to the question “Do you intend to be physically active today?” hereafter called intention, collected at the beginning of each day via ecological momentary assessment. Analyses were performed examining: 1) the effects of subject-level covariates (e.g., age, sex, race, BMI) on intention, 2) the effects of objectively measured sleep characteristics (e.g., total sleep time [TST], number of awakenings, sleep fragmentation) on intention, and 3) the relationships between sleep, intention, and MVPA. Logistic regression using generalized estimating equations and linear mixed-effect models were used.

Results: The analyses included 680 person-days at 6 mo and 678 person-days at 12 mo. Participants (N=136) were mostly female (89.8%) and white (81.8%) with a mean (± SD) age of 51.5 ± 9.9 years and BMI of 33.5 ± 4.6. At 6 mo, participants intended to engage in PA on 81.2% of days, had a mean TST of 408.9 ± 81.8 min/night, and a mean of 32.4 ± 14.7 awakenings/night. At 12 mo, PA intention decreased to 80.6% of days, TST increased to 416.5 ± 82.5 min/night, and awakenings increased to 34.0 ± 14.4 per night (p = .089 for TST; p = .043 for awakenings). Mean daily MVPA decreased from 19.0 ± 23.9 min at 6 mo to 17.3 ± 23.4 min at 12 mo (p = .185). Intention increased with increasing age (odds ratio [OR] = 1.04; 95% confidence interval [95% CI] = 1.02 - 1.07). At 6 mo, sleep fragmentation, after adjusting for age, negatively affected intention (OR = 0.96; 95% CI = 0.94 - 0.98); however, it did not significantly affect intention at 12 mo. When comparing days with no PA intention to days in which participants intended to engage in PA, mean MVPA nearly tripled from 7.4 min (95% CI = 3.6 - 11.2) to 21.2 min (95% CI = 18.4 - 24.0). Furthermore, when controlling for age, time of assessment, and intention, participants engaged in an estimated 0.135 (95% CI = 0.241 - 0.029) fewer min of MVPA for each awakening.

Conclusions: Based on these findings, future weight loss programs should include interventions that improve sleep quality by reducing fragmentation and strengthen the link between intention and engagement in PA.


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Workplace Facilities and Policies Associated With Bicycling to Work Among Adults

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Introduction. Bicycling to work is a mode of transportation that provides regular physical activity and has been associated with mental and physical well-being. Limited research has examined what facilities, such as bike racks, and policies within the workplace are associated with bicycling to work. Hypothesis. Access to workplace facilities and policies will be associated with higher odds of bicycling to
work. **Methods.** In 2016/17, a convenience sample of adult residents of Travis County (Austin), Texas, and Jefferson County (Birmingham), Alabama who had ridden a bicycle at least once in the past year responded to an Internet-based questionnaire assessing correlates of bicycling. Participants who self-reported that a purpose of their bicycle trips was commuting to/from work were categorized as a bicycle commuter. Workplace facilities/policies included (a) bicycle lockers, (b) locked rooms/cages, (c) clothes storage, (d) bike racks, (e) showers, and (f) policies that supported bicycling to work. A summary score ordinal variable, (g) total facilitators, was derived by adding the total number of reported policies/facilities per participant. Multivariable logistic regression models adjusting for age, race, education, income, number of motor vehicles, relationship status, children in household, and sex were used to estimate the association between individual workplace facilities and policies, as well as total facilitators, and bicycle commuting. Interactions were tested between sex and each of the workplace variables. Analyses was limited to participants who were employed. **Results.** The final analytic sample was 771; 45% were categorized as a bicycle commuter (n=344). Access to workplace facilities/policies ranged from 7% (bike lockers) to 50% (bike racks). Bike lockers (OR 5.6; 95% CI 4.5, 6.8), locked rooms/cages, (OR 2.2; 95% CI 1.4, 3.3), clothes storage (OR 2.0; 95% CI 1.5, 2.7), bike racks (OR 3.2; 95% CI 3.0, 3.3), and policies that supported bicycling to work (OR 3.3, 95% CI 2.5, 4.4) were associated with significantly higher odds of being a bicycle commuter. Only showers in the workplace showed a significant interaction by sex; showers were directly associated with being a bicycle commuter for males (OR 2.1; 95% CI 2.0, 2.1), but inversely associated with being a bicycle commuter for females (OR 0.9; 95% CI 0.8, 0.9). As compared to no facilitators, having 1 facilitator was associated with 2.1 times higher odds (95% CI 1.8, 2.6), 2 facilitators with 3.1 times higher odds (95% CI 2.1, 4.5), 3 facilitators with 4.4 times higher odds (95% CI 4.2, 4.8), and 4 or more facilitators with 7.9 times higher odds of being a bicycle commuter (95% CI 7.0, 9.0). **Conclusions.** The presence of workplace facilities/policies is associated with higher odds of bicycling to work. Workplaces should consider how the institutional environment can promote active transportation, and, in turn, employee health.


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**P280**

**Neighborhood Social Cohesion Does Not Moderate the Association of Neighborhood Walkability With Aerobic Physical Activity in Latino Adults: The National Health Interview Survey (NHIS) 2015**

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**Introduction:** Neighborhood walkability and neighborhood social cohesion have been shown to contribute to physical activity. However, limited research has examined neighborhood social cohesion as a moderator in the association between neighborhood walkability and aerobic physical activity among Latino adults. We examined associations of neighborhood walkability using measures assessing built environment and safety, with meeting the aerobic activity guideline among a large nationally representative diverse sample of Latino adults. **Methods:** We used cross-sectional data from 4,765 NHIS 2015 Latino participants 18 years of age and older. Neighborhood walkability was assessed based on self-reported measures of built environment (e.g., presence of sidewalks, presence of paths/trails) and neighborhood safety (e.g., presence of traffic, crime). A neighborhood
The walkability score was created by combining the built environment and neighborhood safety items, with a higher score indicating higher walkability. Aerobic activity was categorized as meeting versus not meeting the aerobic activity guideline, based on *2008 Physical Activity Guidelines for Americans*. Neighborhood social cohesion was measured based on self-reported items assessing perceived neighborhood social cohesion. Survey logistic regression was used to compute odds ratios [OR] and 95% confidence intervals [CI], with covariates adjusting for age, sex, education, acculturation, and neighborhood social cohesion. Effect modification by neighborhood social cohesion was tested by inclusion of a neighborhood walkability and neighborhood social cohesion interaction term. **Results:** On average the sample was 44 years old, 44% were male, 36% had less than a high school education, and 58% were foreign-born. After adjusting for age, sex, education, and acculturation, a one-unit higher neighborhood walkability score was associated with significantly higher odds of meeting the aerobic physical activity guideline (OR: 1.08; 95% CI: 1.05, 1.11), relative to not meeting the aerobic activity guideline. After adding neighborhood social cohesion to the adjusted model, the association between neighborhood walkability and meeting the aerobic activity guideline was slightly attenuated, but remained significant (OR: 1.07; 95% CI: 1.03, 1.11). Results from the effect modification test indicated that the neighborhood walkability and neighborhood social cohesion interaction term was not significant. **Conclusions:** These findings suggest that neighborhood walkability contributes to meeting the aerobic physical activity guideline among Latino adults. However, neighborhood social cohesion does not moderate the association between neighborhood walkability and meeting the aerobic activity guideline.

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**P281**

All-cause and Cardiovascular Mortality in Men With High Levels of Physical Activity and Coronary Artery Calcification

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**Introduction:** Recent studies have suggested that extreme levels of physical activity (endurance athletes) are associated with subclinical atherosclerosis as well as increased mortality. The safety of continuing high levels of physical activity is uncertain once coronary artery calcification (CAC) is discovered. **Hypothesis:** We hypothesized that men performing ≥3000 MET-minutes/week of physical activity would have greater all-cause and cardiovascular (CV) mortality compared to those with <1500 or 1500-<3000 MET-minutes/week of physical activity and that mortality risk would be greater in those with CAC≥100 compared to <100 Agatston units. **Methods:** The cohort studied included 16,109 men without prevalent CV disease who reported physical activity levels and underwent EBT or MDCT scan. Physical activity was categorized into ≥3000 (n=1,266), 1500-3000 (n=3,027), and <1500 (n=11,816) MET-minutes/week. CAC scanning included EBT scans (1997-2007) or MDCT scans (2007-2013), and CAC score was categorized into ≥100 (n=3,547) and <100 (n=12,562) Agatston units. We fit separate proportional hazards regression models to follow-up times for all-cause and CV mortality. The models included all combinations of CAC and physical activity categories and were adjusted for baseline age, smoking, BMI, cholesterol, HDLc, and systolic blood pressure.
Results: The average age of participants at baseline was 51.3±8.3 years. Men with the highest activity level had a lower BMI and higher HDLc. After an average follow-up of 8.9 years, there were 329 all-cause and 60 CV deaths, including 174 all-cause and 38 CV deaths in those with CAC≥100. The sample had 80% power to detect all-cause mortality hazard ratios ≥1.9 and 1.8 for physical activity ≥3000 versus <1500 in those with CAC<100 and ≥100, respectively. The corresponding minimum detectable CV mortality hazard ratios were 3.5 and 2.8. Comparing physical activity ≥3000 to <1500 in those with CAC≥100, the hazard ratios (95% CI) were 0.9 (0.5, 1.5) for all-cause mortality and 0.9 (0.3, 3.1) for CV mortality. Hazard ratios were similar when comparing physical activity ≥3000 to 1500-<3000 in those with CAC≥100. Finally, when comparing physical activity categories, there was no evidence that hazard ratios varied by CAC category, p>0.7.

Conclusions: This sample offers no evidence that levels of activity ≥3000 MET·minutes/week are associated with increased all-cause or CV mortality compared to those with <1500 or 1500-<3000 MET·minutes/week, regardless of CAC level.


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P282

Cross-sectional Relationship Between Physical Activity and Cardiovascular Risk Factors in Kidney Transplant Patients: A Baseline Examination of the Folic Acid for Vascular Outcome Reduction in Transplantation (FAVORIT) Trial

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Introduction: Data characterizing the potential relationship between physical activity and cardiovascular disease (CVD) risk factors in kidney transplant recipients (KTRs) are limited in the published literature. Accordingly, we sought to: (1) describe the levels of physical activity (PA) in KTRs; and (2) analyze the associations between PA levels and CVD risk factors in KTRs. We report the largest cross-sectional study of PA levels and CVD risk factors in KTRs to date.

Methods: Baseline data from the large multiethnic, multicenter trial (FAVORIT) were examined with n = 4034 participants (37% female; mean age 51.9 ± 9.4 years; 75% White; 97% with stage 2T-4T Chronic Kidney Disease; 20% with prevalent CVD). PA was categorized in tertiles (low, moderate, high) derived from a modified PA summary score from the Yale Physical Activity Survey (YPAS). CVD risk factors were examined across levels of PA by ANOVA, Kruskal-Wallis rank test and hierarchical multiple regression modeling.

Results: Collectively, participants were less active (mean YPAS 39.9 ± 20.6) compared to similar-aged rheumatoid arthritis (48 ± 21) and osteoarthritis (51 ± 20) samples from other studies. Participants in the “high” PA tertile reported more vigorous PA and walking, compared to participants in moderate and low tertiles (both p < .001). No differences were observed for daily household, occupational or sedentary activities (i.e., standing, sitting, moving about) across PA tertiles. More participants in the “low” PA tertile were overweight/obese and had a history of prevalent diabetes and/or CVD, compared with more active participants (all p < .001). Hierarchical multiple regression revealed that lower age (p = .002), having a cadaveric donor source (p = .006), shorter transplant vintage (p =
.025), lower pulse pressure (p < .001) and no history of diabetes (p < .001) were significantly associated with higher PA scores.

**Conclusion:** KTR participants appear to be less active than samples of other chronically ill participants. In our data, lower levels of PA were positively associated with the presence of most CVD risk factors in the KTR population. Furthermore, higher PA levels were associated with younger age and variables associated with more positive KTR outcomes. Future longitudinal analyses of this unique KTR cohort will examine whether higher PA levels are associated with reduced risk for the development of hard, centrally-adjudicated CVD outcomes.

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**P283**

**Resistance Exercise Reduces the Risk of Developing Excess Body Fat and Abdominal Obesity**

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**Introduction:** Excess body fat and abdominal obesity have been associated with cardiovascular diseases. While aerobic exercise is often recommended to prevent fat accumulation, less evidence exists detailing the specific effects of resistance exercise, independent of or combined with aerobic exercise, on the development of excess body fat and abdominal obesity. **Hypothesis:** We hypothesized that resistance exercise would be associated with a lower incidence of developing excess body fat and abdominal obesity.

**Methods:** Participants were 7,685 men and women aged 18 to 89 years (mean age, 46) who received a preventive medical examination during 1987-2005 in the Aerobics Center Longitudinal Study. Participants with a history of myocardial infarction, stroke, cancer, excess body fat, or abdominal obesity at baseline were excluded. Resistance exercise (RE) and meeting the 2008 US Physical Activity Guidelines (RE ≥2 days/week) for RE were determined by self-reported leisure-time exercise. Excess body fat was defined as % body fat (≥25 in men, ≥30 in women) based on underwater weighing or skinfold measurements and abdominal obesity as waist girth (>102 cm in men, >88 cm in women). Cox regression was used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) of incident excess body fat and abdominal obesity by RE levels after adjusting for baseline age, sex, examination year, body weight, current smoking, heavy alcohol drinking, and meeting aerobic exercise (AE) guidelines (≥500 MET-minutes per week).

**Results:** During an average follow-up of 5 years, 1517 (20%) developed excess body fat and 552 (14%) developed abdominal obesity. Individuals meeting the RE guidelines (30%; 2323 of 7685) had a 26% and 25% lower risk of developing excess body fat (HR: 0.74; 95% CI: 0.65 to 0.84) and abdominal obesity (HR: 0.75; 95% CI: 0.61 to 0.92), respectively, after adjusting for potential confounders including AE. The HRs (95% CIs) of incident abdominal obesity were 0.70 (0.48-1.01), 0.62 (0.44-0.87), 0.98 (0.67-1.42), and 0.62 (0.42-0.91), while the HRs (95% CIs) of incident excess body fat were 0.84 (0.69-1.03), 0.71 (0.59-0.86), 0.75 (0.59-0.96), and 0.56 (0.43-0.72), in weekly RE time of 1-59, 60-119, 120-179, and ≥180 minutes/week, respectively, compared with no RE. In the combined analysis of RE and AE, HRs (95% CIs) of incident excess body fat and abdominal obesity were 0.71 (0.53-0.95) and 0.62 (0.37-1.04) in meeting RE guidelines only, 0.86 (0.77-0.97) and 0.80 (0.66-0.97) in meeting AE guidelines only, and 0.65 (0.56-0.75) and 0.62 (0.49-0.79) in meeting both RE and AE guidelines, respectively, compared with meeting none of the guidelines. **Conclusions:** We found that RE, independent of and
combined with AE, is associated with a reduced risk of developing excess body fat and abdominal obesity.

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**P284**

**Cluster Analysis of Objectively Measured Physical Activity Patterns in Women in the mPEDTrial**


**Background**: Determining patterns of physical activity throughout the day could assist in developing more personalized interventions or physical activity guidelines in general, and in particular for women, who are less likely to be physically active than men.

**Objective**: The aims of this report are to identify clusters of women based on accelerometer measured raw metabolic equivalent values (METs) and a normalized version of the METs ≥ 3 data and to compare sociodemographic and cardio metabolic risks among these identified clusters.

**Methods**: 215 women wearing an accelerometer for at least 8 hours per day for the last 7 days prior to the randomization visit were analyzed. A K-means clustering method, the Lloyd’s algorithm, was used. To choose the number of clusters, we used the elbow method, looking at the percentage of variance explained as a function of the number of clusters.

**Results**: The results of k means cluster analyses of raw METs revealed three different clusters (Figure 1) and the Low Active Group (n=102) had the highest depressive symptoms score compared to the Afternoon Active (n=65) and Morning Active (n=48) groups (overall \( P < .001 \)). Based on a normalized version of the METs ≥ 3 data Figure 2), the moderate to vigorous physical activity (MVPA) Evening Peak group (n = 108) had higher BMI, and waist and hip circumference than the MVPA Noon Peak group (n=61) (overall \( P = .03, .02, \) and \( .03 \) respectively).

**Conclusions**: Categorizing physical inactive individuals into more specific activity patterns could aid in creating timing, frequency, duration, and intensity of physical activity interventions for women. Further research is needed to confirm these cluster groups using a large national dataset.

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**P285**

**Potential Direct Medical Cost-Savings Attributable to Physical Activity in Major Disease Categories**
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Introduction: Physical activity (PA) is known to be effective in treating and preventing many lifestyle diseases including CVD, stroke, depression, type II diabetes, Alzheimer’s disease, as well as breast and colon cancer. To date the direct medical cost-savings of PA as a medical intervention are poorly understood.

Hypothesis: We hypothesized that a 10% increase in the proportion of US citizens who meet the minimum weekly exercise requirements of 150 minutes per week would lead to savings in direct medical costs (DMC) and cases prevented, as related to the above diseases. Methods: Population Attributable Risk (PAR) was calculated as PAR= (1+Prf x (RR-1))/(Prf x(RR-1)), where Prf is the percentage of the U.S. population not meeting minimum exercise requirements and RR is the relative risk of disease for sedentary versus physically active individuals. Prf and RR data were retrieved from the most recent and comprehensive meta-analyses and systematic reviews. PAR was calculated for each disease under two conditions; first, Prf was equal to the current percent (9.6%) of the population estimated to achieve the minimum weekly PA requirements. Second, Prf was equal to the initial Prf plus 10 percent (19.6%). For each condition the following were calculated: Attributable DMC=(PAR x DMC), preventable cases=(PAR x Prevalence) and Savings=(Condition 2-Condition 1).

Results: The Prevalence, RR, PAR and DMC are provided in Table 1. This table also describes the potential savings in DMC and new cases by improving the Prf by 10%. A 10% increase in US citizens who meet the minimum weekly exercise requirements could lead to a total savings of 10.78 billion USD in DMC and 2.1 million cases prevented related to the studied diseases. Conclusion: A healthcare system directed PA intervention that effectively leads to a 10% increase in US citizens that meet minimum weekly exercise requirements and costs less than 10.78 billion dollars has the potential to be cost-effective, and prevent and treat, millions of cases in the United States.

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Walking as a Source of Physical Activity for Cardiovascular Disease Prevention

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Introduction: Increasing physical activity among adults at risk for or with cardiovascular disease (CVD) can help prevent and manage disease. Walking may present an opportunity for promoting physical activity among this high risk group. We hypothesized that in US adults the prevalence of self-reported walking would decrease with increasing CVD risk. Methods: Nationally representative data from the 2015 National Health Interview Survey Cancer Control Supplement (N=28,780) were analyzed. Analyses were repeated after excluding those needing assistance with walking (n=2,192). Walking was defined as engaging in at least one 10-minute bout of transportation or leisure walking in the past seven days. Prevalence estimates of walking (any, transportation, and leisure) are reported overall and by presence of risk factors (overweight or obesity and ≥1 of diabetes, high cholesterol, or hypertension) or CVD (myocardial infarction or stroke). Orthogonal polynomial contrasts were used to identify significant trends. Results: Overall,
64.9% (standard error, SE=0.5) of adults reported any walking (TABLE). This prevalence was highest among those with no CVD or risk factors (67.1%, SE=0.5), decreased with increasing number of risk factors (1 risk factor: 64.0%, SE=1.0; 2 risk factors: 60.3%, SE=1.3; 3 risk factors: 54.8%, SE=2.0), and the lowest was among those with CVD (51.9%, SE=1.7). Similar trends were observed for leisure and transportation walking. To ensure differences in prevalence of walking by risk factor or disease status was not due to functional limitations, repeated analyses that excluded those needing assistance with walking observed similar patterns. **Conclusions:** Prevalence of any and leisure walking decreased as the presence of CVD risk factors increased and was lowest among those with disease. Promoting walking, especially among adults at higher risk, may present an important opportunity for encouraging an active lifestyle for CVD prevention and management.

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**Funding Component:**

P287

**Cardiorespiratory Fitness is Associated With Ambulatory Blood Pressure in Adolescents**

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**Introduction:** Low cardiorespiratory fitness (fitness) and high levels of adiposity are independently associated with higher levels of blood pressure in adolescents. However, it remains uncertain whether the associations between fitness and blood pressure are due to fitness itself or results from lower levels of adiposity. Moreover, there are no studies that have determined the extent to which adiposity, including central adiposity, moderates the association between fitness and 24-hour ambulatory blood pressure (ABP).

**Hypotheses:** 1. Higher levels of fitness will be associated with lower levels of ambulatory systolic (SBP) and diastolic (DBP) blood pressure after adjusting for adiposity and covariates. 2. With adjustments for covariates, adiposity (body mass index [BMI], waist circumference [WC]) will modify the association between fitness and 24-hour SBP and DBP.

**Methods:** A cross-sectional study was conducted in Houston, TX with a sample of 370 adolescents aged 11-16 years. Demographically, the sample was 54% female, 37% African American, 31% Hispanic, 29% non-Hispanic white, and 3% other ethnic/racial groups. Fitness was assessed by a height-adjusted step test and estimated by heart rate recovery, defined as the difference between peak heart rate during exercise and heart rate two minutes post-exercise. Adiposity was measured using dichotomized values for percentiles of BMI (≥ 85th) and WC (≥ 50th). Ambulatory SBP and DBP (Spacelabs model 90207) were measured every 30-60 minutes over 24 hours on a school day. Mixed-effects regression analysis was used to test the hypotheses with the following covariates: activity, location, and position at the time of each ABP measurement, height, age, sex, ethnicity, sexual maturation level, and mother’s education level.

**Results:** Hypothesis 1: Each unit increase in fitness was associated with a decrease of SBP (-0.058 mmHg, \( p = 0.001 \)) and DBP (-0.043 mmHg, \( p < 0.0001 \)) after adjustment for WC and
covariates. Each unit increase in fitness was associated with a decrease in SBP (-0.058 mmHg, $p = 0.001$) and DBP (-0.045 mmHg, $p < 0.0001$) after adjustment for BMI and covariates. Hypothesis 2: Fitness and BMI $\geq 85$th percentile (or WC $\geq 50$th percentile) interactions were not significantly associated with ambulatory SBP or DBP after adjustment for covariates.

**Conclusions:** Our findings indicate a small but statistically significant inverse effect of fitness on 24-hour ABP in adolescents, and no evidence of a modifying effect of adiposity on this association. Further research is needed to better understand the protective role of fitness on cardiovascular health in adolescents.

Disclosures:  

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P288

**The Association Between Moderate to Vigorous Physical Activity and Health-Related Quality of Life Among Hispanic/Latino Adults in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)**

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**Background:** Self-reported moderate to vigorous physical activity (MVPA) has been associated with better health-related quality of life (HRQoL), however research on quantitative MVPA in relation to HRQoL has been limited. In addition, the association of PA with physical and mental health components of HRQoL has not been examined.

**Hypothesis:** Higher accelerometer-measured MVPA will be associated with better mental and physical HRQoL.

**Methods:** Cross-sectional data from 12,179 adults ages 18-74 in 2008-11, who participated in HCHS/SOL and had complete data on key study variables. MVPA (minutes/week), measured by accelerometer, was grouped into 4 levels: inactive, low, moderate, and high. HRQoL was assessed using the Short-Form 12 (SF-12) questionnaire; the SF-12 mental and physical component summary (MCS; PCS) scores were computed (standardized to general US population norms with mean of 50 and standard deviation of 10; higher scores indicate better HRQoL). Multivariable linear regression models were used to derive adjusted means with 95% confidence intervals (CI) and to assess linear trends. All models were adjusted for covariates. The analyses were weighted for the study design and non-response.

**Results:** PCS adjusted mean scores ranged from 46.8 (CI: 44.9, 48.6) among inactive persons to 51.3 (CI: 50.8, 51.8) among those with high levels of MVPA ($p_{trend} < 0.001$). No significant differences in MCS scores were observed across MVPA levels ($p = 0.64$).

**Conclusion:** MVPA was positively associated with better self-perceived physical health-related quality of life. Our findings align with studies examining self-reported MVPA and HRQoL. Future prospective studies should evaluate whether increasing MVPA can lead to improvements in HRQoL among the US Hispanic/Latino population.

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P289

Social Determinants of Long Term Maintenance of Physical Activity: The Jackson Heart Study

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Background: Data showing long term efficacy and sustained active lifestyle change are scant. Identifying social determinants for maintaining an active lifestyle overtime may help pinpoint barriers/facilitators for sustaining an active lifestyle change. Methods: We evaluated the associations between social determinants of health (SDH) and changes in physical activity (PA). The analysis dataset included 3,741 participants in the Jackson Heart Study (JHS) who completed the PA questionnaire at exams 1 and 3, approximately 8 years apart. Participants were classified into 3 PA groups: poor (0 minutes/week moderate/vigorous activity), intermediate (some moderate/vigorous activity), or ideal (≥75 minutes/week vigorous or ≥150 minutes/week moderate or ≥150 minutes/week combined moderate/vigorous activity). SDH evaluated were individual level socioeconomic status (SES), social support, perceived stress and neighborhood characteristics. Other covariates included age, sex and body mass index (BMI). Unadjusted analyses followed by multivariable logistic regression analyses with backward selection were performed to explore the most significant SDH associated with changes in PA.

Results: Twenty-eight percent (28%) participants had poor PA at both exams; 35.5% had at least intermediate PA at both exams; 19.2% changed from poor to intermediate/ideal PA and 17.8% changed from intermediate/ideal to poor PA overtime. In unadjusted analyses, among participants with intermediate/ideal PA at exam 1, younger age, higher levels of SES and greater social support; as well as higher neighborhood SES, greater social cohesion, fewer neighborhood problems and violence were positively associated with maintaining intermediate/ideal PA at exam 3. Among those with poor PA at exam 1, the same factors other than social cohesion were associated with improved PA to moderate/ideal level at exam 3. Sex, perceived stress, number of PA facilities in the neighborhood or being overweight/obese at either exam was not associated with changes in physical activity levels. Exploratory multivariable logistic regression with backward selection suggested that all three individual SES indicators were important factors for maintaining moderate/ideal PA levels at exam 3; and younger age, higher education, and higher neighborhood SES were important factors for improving PA levels from poor to intermediate/ideal. Conclusions: Individual SES indicators were significantly associated with maintaining an intermediate/ideal PA overtime; whereas younger age, higher educational attainment and higher neighborhood SES were significantly associated with changes in PA from poor to intermediate/ideal. Targeting individual education and environmental factors (e.g., neighborhood problems, violence) associated with neighborhood SES may provide most benefit both in initiating and maintaining an active lifestyle.
Introduction: Self-reported maternal exercise is associated with improved heart and body size measures in the fetus. Currently, there is a gap in understanding how regular maternal aerobic exercise at recommended levels (150 min/wk) for pregnancy influence heart and body size in utero. Hypothesis: We assessed the hypothesis that offspring of women randomized to aerobic exercise will have lower heart rate (HR), higher ejection fractions (EF), and lighter fetal weight than offspring of women in the control group. Methods: Healthy pregnant women were randomly assigned to aerobic exercise or no intervention. Women performed aerobic activity at a moderate intensity for 150 min/wk from 16 weeks until delivery. Maternal demographics (age, pre-pregnancy BMI) as well as other activities were self-reported. Based on type and intensity, activities were converted to METs and then combined to yield METmin per week (METs X frequency per week X duration in minutes). A sonographer blinded to group assignment recorded fetal ultrasound. Data from 27 pregnancies (16 exercise, 11 control) were analyzed. To compare differences between groups (Active only=A; Quiet only=Q) independent t-tests were performed while regression analysis was conducted to determine predictors of fetal HR, our primary outcome. Results: Of the 16 exercisers, 6 were excluded (compliance 51-74%); the remaining 10 had >80% compliance. There were no group differences in maternal demographics, i.e., age and pre-pregnancy BMI. All values were in the normal range for fetal heart and body size measures. While not statistically significant, there was trend for fetal HR to be lower in exercisers (p=0.14) while aortic (p=0.05) and pulmonary (p=0.22) diameter, right ventricular (RV) EF (p=0.17), and left ventricular (LV) EF (p=0.18) were slightly higher compared to controls. In the A state, the female HR of exercisers were lower (p=0.05), while male left ventricular (LV) EF (p=0.006), and all fetuses right ventricular (RV) EF (p=0.07) were increased relative to same gender controls. In the Q state, female aortic diameter (p=0.11) and all fetuses’ pulmonary diameter (p=0.04) were increased in exercisers relative to same gender controls. Exercise level during pregnancy was a significant predictor of fetal HR (R²=0.10; p=0.01). Fetal head to abdominal circumference ratio was appropriate in exercisers (1.0±0.1) relative to control (0.985±0.1) fetuses (p=0.09). The fetuses of exercisers were slightly lighter relative to fetuses of controls (p=0.20). Conclusion: These preliminary data support the positive influence of aerobic exercise at recommended levels on fetal health outcomes during pregnancy.
**Introduction:** Preeclampsia is a multisystem hypertensive disorder that affects 4 to 16% of all pregnancies worldwide. Because of its impact on maternal mortality and morbidity, it is considered a major public health problem. However, its role as a risk factor for future cardiovascular events, especially subclinical cardiovascular disease, remains unknown.

**Hypothesis:** Women with history of preeclampsia have an increased risk of subclinical cardiovascular disease (sCVD) compared with women with normal pregnancies. **Methods:** We conducted a cross-sectional analysis of a sample of 1999 women without cardiovascular disease from the Mexican Teacher's Cohort to assess the relationship between history of preeclampsia and carotid intima media thickness (IMT). Information about preeclampsia diagnosis was collected using self-report data from a questionnaire answered by the participants in 2008-2010 which included questions about reproductive history. Carotid IMT was measured on both carotid arteries through ultrasound by standardized neurologists and log transformed. We defined sCVD as mean right and left IMT >0.8mm or the presence of a plaque. Multivariable linear and logistic regressions were performed to estimate the association between women with history of preeclampsia and IMT or sCVD respectively adjusting for age, sociodemographic factors, BMI at age 18, and age at first pregnancy.

**Results:** Women with a history of preeclampsia (187 of 1999) had slightly higher IMT values (0.69 [IQR 0.12]) than women without (0.67 [IQR 0.12]); they also showed higher prevalence of diabetes (34.7% [65 of 187] vs. 16.8% [306 of 1811]), hypertension (33.1% [62 of 187] vs. 21.9% [398 of 1811]), overweight (44.3% [83 of 187] vs. 41.6% [754 of 1811]), and obesity (43.3% [81 of 187] vs. 35.1% [636 of 1811]). The adjusted IMT was 2.36% (95% CI 0.48, 4.27) higher in women with history of preeclampsia compared with those without. There seems to be an association between preeclampsia and sCVD in the adjusted logistic regression model (odds ratio 1.53 95% CI, 0.97, 2.41), however the association lacked statistical significance.

**Conclusion:** We found an association between history of preeclampsia and increased carotid IMT values. This results support the need of considering the history of preeclampsia in the risk assessment of cardiovascular disease among women later in life to initiate preventive strategies.

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**Cardiovascular Risk Factors in U.S. Men With and Without History of Prostate Cancer: NHANES 1999-2014**

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In 2017 161,000 new cases of prostate cancer diagnosed in the U.S. With improved survival from prostate cancer, cardiovascular disease has emerged as competing cause of morbidity and mortality. However, few studies have assessed CVD risk factors among prostate
cancer survivors. We analyzed National Health and Nutrition Examination Survey (NHANES) from 1999-2014 to assess CVD risk factors, as defined by AHA/ACC, in adult men with and without a history of prostate cancer. A total of 602 men, age 50 years and older, with prostate cancer history and 8,226 men without cancer history were included in the analysis. Among men with prostate cancer history, the mean (SE) age at survey was 72.3(0.4); 41% of the survivors had their diagnoses less than 5 years ago, while 31% survived more than 10 years after diagnosis. Compared to men without cancer, prostate cancer survivors were older (mean age 72 (0.4) vs 62y (0.1)), but with similar education level (p=0.41). For CVD risk factors, prostate cancer survivors were less likely to be current smokers (6.5% vs 20.3%), but more likely to have hypertension and on antihypertensive medication (95.6% vs 88.9%) with age-adjusted prevalence odds ratio of 1.53 ([95% CI, 1.2 - 1.9]; p=0.001) and 1.78 ([95% CI, 1.1 - 2.9]; p=0.024), respectively. There were no differences in lipids profiles between men with and without prostate cancer. In stratified analysis, non-Hispanic blacks’ survivors have almost two times the prevalence of hypertension compared to non-Hispanic blacks free of cancer, with age-adjusted prevalence odds ratio of 1.9 ([95% CI, 1.2 - 2.96]; p=0.005).

In conclusion, CVD risk factors were prevalent in prostate cancer survivors. Improving cardiovascular health through lifestyle change and preventive strategies is a public health priority, particularly among non-Hispanic Blacks.

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P293

The Association of Healthy Lifestyles and Markers of Inflammation: Results From the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)

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Background. Healthy lifestyle factors (HLFs; i.e., healthy diet, ideal weight, ideal physical activity, non-smoking, moderate alcohol intake) are associated with lower risk of cardiovascular disease (CVD), while inflammatory markers such as C-reactive protein (CRP) and white blood cell (WBC) count are associated with higher risk. The association of healthy lifestyles (i.e., HLF combinations) with inflammatory markers is not well established, and has not been examined in US Hispanics/Latinos. We examined cross-sectional associations of HLFs with elevated CRP levels and WBC count in Hispanic/Latino adults.

Methods. Data from 12,966 men and women ages 18-74 from the baseline HCHS/SOL were analyzed. HLFs examined were: healthy diet (highest sex-specific 40% of Alternate Healthy Eating Index 2010), ideal physical activity (moderate/ vigorous activity ≥150 min/week or vigorous activity ≥75 min/week), no current smoking, moderate alcohol intake (men ≤28g/day; women ≤14g/day) and body mass index (BMI) <25 kg/m². Logistic regression was used to examine associations with CRP levels >3mg/l or WBC count in the highest quintile
(≥8×10^9 cells/L), adjusting for demographic and socioeconomic factors, CVD risk factors, and relevant clinical factors, and accounting for the complex survey design.

**Results.** In multivariable-adjusted analyses, higher number of HLFs (vs. 0-1 HLF) were associated with progressively lower odds of CRP >3mg/l and WBC count in the 5th quintile (p-trend <0.001 for both) (Table). In analyses on individual HLFs, BMI <25 kg/m^2 and non-smoking were associated with lower odds of CRP>3mg/l (0.33, [0.28,0.40] and 0.83 [0.71,0.96]) and WBC in the highest quintile (0.74 [0.62-0.89] and 0.37 [0.32-0.44]); moderate alcohol intake and healthy diet were associated with lower odds of WBC in the highest quintile (0.63 [0.48, 0.83] and 0.76 [0.64, 0.89]) (results not tabulated). **Conclusion.** Higher number of HLFs, particularly ideal weight and non-smoking are associated with lower levels of CRP and WBC count.


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P294

**Greater Peripheral Vasoconstriction During Mental Stress Predicts Adverse Cardiovascular Outcomes**

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**Introduction:** Peripheral arterial vasoconstriction during mental stress (MS) has been associated with mental stress-induced myocardial ischemia, which in turn has been linked with worse cardiovascular outcomes. It is unknown whether the magnitude of peripheral vasoconstriction with MS is predictive of long term outcomes.

**Hypothesis:** We hypothesized that greater peripheral arterial vasoconstriction during MS would be associated with adverse events among patients with coronary artery disease (CAD).

**Methods:**
Four hundred sixty-three patients with stable CAD and normal left ventricular function, (age 63±9, 75% male, 27% Black, EF 60±8 %) underwent MS testing with a standardized public speaking stressor. Digital pulse wave amplitude was continuously measured at baseline and during MS using peripheral arterial tonometry (PAT), and the PAT ratio of pulse wave amplitude (during mental stress/ baseline) was calculated. Cox proportional hazard models were calculated to examine the association between the PAT ratio and outcomes.

**Results:**
Median PAT ratio during MS was 0.68, indicating 32% average constriction with MS compared to rest. Subjects with greater peripheral constriction [low (<median) PAT ratio] were more likely to be male (80% vs. 70%, P=0.008) compared to those with PAT ratio ≥median, but their risk factor profiles were similar. During 2.8±0.5 year follow-up, 64 patients had adverse cardiac events including 7 cardiovascular deaths, 19 MI, and 54 revascularization events. After adjusting for age, sex, race, hypertension, diabetes, current smoking status, and prior MI, those with low PAT ratio had a greater risk of CV death/MI (HR[hazard ratio] 2.49, 95% CI [1.04-5.99]) and
CV death/MI/revascularization (HR 1.77, 95% CI [1.03-3.04]) compared to those with high PAT ratio.

**Conclusion:**
Greater peripheral arterial vasoconstriction with MS is associated with a higher risk of adverse cardiovascular outcomes in patients with CAD.


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P295

**Association Between Remained Number of Teeth and Cardiovascular Disease Among Korean Adults**

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**Background:** It has been reported that people with teeth loss have an increased risk of cardiovascular disease. However, there is limited evidence for the specific relationship between remained teeth and cardiovascular disease (CVD).

**Method:** Among subjects who participated in Korea National Health and Nutrition Examination Survey conducted in 2008-2013, a total of 12,612 adults with mean age of 60.2±1.2 years old were analyzed. Number of teeth was classified as number less than 20, from 20 to 27 and more than 27. Multiple logistic regression analysis was performed to determine the relationship between cardiovascular disease and remained teeth number after adjusting for potential confounders.

**Result:** The prevalence of cardiovascular disease was 6.5%, 3.3% and 1.4% respectively in groups having number less than 20, 20 to 27 and more than 27 ($P<0.001$). Total number of cardiovascular disease was 666. Diabetes, hypertension, total cholesterol level, waist circumference, metabolic syndrome had large proportion in a group having less than 20 teeth ($P<0.001$). People having less than 20 remained teeth had statistically significant cardiovascular disease after adjusting for age, sex, body mass index, smoking, drinking alcohol, exercise, education, income status, stress, diabetes, and hypertension. A group having less 20 teeth was likely to have statistically significant relationship with cardiovascular disease. (Odds ratio [OR]: 1.41, 95 % confidence interval [CI]: 1.06-1.89) and stroke (OR:1.90, CI:1.03-3.48).

**Conclusion:** Our findings suggest that the number of remained teeth could be a useful additional indicator for assessing cardiovascular disease and stroke

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P296

**Poor Functional Capacity is Associated With Peripheral Microvascular Dysfunction in Coronary Artery Disease**

Jeong Hwan Kim, Ahmed Al-Badri, Muhammad Hammadah, Ibhar Al Mheid, Kobina Wilmot,
Ronnie Ramadan, Bruno Lima, Ayman Alkhoder, Naser Abdelhadi, Malik Obideen, Irina Uphoff, Mohamad Mazen Ghafeer, Belal Kaseer, Fahad Choudary, Amit Shah, Emory Univ, Atlanta, GA; Paolo Raggi, Univ of Alberta, Edmonton, AB, Canada; Viola Vaccarino, Arshed Quyyumi, Emory Univ, Atlanta, GA

Introduction:
Reduced functional capacity, assessed by self-reported Duke Activity Status Index (DASI) is associated with adverse outcomes. Peripheral microvascular dysfunction, measured as reduced digital reactive hyperemia index (RHI) is also associated with adverse events. Whether microvascular dysfunction is related to functional capacity is unknown.

Hypothesis:
We hypothesized that peripheral microvascular dysfunction is associated with diminished functional capacity.

Methods:
In 531 patients with stable CAD (age 62±9, 75% male, 30% Black, EF 55±13%) enrolled in the Mental Ischemia Prognosis Study, self-reported functional capacity was assessed with the DASI questionnaire with a score of >25 as the cutoff for normal. Pulsatile arterial tonometry (EndoPat, Itamar Inc.) was used to measure digital RHI during 5 minutes of upper arm occlusion with blood pressure cuff followed by reperfusion. Logistic regression was used to model reduced RHI (<median) as a function of normal vs low DASI score (>25 vs ≤ 25).

Results:
Median RHI was 2.01 [IQR 1.67, 2.49] while median DASI score was 45 [29,53], equivalent to 8.3 METs. Compared to those with normal DASI score (>25; N=425), subjects with low DASI score (≤25; N=106) had lower RHI (1.88 [1.64, 2.24] vs 2.06 [1.69, 2.54], P=0.048), higher BMI (32±7 kg/m² vs 29±5 kg/m², P<0.001), were more likely to be female (48% vs 20%, P<0.001) and Black (42% vs 28%, P=0.005), and more likely to have a history of hypertension (87% vs 75%, P=0.009), diabetes (39% vs 29%, P=0.046), and heart failure (34% vs. 20%, P=0.003). After adjusting for the aforementioned variables in addition to history of dyslipidemia, smoking and prior MI, those with a low DASI score had a significantly higher likelihood of a reduced RHI (<median) (OR 1.72, 95% CI 1.08 - 2.74, P=0.023)

Conclusion:
Poor functional capacity is independently associated with microvascular dysfunction in patients with stable CAD, and illustrates a potential mechanism by which reduced functional capacity increases cardiovascular risk. Whether improvement in functional capacity by exercise/rehabilitation programs improves microvascular function requires further investigation.


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P297

Long-Term Benefit Comparison of Absolute Risk Reduction versus Absolute Risk to Prioritize Statin Therapy

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Introduction: Individuals with no established cardiovascular disease (CVD) are currently recommended preventive statin therapy based on 10-year absolute risk (AR) of CVD, and
individuals with a 10-year AR ≥7.5% are recommended statins. However, individuals with elevated LDL cholesterol experience greater absolute CVD absolute risk reduction (ARR) from statin therapy compared with those with the same 10-year AR but with lower LDL. A previous study showed that ARR-based statin treatment would prevent more CVD events than AR-based treatment in the 10 years following treatment initiation.

**Objective:** This study aimed to quantify the long-term benefits of treating patients based on ARR rather than AR.

**Methods:** A microsimulation version of the CVD Policy Model, a decision-analytic state transition model, simulated intermediate-strength statin therapy in 40,000 CVD-free US adults (50% female) under a variety of treatment strategies. The model predicts health outcomes for individuals based on their age, sex, and risk factor profile, accounting for the competing risk of non-CVD mortality. Individuals entered the model aged 40 years, and a time horizon of 40 years was employed. Life year gains and CVD events prevented compared to no treatment were estimated for a range of 10-year ARR and AR treatment initiation thresholds.

**Results:** At the same numbers of patient-years of treatment (PYoT), ARR consistently produced more life year gains than AR (Figure). A 10-year ARR threshold of ≥2.62% would lead to approximately the same PYoT as standard of care (10-year AR ≥7.5%) while preventing 60 additional CVD events and producing 421 additional life year gains in the cohort.

**Conclusion:** Treating patients with statins based on ARR would yield significant health gains in the U.S. population compared to standard AR-based treatment strategies. The ARR strategy may also achieve greater adherence and uptake as it focuses on individuals with elevated levels of a modifiable risk factor.


Funding: No

Funding Component:

P298

**Light-to-Moderate Alcohol Consumption and Risk of Abdominal Aortic Aneurysm in the Physicians’ Health Study**

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**Background:** Abdominal aortic aneurysm (AAA) is an increasingly recognized cause of morbidity and mortality in the aging US population. While moderate alcohol consumption has been shown to be associated with a lower risk of atherosclerotic macrovascular disease, its relationship with AAA remains inconsistent in previous studies. We therefore sought to elucidate the relationship between alcohol consumption and risk of AAA in a prospective cohort of middle-aged and older men.

**Methods:** Our study included 21,842 male physicians (mean age: 53.7 years) in the Physicians’ Health Study I who reported no history of AAA at baseline. Self-reported information on alcohol consumption and known AAA risk factors including body mass index (BMI), smoking and exercise was obtained on baseline questionnaires. Incidence of clinically diagnosed AAA was assessed via self-reported
information on annual questionnaires and validated successfully in a subsample. Cox regression models were used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) of AAA in each category of alcohol intake. Cubic spline regression was used to assess non-linear trend.

**Results:** During an average follow-up of 23.0 years, 655 cases of newly diagnosed AAA were reported. Compared with men reporting less than one alcoholic drink (combined beer, wine, and liquor) per month, the HR [95% CI] of incident AAA after adjustment for age, BMI, smoking, and exercise was 0.69 [0.50 - 0.95] with one to three drinks per month, 0.80 [0.60 - 1.08] with one drink per week, 0.75 [0.58 - 0.97] with two to four drinks per week, 0.67 [0.49 - 0.90] with five to six drinks per week, 0.77 [0.61 - 0.99] with one drink per day, and 0.73 [0.47 - 1.13] with two or more drinks per day (P, non-linear trend=0.17).

**Conclusions:** In this large cohort of middle-aged and older male physicians, light-to-moderate alcohol consumption was associated with a lower risk of clinically diagnosed AAA.


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Funding Component:

**P300**

**Presence of Mental Health Conditions Associated With Greater Adherence to Home-Based Cardiac Rehabilitation**

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**Introduction:** Patients with mental health conditions have higher rates of ischemic heart disease but have been less likely than those without mental health conditions to participate in traditional (center-based) cardiac rehabilitation programs. We sought to examine the association of mental health conditions with rates of participation in (and completion of) home-based cardiac rehabilitation (HBCR).

**Methods:** The Veterans Health Administration is developing new HBCR programs to improve access for patients with cardiovascular disease who are unable to attend traditional (center-based) programs. Among 323 hospitalized patients who were eligible and referred to cardiac rehabilitation at the San Francisco VA between 8/1/15 and 9/30/16, we evaluated the association of depression and/or PTSD (defined based on manual review of medical records) with participation in and completion of HBCR. Logistic regression models were used to adjust for patient demographics, primary indication for CR and comorbid conditions.

**Results:** Of the 323 eligible patients referred to HBCR, 127 (39%) suffered from depression and/or PTSD. Participation rates were 41% (52/127) in patients with vs. 32% (62/196) in patients without depression or PTSD (p=0.09). Among the 114 patients who agreed to participate in HBCR, 52 (46%) suffered from depression and/or PTSD. Rates of completing 9 or more sessions were 67% (35/52) in patients with vs. 44% (27/62) in patients without depression or PTSD (p=0.01). After multivariable adjustment, patients with depression and/or PTSD had a 3-fold greater odds of completing HBCR than those without depression or PTSD (OR 2.85, 95% CI 1.14- 7.17; p=0.02).

**Conclusions:** Among patients referred to cardiac rehabilitation, those with a history of depression and/or PTSD were equally likely to participate and significantly more likely to complete HBCR than those without depression and/or PTSD. These findings suggest that patients with mental health conditions may be especially likely to benefit from HBCR.

Background Cardiorespiratory fitness is a distinct health characteristic that relates to the ability to perform physical activity. Higher cardiorespiratory fitness was reported to have reverse relationship with overall mortality and morbidity rates due to various chronic disease. The assessment of cardiorespiratory fitness was measured by maximal oxygen uptake (VO2\text{max}; mL/kg/minute) on a submaximal treadmill test. This study was aimed to examine cardiorespiratory fitness among U.S. adults 20-49 years of age, to describe the distribution of cardiorespiratory fitness and cardiovascular risk factors depends on different ethnicity for without physical limitations or indications of cardiovascular disease.

Method Data from the 1999-2004, National Health and Nutrition Examination Survey were used to describe the distribution of cardiorespiratory fitness for adults 20-49 years of age. 8324 out of 31126 subjects have valid values of cardiopulmonary fitness in the dataset with 5391 in low category of cardiorespiratory fitness (VO2\text{max} < 27), 2606 in medium category (37.1 > VO2\text{max} ≥27) and 327 in high category (37.1 ≥ VO2\text{max}). The risk factors for cardiopulmonary fitness was assessed by using logistic regression after adjusting all cardiovascular risk factors. All data were analyzed using SAS Ver. 9.4.

Result

Overall, there is no significant association of cardiorespiratory fitness with ethnicity (P=0.08). 65.9% of study population was male in all races. Among, non-Hispanic whites, those with 25 m²/kg > BMI had better cardiorespiratory fitness (more than 37.1 mL/kg/minute) than those with BMI ≥ 35 [Odds ratio (OR): 0.496, Confidence Interval (CI): 0.258-0.957]. A similar pattern was observed for Mexican Americans. Non-Hispanic black with 25 m²/kg > BMI had better cardiorespiratory fitness than ones with BMI ≥ 35 m²/kg [OR:0.137, CI:0.059-0.318], 35 m²/kg > BMI≥30 m²/kg [OR:0.269, CI:0.124-0.583], 30 m²/kg > BMI≥25 m²/kg [OR:0.241,0.123-0.318]. Non-Hispanic white with higher diastolic blood pressure over 90 mmHg had tendency to have lower cardiorespiratory fitness. Among metabolic panel, only Mexican American with LDL<100 mg/dl has higher cardiorespiratory fitness [OR:0.559, CI:0.319-0.981].

Discussion Our findings on cardiorespiratory fitness level among non-Hispanic blacks, non-Hispanic whites and Mexican Americans are similar to previously reported studies, however, non-Hispanic black had different risk factors related to cardiorespiratory fitness, especially significant benefit from lower BMI less than 25 m²/kg since other ethnicities with BMI less than 25 m²/kg had benefit only compared to BMI> 35 m²/kg. These results can be used to improve cardiorespiratory fitness level for future population based on ethnicities. The different risk factors in fitness status can also be used to develop health policies and targeted educational campaigns.

Disclosures: H.S. Lee: None. Z. Zhang: None. K. Xu: None. Y. Park: None.
Introduction: Elevated Fibroblast Growth Factor 23 (FGF23) - an endocrine hormone linked to cardiovascular and kidney disease outcomes - is a compensatory response to high dietary phosphate load or chronic kidney disease. Large quantities of inorganic phosphates additives are found in processed foods, and food insecurity is associated with higher consumption of processed foods. Hypothesis: We hypothesized that developing food insecurity is associated with an increase in FGF23. Methods: We included CARDIA study participants with a stored plasma sample available from at least two consecutive exams at years 20, 25, and 30 (N=3,421). Food insecurity was assessed through a single question about ability to afford quantity and quality of food. FGF23 levels were assessed using a commercial c-terminal ELISA. Due to a strong right skew in FGF23 levels, we divided FGF23 in quartiles and compared the highest quartile to the combined lower three quartiles using logistic regression. Econometric fixed effects models that adjust by design for all time-invariant covariates were used to model the longitudinal association between simultaneous within-person change in food insecurity and FGF23. Due to an interaction between food insecurity and race (p=0.002), we stratified by race. Results: About 29% of blacks and 14% of whites experienced change in food insecurity during follow-up. Developing food insecurity was associated with a 1.46 greater odds of increasing to the highest quartile of FGF23 (95% CI: 1.02,2.10) among blacks; however, there was no significant longitudinal association among whites (OR=1.05; 95% CI: 0.62,1.77). Conclusions: Using models that tightly control for all time-invariant confounding, we found that developing food insecurity was associated with increases in FGF23 among blacks. The differential increases in blacks as compared to whites may be due to differences in dietary changes in response to developing food insecurity. Previous research has shown racial differences in dietary quality by food insecurity.


Funding: Yes

Funding Component: National Center

P304

High Cardiovascular Health Metrics Score Predicts Slower Cognitive Performance Decline in Coronary Patients

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Introduction: In 2010, the American Heart Association introduced a metric defining the concept of ideal cardiovascular health (CVH) metrics as part of its 2020 Impact Goals definition designed for the health general population. Several studies have demonstrated that a higher number of ideal CVH metrics were associated with a lower rate of cardiovascular events, stroke and all-cause mortality. Hypothesis. We hypothesized that a modified cardiovascular health (CVH) metrics score among patients with CHD may be associated with the change in cognitive functions two decades later in patients. Methods. CVH metrics were assessed in a subgroup of men, who had previously
participated in a secondary prevention trial and two successive examinations of cognitive function (N=200, mean age at baseline 57.3±6.3 yrs.). A CVH metrics score at baseline was calculated including 3 health parameters, glucose, LDL-cholesterol, blood-pressure; and 4 health behaviors, smoking, obesity, physical-activity and adherence to Mediterranean diet. We scored each of these CVH metrics into best (2 points), intermediate (1 point), and poor levels (0 points). Cognitive performance was evaluated 14.7±1.9 and 19.9±1.0 years after entry to the trial. Cognitive function was assessed using the NeuroTrax Computerized Cognitive Battery. Linear mixed model was used to assess change in cognitive functions between T1 and T2 cognitive evaluations.

Results. Among the 200 patients, 68 (34.0%) had less than 7 (bottom group), 85 (42.5%) had 8-9 (middle group) and 47 (23.5%) had at least 10 CVH metrics points (top group). After adjustments, the top group of CVH score vs. others was associated with slower decline in overall cognitive performance composite z-score [0.23±0.09; p=0.009] and on tests of executive and visual spatial functions [0.23±0.11; p=0.047 and 0.49±0.17; p=0.004, respectively]. A 3 point-Increment in the health behaviors component was related to a slower decline in visuospatial functions [0.325±0.12; p=0.01].

Conclusion, an inverse association was observed between the score of best CVH metrics and cognitive decline among men with pre-existing CHD.


Funding: No

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P305

Psychosocial Stressors and Tobacco Use: Views of the Transgender Community in a 2016 Focus Groups Study

Background. Studies have found that cigarette smoking is higher among lesbian, gay, bisexual, transgender and queer (LGBTQ) groups compared to heterosexual individuals. However, limited research is available about factors related to tobacco initiation or continuation among transgender adults.

Methods. During summer 2016, the AHA- Tobacco Regulatory and Addiction Center (A-TRAC) conducted 27 focus groups and 196 surveys among smokers and non-smokers (ages 18-64) who self-identified as lesbian, gay, bisexual, transgender, or queer (LGBTQ). Study participants were of diverse racial and ethnic backgrounds and were recruited in Chicago, New York City and San Diego. Using qualitative data analyses, we analyzed a subsample of the LGBTQ data to examine the views and experiences of transgender individuals and identified themes related to psychosocial stressors linked to tobacco use. Atlas ti.v 7.5 qualitative software was used for analysis.

Results. A total of 26 participants were identified as transgender, representing 13.9% of the total LGBTQ sample. Psychosocial stressors that were often mentioned by study participants and were associated with initial and continuing tobacco use included: childhood and adulthood trauma due to family, peer and community rejection and/or exposure to partner and/or community violence; surgery and the side effects of medication; use of hormones and/or other experiences related to the process of transitioning. Structural discrimination associated with low income, housing, and employment was also mentioned. These psychosocial stressors were also
associated with depression and the use of intoxicating substances (i.e., alcohol and drugs). Tobacco use was felt to provide relief from these stressors. Conclusion. Transgender individuals perceived tobacco use as a relief from everyday chronic psychosocial stressors and appears to be associated with tobacco initiation and continued use. Health communication messages stressing healthy lifestyle practices and encouraging drawing on professional and informal support systems may prevent tobacco use.


Funding: Yes

Funding Component: National Center P306

Negative Emotional States and Atherosclerosis in African American Adults: The Jackson Heart Study

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Background: Atherosclerotic cardiovascular disease is prevalent among African Americans (AAs). Findings are mixed regarding the relationship between anger expression and peripheral atherosclerosis, as well as coronary atherosclerosis, as measured by coronary artery calcification (CAC). In addition, this relationship is unknown among AAs.

Hypothesis: Higher anger levels are positively associated with CAC and abdominal-iliac artery calcification (AAC) among AAs.

Methods: Using the Jackson Heart Study cohort (N=5301), we stratified 1809 participants who completed the Spielberger Anger Expression scale at baseline into four quartiles. The scale consists of 16 items, measuring anger-in and anger-out, with higher scores representing higher frequencies of anger expression. Total anger (anger-in and anger-out) quartiles were measured against CAC and AAC using ordinal logistic regression. CAC and AAC were categorized as: 0, 1-10, 11-100, 101-300, and greater than 300. Models were adjusted for potential confounding variables (age, sex, smoking, alcohol, diabetes mellitus, hypertension, and coronary heart disease).

Results: The final study sample consisted of 34% (615 of 1809) male with a mean age of 54.0 (SD 10.79). Higher total anger was inversely associated with age and hypertension, but positively related to alcohol use and smoking status. Unadjusted analysis showed that total anger quartiles and anger-in quartiles were inversely related to CAC and AAC. The association of anger with CAC and AAC was non-significant after adjustment for confounders (Table).

Conclusion: Before adjustment, higher anger levels showed a protective effect against coronary and aortic atherosclerosis. However, this relationship was no longer significant after adjustment for confounders suggesting that age and hypertension played a major role in the presence of atherosclerosis in this AA population. Future studies should investigate whether other negative emotional expressions are associated with atherosclerosis in AAs.
Association of Psychosocial Factors With Leukocyte Telomere Length Among African Americans in the Jackson Heart Study

Christina DeShun Jordan, The Univ of MS Medical Ctr, Jackson, MS

**Introduction:** Leukocyte telomere length (LTL), a biomarker of cellular aging, is associated with human longevity. Psychosocial stressors are associated with shorter LTL. African Americans (AAs) experience greater stressor levels compared to other racial and ethnic groups. Research on associations of psychosocial factors with LTL among AAs is not well understood. Using Jackson Heart Study (JHS) data, we examined associations of psychosocial factors (negative affect and stressors) with LTL among AAs.

**Hypothesis:** We hypothesized that psychosocial factors are inversely associated with LTL.

**Methods:** Analysis was restricted to 2,516 JHS participants with LTL and psychosocial data between 2000-2004. Cross-sectional associations of negative affect [cynical distrust, anger-in, anger-out, depressive symptoms] and stressors [perceived stress, weekly stress inventory event (WSI-event), WSI-impact, major life event (MLE)] were examined with LTL among participants aged 21-95 years old (women=1,542; men=974). Psychosocial variables were measured by standardized questionnaires; LTL was measured by Southern blot. Summations of the four psychosocial measures were created for negative affect and stressors, with scores ranging from 4-12. We expressed each individual psychosocial measure into categories (tertiles: low, moderate, high) and in continuous standard deviation (SD) units. Using multivariable linear regression we evaluated the associations of psychosocial factors with mean differences (beta coefficient, b) in LTL adjusting for demographics (Model 1), socioeconomic status (SES) (Model 2), health behaviors, cardiovascular disease (CVD) risk factors (Model 3), and coping (Model 4).

**Results:** High (vs low) anger-out was inversely associated with LTL in Model 1 (b = -0.043, p=0.008) and Model 2 (b = -0.0395, p=0.03), where 1-SD unit increase in anger-out was associated with shorter LTL. High (vs low) cumulative negative affect was marginally associated with insignificantly shorter LTL in Model 1 (b = -0.09, p=0.06) and Model 2 (b = -0.09, p=0.07) before transformation to SD units. There was no association between psychosocial stressors and shorter LTL in this sample. Paradoxically, high (vs low) WSI-event was positively associated with LTL (b =0.042, p=0.016), where 1-SD unit increase in WSI-event was associated with longer LTL after full adjustment.

**Conclusion:** Depressive symptoms were associated with LTL shortening in the literature. The current study associates anger-out with shorter LTL, while WSI-event was associated with longer LTL among AAs in the JHS. Possibly, stress pathways that effect telomere length vary, where high stress can trigger LTL lengthening or shortening. Mechanisms of the paradoxical association between stress and telomere length must be further explored among AAs.

**Disclosures:** C.D. Jordan: None.
**Introduction.** Both individual-level socioeconomic position (SEP) and the socioeconomic context of neighborhood of residence are important social determinants of cardiovascular health. However, few studies have considered how both individual and neighborhood socioeconomic factors simultaneously impact the effect of an intervention on cardiovascular health. **Hypothesis.** We assessed the hypothesis that higher individual SEP and lower neighborhood poverty and would each be independently associated with better cardiovascular health in response to the Examination of Mechanisms (E-Mechanic) of Exercise-Induced Weight Compensation randomized control trial. **Methods.** Cardiovascular health (CVH) was measured via a composite score that included 4 factors (1) BMI, 2) cholesterol, 3) glucose, and 4) systolic blood pressure), each categorized as ideal (2 points), intermediate (1 point), and poor (0 points) health for a possible range of 0 points (worst CVH) to 8 points (best CVH). CVH scores were calculated at baseline and follow-up. Individual SEP was created using principal components analysis with income and educational attainment, controlling for race, to produce a single socioeconomic factor that was dichotomized to indicate high (=1) or low (=0) SEP. Neighborhood socioeconomic context was measured at the census block group using percent (%) poverty derived from the U.S. Census Bureau’s American Community Survey. We estimated a multilevel repeated-measures regression model of CVH against individual SEP and neighborhood poverty that included covariates for age, sex, race, and marital status. **Results.** The final analytic sample included 114 participants (mean age = 48.3 years, SD age = 11.5 years; 72% female; 30% African American; 72% married) residing in 88 neighborhoods (mean poverty = 14.5%, SD=13.3%) who received the E-Mechanic exercise intervention and who had no missing data for all variables. On average, the E-Mechanic trial improved cardiovascular health among all exercise intervention participants by 0.3 points (95% CI 0.2 to 0.5). Results from the regression model demonstrated that participant SEP only approached marginal significance (p=0.12), while neighborhood poverty was not significant (p=0.32). **Conclusions.** The current study found that individual and neighborhood socioeconomic characteristics were not independently associated with response in cardiovascular health to the E-Mechanic exercise intervention. While findings from the analysis do not implicate either personal or contextual socioeconomic influences in intervention response for the E-Mechanic trial, this study does address the need to assess potential disparities in randomized control trials by examining differential response in health outcomes among participants by multiple social determinants of health. **Disclosures:** **C.A. Myers:** None. **S.T. Broyles:** None. **C.K. Martin:** None. **Funding:** Yes **Funding Component:** Greater Southeast Affiliate (Alabama, Florida, Georgia, Louisiana, Mississippi, Puerto Rico & Tennessee) **P309** **Social Network Analysis of Religious Organization Co-Affiliation, Exercise, and Weight in South Asians** **Namratha R. Kandula**, Northwestern Univ, Chicago, IL; Kayo Fujimoto, Yucheng Zhao, Univ of Texas Medical Ctr, Houston, TX; Alka M. Kanaya, Univ of California, San Francisco, CA; John A Schneider, Univ of Chicago, Chicago, IL; Andrew Cooper, Ankita Puri, Swapna Dave, Juned Siddique, Northwestern Univ, Chicago, IL **Objective:** Religious organizations may influence health behaviors by exerting social influence and reinforcing cultural beliefs. We tested the hypothesis that social influence,
constituted by affiliating with or attending religious organizations, was associated with exercise and weight in South Asians.

**Methods:** Multilevel, cross-sectional data were collected from participants in the Mediators of Atherosclerosis in South Asians Living in America (MASALA) study. Participants (n=700) were surveyed about their affiliation/membership in religious organizations (e.g., churches, temples, mosques) where South Asians participate using a comprehensive roster. MASALA participants who reported affiliating with or attending the same religious organization were classified as co-attendees. Body mass index (BMI) was calculated from measured height and weight, and physical activity (PA) was assessed using a validated questionnaire. The dependent variables were BMI categories (normal and overweight/obese), and meeting the minimum recommended amount of exercise (≥500 metabolic-minutes/week of moderate-vigorous PA). The main independent variable was affiliation exposure, a measure of the level of exposure to overweight/obesity and PA level among co-attendees at religious organizations, which is an indicator of social influence. Exponential random graph models were conducted to examine associations between exposure to co-attendees’ overweight/obesity and PA and individuals’ overweight/obesity and PA. Models controlled for individual-level sociodemographic, cultural, and network characteristics.

**Results:** Participants (average age 59 years, SD=9 and 43% female) affiliated with 163 unique religious organizations, and the median number of affiliations was 3 (IQR 2-7). Participants were significantly more likely to be overweight/obese (aOR=2.3, 95% CI=1.1, 4.8) as they were increasingly exposed to other overweight/obese participants through co-affiliation in religious organizations. Individual-level network characteristics (e.g., number of overweight/obese friends/family) were not associated with overweight/obesity. Co-affiliation in religious organizations was not associated with PA; however participants with less traditional South Asian cultural beliefs were more likely to exercise at least 500 met-min/week (aOR=2.5, 95% CI= 1.4, 4.7) than those who held more traditional cultural beliefs.

**Conclusion:** South Asians who were exposed to other overweight/obese South Asians through co-affiliation in religious organizations were more likely to be overweight/obese. These results provide evidence of multilevel social and cultural influences on health. Lifestyle interventions that address social and cultural drivers of behaviors and are implemented in partnership with religious organizations could be effective at reducing CVD risk in South Asians.

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P310

**Physician Trust and Home Remedy Use Among Low Income Blacks and Whites With Hypertension: Findings From the TRUST Study**

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**Introduction:** Home remedies are used for the treatment of hypertension, despite unsubstantiated claims of their effectiveness. Home remedy use is often attributed to mistrust towards healthcare providers. Few studies have examined the relationship
between HR use and physician trust. The objective of this study was to examine the correlates of home remedy use and the relationship between trust in physicians in a cohort of low-income Blacks and Whites with hypertension living in an inner-city in the Deep South.

**Hypothesis:** We hypothesized that White and Black home remedy users with hypertension would report greater mistrust towards physicians than individuals that were not using home remedies.

**Methods:** A cross-sectional examination was conducted among 925 Black and White patients with hypertension receiving care at an urban hospital in the southeastern US. Trust in physicians was self-reported using the Hall General Trust Scale and home remedy use was self-reported using the Brown and Segal scale.

**Results:** Twenty-eight percent (219 of 788) of Black and 15% (20 of 137) of White participants reported home remedy use (p=0.001). Black home remedy users and nonusers had similar trust scores (p=0.582). Whites home remedy users reported lower trust in physicians than white nonusers and Black home remedies users and nonusers (p=0.026).

**Conclusions:** Black home remedy users, non-users, and White non-users reported similar trust scores. The lowest trust scores were found among White home remedy users. Home remedy use was higher among Black than White participants. This study highlights the importance of examining topics of home remedy use and physician trust among low-income White and Black populations. In conclusion, mistrust towards physicians was associated with greater use of home remedies among White participants with hypertension. Home remedy users may benefit from interventions that bolster trust between patients and providers, and facilitate discussion about home remedy use.

Disclosures:  

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P311

**Individual Characteristics of Resilience Are Associated With Lower-Than-Expected Neighborhood Rates of Cardiovascular Disease in African-Americans: Results From the Morehouse-Emory Cardiovascular (MECA) Center for Health Equity Study**

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**Background:** Excess rates of cardiovascular (CV) disease in African-Americans, relative to Whites, have been well-documented. However, factors promoting CV health in the face of high risk, i.e. CV resilience, are unknown and may identify novel areas for intervention in reducing racial health disparities. **Methods:** Using data obtained from the Georgia Hospital Association, we identified age-, sex-, and income-matched neighborhoods (census tracts) in Atlanta, GA, with higher-than-expected (“high risk”) or lower-than-expected (“low risk”) rates of CV morbidity and mortality for African-Americans from 2010-2014. African-Americans from low risk (N = 742) and high risk (N = 753) neighborhoods were surveyed. Several domains of psychosocial well-being and neighborhood quality were assessed as features of resilience, in addition to individual demographic, socioeconomic and medical history variables. Ordinal logistic regression was used to determine odds of resilient characteristics among individuals living in neighborhoods at low versus high risk. **Results:** After adjustment
for age, sex, household income, education, marital status and occupation, African-Americans living in low compared to high risk neighborhoods reported better overall neighborhood quality (odds ratio [OR] 1.25; 95% confidence interval [CI] 1.01, 1.57), driven by better aesthetic quality (OR 1.42; CI 1.17, 1.73), more safety (OR 1.34; CI 1.10, 1.62), absence of violence (OR 1.42; CI 1.10, 1.83) and better access to healthy foods (OR 1.50; CI 1.24, 1.82). Additionally, individuals from low compared to high risk neighborhoods reported greater environmental mastery (OR 1.33; CI 1.03, 1.71), purpose in life (OR 1.22; CI 1.01, 1.48), optimism (OR 1.28; CI 1.05, 1.55) and resilient coping (OR 1.33; CI 1.04, 1.70), while also reporting less depressive symptoms (OR 0.78; CI 0.63, 0.98). There were no reported differences in CV risk factors or disease, religious practices, spirituality or experiences of discrimination between low and high risk neighborhoods. **Conclusions:** African-Americans living in neighborhoods at lower risk for CVD morbidity and mortality reported better neighborhood quality and psychosocial well-being than individuals from neighborhoods at higher risk. Neighborhood and personal psychosocial determinants of health may confer resilience to CVD in African-American individuals and communities.

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**Stress Related to Family Member(s) With Legal/Police Problems and BodyMass Index in the Study of Women’s Health Across the Nation (SWAN)**

**Miriam E Van Dyke,** Emory Univ, Atlanta, GA; Tiffany Lemon, Harvard Univ, Boston, MA; Karen A Matthews, Emma Barinas-Mitchell, Univ of Pittsburgh, Pittsburgh, PA; Tené T Lewis, Emory Univ, Atlanta, GA

**Introduction** Millions of Americans encounter the legal system each year, although persons of low socioeconomic status and racial/ethnic minorities are disproportionately impacted. The health implications of having legal or police problems have been well-documented, especially among incarcerated populations. Missing from the literature, however, is an insight into the health of those closest to the individuals facing legal and/or police problems—their family. **Hypothesis** Using data from the Study of Women’s Health Across the Nation (SWAN), we examined the hypothesis that stress related to family member(s) with legal/police problems (FLPP) is associated with higher body mass index (BMI, kg/m²) across 12 years and examined whether this association varied by education or race. **Methods** Participants were 1,550 white, 935 Black, 281 Japanese, and 250 Chinese middle-aged women. Data from baseline through year 13 were analyzed using generalized estimating equations with a year fixed effect. Models were adjusted for site, year, age, race/ethnicity, education, menopausal status, smoking, alcohol use, physical activity, caloric intake, and depressive symptoms. **Results** Of the 3,016 women included at baseline, 16.1% of women reported any FLPP, although lower educated women reported more FLPP (20.4%) than higher educated (12.3%) women, and slightly more FLPP than middle educated women (18.9%). Similarly, Black women reported more FLPP (23.8%) than white (14.3%), Japanese (8.5%), and Chinese (7.6%) women. EducationxFLPP interaction was observed such that among lower, but not middle or higher educated women, FLPP that were reported to be very upsetting were on average associated with higher BMI in age, year, race/ethnicity, menopausal status, and site-adjusted models (beta=0.35, p=0.03), although this association
became marginal in fully-adjusted models (beta=0.31, p=0.09). Although race/ethnicityxFLPP interaction was not observed, in race-stratified models, very upsetting FLPP were on average marginally associated with increased levels of BMI among Black women only, in both minimally (beta=0.21, p=0.06) and fully-adjusted (beta=0.21, p=0.08) models. **Conclusions** Our findings based on 12 years of data suggest that lower educated women and Black women who report having a family member with legal or police problems and who find this very upsetting on average have higher BMI. SWAN has grant support from the National Institutes of Health (NIH), DHHS, through the National Institute on Aging (NIA), the National Institute of Nursing Research (NINR) and the NIH Office of Research on Women’s Health (ORWH) (Grants U01NR004061; U01AG012505, U01AG012535, U01AG012531, U01AG012539, U01AG012546, U01AG012553, U01AG012554, U01AG012495). The content of this abstract is solely the responsibility of the authors and does not necessarily represent the official views of the NIA, NINR, ORWH or the NIH.

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**P313**

**Association of Positive Emotion and Cardiovascular Health in Hispanics/Latinos With Chronic Kidney Disease: Results From the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)**

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**Introduction**: Mounting evidence exists, linking positive emotion (e.g., joy) to favorable health outcomes. Little is known of the relationship between positive emotion and the American Heart Association defined concept of cardiovascular health (**CVH**), particularly in Hispanics/Latinos with chronic kidney disease (**CKD**), a group at high risk of cardiovascular mortality. **Hypothesis**: In Hispanics/Latinos with CKD, those with greater positive emotion will display more favorable CVH profiles. **Methods**: We analyzed data from adults ages 18-74 with stage 1-5 non-dialysis dependent CKD enrolled in the Hispanic Community Health Study/Study of Latinos in 2008-11. Positively worded items of the Center for Epidemiologic Studies Depression Scale were used to create a composite positive emotion score (range, 0-6; higher scores indicative of greater positive emotion). A composite overall CVH score was calculated using metrics of diet, body mass index, physical activity, cholesterol, blood pressure, fasting glucose, and smoking status. Each metric was defined as ideal, intermediate, or poor to compute an additive score ranging from 0-14; ideal metrics were also enumerated to compute an ideal CVH score, ranging from 0-7. Linear and logistic regression analyses were used to examine associations of positive emotion with CVH, after adjusting for relevant covariates. **Results**: Overall, 1,716 participants screened positive for CKD. In multivariable-adjusted models, a higher positive emotion score was associated with higher overall and ideal CVH scores when modeling CVH as a continuous outcome, (overall CVH: \( \beta=0.11, 95\% CI=0.01, 0.20 \); ideal CVH: \( \beta=0.06, 95\% CI=0.01, 0.11 \)) (Table 1). A 1-unit increase in positive emotion was associated with 1.14 times higher
odds of having ≥4 (vs. <4) ideal CVH indicators.

Conclusions: These findings provide preliminary evidence for an association between positive emotion and CVH in Hispanics/Latinos with CKD. Future studies should explore the mechanism through which emotion influence heart health.


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P314

Healthy Food Choices Are Correlated in a Large Employee Social Network

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Introduction: Research suggests obesity may be transmitted through social networks. A possible pathway is social influence on food choice. We investigated peer influence on the healthfulness of worksite food choices using social network analysis in a large hospital employee population, hypothesizing that socially-connected employees’ food choices would be correlated. Methods: Data on all food purchases in 2016 were obtained from the hospital’s cash register database. The cafeteria system uses traffic light labels to mark foods as healthy (green), less healthy (yellow), or unhealthy (red). Employees’ food purchases were identified through the use of cafeteria debit cards; social ties among employees were inferred based on a validated algorithm using demographics and time/location of purchases. We used spatial autoregression (SAR) and generalized estimating equation (GEE) models to calculate associations between the proportions of employees’ and coworkers’ purchases that were labeled green (or red). SAR models assessed concurrent purchases of an employee and coworker, weighting the association between their purchases by the frequency and inferred strength of the social tie. GEE models assessed longitudinal relationships between purchases coworkers’ made in the presence of an employee in one 8-week period and the employee’s purchases in the next 8-week period. Food and beverages were analyzed separately. Models adjusted for employee and coworker confounders (age, sex, race/ethnicity, job type, education). Results: In all, 5,118 employees used cafeteria debit cards to make purchases. Up to 536,240 employee/coworker interactions were observed, depending on the model (SAR, GEE) and outcomes (green/red, food/beverages). SAR models showed that a 1 percentage point increase in the network-weighted average of coworkers’ green-labeled (healthy) food purchases was associated with a 0.39 percentage point increase in an employee’s concurrent green-labeled food purchases (p<.001). Positive associations were also observed for red foods (0.20), and green (0.14) and red (0.31) beverages (all p<.001). Longitudinal GEE models showed that employees, as a population, increased purchases of green-labeled items by 0.013 percentage points on average when coworkers with whom they visited cafeterias in the prior 8 weeks increased their purchases of green items by 1 percentage point (p<.001). Similar associations were observed for red foods (0.013), and for green (0.006) and red beverages (0.020) (all p<.003). Conclusions: Employees’ healthy and unhealthy food choices are correlated. Although one explanation is that
people eat with others who have similar preferences, the longitudinal findings suggest that people create social norms for eating that influence peers. Worksite and other social networks may be novel targets for population-level interventions to promote healthy diet.


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Is Self-rated Health Associated With Ideal Cardiovascular Health? The Multi-Ethnic Study of Atherosclerosis

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Introduction: Self-rated health (SRH) is a commonly used indicator of health status. It has been identified as a determinant of health-promoting behaviors and a predictor of morbidity and mortality. However, little is known about the association between SRH and ideal cardiovascular health (CVH) as measured by the American Heart Association Life’s Simple 7 (LS7) criteria. We examined whether SRH was associated with ideal CVH, for the overall cohort and by sex and race/ethnicity.

Methods: We conducted a cross-sectional analysis of 6457 men and women of 4 race/ethnicities, aged 45 to 84 years, who participated in the Multi-Ethnic Study of Atherosclerosis. SRH was measured on a 5-point Likert scale (excellent, very good, good, fair and poor). CVH was determined using the LS7 score with each of the 7 metrics scored from 0-2, and a total score ranging from 0-14. Scores of 0-8 indicate an inadequate score, 9-10, average and 11-14, optimal. Odds ratios (OR) and 95% confidence intervals were calculated for the associations between SRH and LS7 score categories using multinomial logistic regression, adjusted for age, sex, race/ethnicity, education, income, marital status, health insurance status and chronic diseases.

Results: The mean age (SD) of participants was 62 (10) years; 53% were women. Approximately, 16% of participants rated their health as excellent, 33% very good, 41% good and 9% poor-fair. In this population, 47% had inadequate LS7 scores, 33%, average and 20% optimal. The odds of having a higher LS7 score increased as SRH improved. Using participants who rated their health as poor-fair as the reference group, the adjusted OR for having an optimal LS7 score in the overall cohort was: excellent 3.0 (2.1-4.3); very good 1.6 (1.1-2.1); good 1.2 (0.9-1.7). A similar trend was observed in the stratified analyses by sex and race/ethnicity (Table).

Conclusion: A more favorable SRH was associated with better CVH irrespective of sex or race/ethnicity. Further research could explore whether optimization of SRH predicts cardiovascular outcomes.


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P316
Multiple Vulnerabilities to Health Disparities and Incident Coronary Heart Disease in the Reasons for Geographic and Racial Differences in Stroke (REGARDS) Study

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Social determinants contribute to disparities in incident CHD but it is not known if they have an additive effect. We hypothesized that having more socially determined vulnerabilities to health disparities is associated with increased risk of incident CHD in the REGARDS study, a large biracial prospective cohort with physiological and survey measures. Experts adjudicated incident fatal and nonfatal CHD over 10 years of follow-up. Vulnerabilities included black race, low education, low income, and Southeastern US residence. The risks for CHD outcomes associated with 1, 2, and 3+ vs 0 vulnerabilities were calculated with Cox proportional hazards models adjusted for medical conditions, functional status, health behaviors, and physiologic variables. Of the 19,645 participants free of CHD at baseline (mean age 64 years, 57% women), 16% had 0 vulnerabilities, 36% had 1, 29% had 2, and 18% had 3+. Increasing numbers of vulnerabilities were associated with higher incidence (Figure) and risk of CHD that attenuated somewhat after multivariable adjustment (Table). These findings may provide a method of risk stratification useful for population health management.


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P317

An Activity Space Approach to Assessing the Food Environments of Food Secure and Insecure Women

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Introduction: Community food environments (FE) are an important correlate of diet- and weight-related CV health. Conventional approaches to measuring the FE focus on residential neighborhoods, and do not assess the full extent of food sources regularly encountered and used. Further, little attention has been given to how individual diet-related experiences, like food insecurity, may interact with features of the FE to affect health. To address these limitations, we use an activity space approach, defined by the locations women routinely visit, to measure FE exposure and use, and assess differences by food security status.

Hypothesis: Food-related spatial behavior and features of the FE differ between a) conventional and activity space definitions, and b) food secure and insecure women.

Methods: We present initial results (n=51) from an ongoing clinic-based study of low-income African American women in Atlanta, GA. Data are collected in-person using a Google Map-powered activity space questionnaire. USDA’s 10-item adult scale is used to measure food insecurity. Retail FE data are from Dun & Bradstreet. ArcGIS 10.5 was used to define three environments: residential census tract (CT), and convex hull polygons of overall and food-specific activity spaces. We tested
differences, by food security status, in mean behaviors and FE features with one-way ANOVAs.

**Results:** Eighty-eight percent of women were food insecure. Food insecure women were lower income, less often employed, and less often had access to a car. CTs contained fewer supermarkets ($\mu=1.2$ $SD=1.4$) and fast food restaurants ($\mu=3.9$ $SD=3.2$) than activity spaces ($\mu=7.9$ $SD=7.0$; $\mu=55.5$ $SD=44.1$, respectively). On average, 6.7% ($SD=13.5$) of utilized food sources fell within CT bounds, while 53.4% ($SD=35.5$) fell within activity spaces. Compared to food secure women, food insecure women had smaller overall ($\mu=329.8km^2$ $SD=340.4$ vs. $\mu=548.3km^2$ $SD=422.4$; $p=0.16$) and food-specific ($\mu=48.1km^2$ $SD=74.3$ vs. $\mu=85.6km^2$ $SD=106.4$; $p=0.28$) activity spaces, and a smaller proportion of their utilized supermarkets fell within their activity spaces ($\mu=60.9%$ $SD=42.4$ vs. $\mu=81.9%$ $SD=21.4$; $p=0.24$). FE features did not differ by food security status.

**Conclusions:** Conventional FE definitions likely underestimate the number of food sources women encounter, and do not capture the majority of sources used. Smaller activity spaces among food insecure women suggest that routine spatial mobility may be constrained by factors like transportation access. Still, food insecure women more often traveled outside of their activity spaces to utilize supermarkets, suggesting a dual burden of constrained spatial mobility and access. Interestingly, FE features did not differ by food security status.

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**P318**

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**Neighborhood Environment Characteristics and Control of Cardiovascular Disease Risk Factors in a Primary Care Patient Sample**

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**Introduction:** Hypertension and diabetes control are leading modifiable risk factors for cardiovascular disease (CVD) risk. Contemporary epidemiological research suggests that individual and health system characteristics are associated with control. Yet, there is little evidence examining how the neighborhood environment influences hypertension or diabetes control among patients engaged in primary care.

**Methods:** We analyzed data of adult patients ($n = 5,711$) with hypertension or diabetes who received primary care at 1 of 3 clinics of a statewide health care organization in Baltimore, MD and lived within the Baltimore city limits. The neighborhood environment exposures were tertiles of neighborhood socioeconomic status (SES), crime, and healthy food availability index (HFAI) assessed at the census tract level. Separate multivariate logistic regression models were constructed to estimate the odds ratio (OR) for each of these neighborhood environment characteristics and hypertension and diabetes control, adjusting for patient demographics, and health behaviors; and for physician demographic characteristics.

**Results:** The overall mean age was 57.8 ± 14.3 years, 67.2% were female, and 89.6% were Black. There were 5,325 patients with hypertension and 2,094 patients with diabetes (not mutually exclusive). In bivariate analyses, high neighborhood SES ($p=0.030$) and low crime ($p=0.006$) were associated with hypertension control, and none of the neighborhood exposures were associated with diabetes control. In fully adjusted analyses, being Black was significantly associated with decreased odds of hypertension control in all.
models (OR range: 0.63 – 0.65), independent of neighborhood exposures. Among those with hypertension, living in a low or moderate SES neighborhood or a high crime neighborhood was associated with lower odds of hypertension control; however, these associations were attenuated in adjusted models. None of the neighborhood exposures were significantly associated with odds of diabetes control in models that adjusted for patient characteristics. Yet, compared to high SES neighborhoods, living in a low or moderate SES neighborhood (OR=0.74, 95% CI: 0.57 - 0.97 and OR=0.75, 95% CI: 0.57 - 0.98, respectively) was associated with reduced diabetes control after adjusting for both patient and physician characteristics. Conclusion: Exposure to neighborhood disadvantage may contribute to poor diabetes and hypertension control among patients in primary care, independent of patient and physician characteristics. Patient-centered risk assessments including measures of social need and preventive interventions adapted to neighborhood environments could be useful for optimizing hypertension and diabetes control in clinical settings.

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P319

Changes in Perceptions of Neighborhood Environment and Cardiometabolic Outcomes in Two Predominantly African American Neighborhoods

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Introduction: Perceived neighborhood characteristics, including neighborhood satisfaction, are associated with lower obesity rates and more favorable cardiovascular risk factor profiles. However, prior studies have not evaluated how longitudinal changes in perceived neighborhood characteristics following revitalization efforts may associate with cardiometabolic health indicators.

Methods: Changes in neighborhood perception scales (infrastructure, safety, aesthetics, and satisfaction) were determined from 2013-2016 and categorized into the following groups: improvement, no change, or worsening over the time-period. Multivariate linear regression was used to measure the association between perceived improvement in each of the neighborhood characteristics with cardiometabolic outcomes (BMI, SBP, HbA1c, HDL-c) assessed in 2016. Outcomes were compared for those who perceived neighborhood improvements to those who perceived no change/worsening of neighborhood characteristics. Models were adjusted for age, sex, income, education, marital status, physical function, neighborhood, years spent in neighborhood. Interaction terms for age and sex were tested in the adjusted models. Results: Among the 622 individuals who did not move during the time-period, 93% were African American, 80% were female, and the mean age was 58 years. Many participants reported some improvements in neighborhood environment; infrastructure (48% reporting improvements), safety (47%), aesthetics (46%) and satisfaction (28%). In covariate-adjusted models, those who perceived improvement in their neighborhood aesthetics over the follow-up period had a significantly higher BMI (kg/m²) than those who perceived no improvement/worsening (β=1.2, p=0.05). Similarly, perceived improvements in neighborhood safety were associated with higher BMI (β=1.5, p=0.01); however, they were also significantly associated with lower SBP (mmHg) (β=-3.8, p=0.01). A significant interaction was observed between sex and perceived improvement in safety when predicting BMI (interaction term p=0.04), such that the relationship between perceived improvements in safety and higher BMI was
observed only among women (β=2.3, p=0.02). We did not observe any statistically significant interactions by age. We also did not find significant associations between changes in neighborhood characteristics and HDL-c or HbA1c. Conclusions: These findings suggest that perceived neighborhood characteristics may have differing associations with multiple cardiometabolic outcomes (BMI, SBP). This highlights the complexity of the associations between neighborhood characteristics and health as well as the importance of considering how changes in perceived neighborhood characteristics associate with multiple clinically relevant cardiometabolic risk factors, and how associations may be sex dependent.


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P320

Optimism and Cardiovascular Health Among African Americans in the Jackson Heart Study

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Introduction: Compared to other racial and ethnic groups, African Americans experience greater negative psychosocial factors (depression, stress), which are related to increased risk of cardiovascular disease (CVD). Little research has examined the association of positive psychosocial factors (optimism) with cardiovascular health in this population. Using the Jackson Heart Study (JHS) data, we examined the association of optimism with the American Heart Association Life’s Simple 7™ (LS7), a measure of seven metrics that assesses a person’s cardiovascular health. Hypothesis: Higher levels of optimism are positively associated with individual LS7 metrics, and positively associated with the total LS7 score.

Methods: We evaluated cross-sectional associations of optimism with each LS7 metric [cigarette smoking, physical activity, diet, body mass index (BMI), blood pressure, cholesterol, glucose] and with a composite LS7 score among 4,761 participants, 21-95 years old (women=3,070; men=1,691) enrolled in the JHS, a single-site, community-based cohort of African Americans residing in Jackson, MS. Optimism was measured in tertiles (low, moderate, high) to examine threshold effects. Each LS7 metric was classified as poor, intermediate, and ideal. LS7 metrics were also summed to create a total continuous score (0-13) categorized in tertiles (low, moderate, high). Multinomial logistic regression estimated the odds ratios (OR, 95% confidence interval-CI) of intermediate (vs. poor) and ideal (vs. poor) LS7 metric by levels of optimism. Multinomial regression also estimated the odds of moderate (vs. low) or high (vs. low) total LS7 score by optimism. Models adjusted for demographics, SES, and depressive symptoms.

Results: Descriptive findings showed that participants who reported high optimism had ideal physical activity, nutrition, smoking, blood pressure, glucose and high total LS7 score (all p<0.01). After adjustment for age, sex, education, income, marital status, and insurance status, participants who reported high (vs. low) optimism had a 39% increased odds of having ideal (vs. poor) physical activity (OR 1.39; 95% CI 1.10-1.76) and a 33% increased odds of having ideal (vs. poor) smoking (OR 1.33; 95% CI 1.02-1.73). Participants who reported high (vs. low) optimism had a 34% greater odds of having a high (vs. low) total LS7 score (OR 1.34 95% CI 1.03-1.74) after full adjustment. Conclusion: Optimism is associated with ideal physical activity and ideal smoking, which is important for promoting cardiovascular health and reducing the risk of CVD among African Americans in this sample.
Family Member Incarceration and Subclinical Cardiovascular Disease in Mexican Women

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Introduction: Losing a family member to incarceration is a stressful life event associated with emotional and financial burdens potentially influencing cardiovascular health through altered behavioral changes and psychobiological processes. Because of men’s higher likelihood of incarceration, women may disproportionately shoulder this burden. As the prison population increases globally, there is a need to evaluate the impact of incarceration on cardiovascular health in women.

Hypothesis: Women who have or have ever had a family member in prison are more likely to have subclinical CVD compared to women without ever having an incarcerated family member.

Methods: We examined the association between family member incarceration, carotid artery intima-media thickness (IMT), and subclinical CVD (sCVD) in 1,848 women reporting no CVD from the Mexican Teachers’ Cohort. Between 2013 and 2016, women responded to family incarceration related questions from the Life Stressor Checklist (LSC). We categorized women according to their response on whether they have or have ever had a family member incarcerated. IMT was measured on both carotid arteries through ultrasound by standardized neurologists and log transformed. We defined sCVD as an intima media thickness of ≥0.8mm in either of the carotid arteries or the presence of plaque. We collected data on potential cofounders (age, site, health insurance provider, indigenous background, education, marital status, socio-economic status, and LSC-measured exposure to violence) and potential intermediates (anthropometry, smoking, physical activity, hypertension, diabetes, and self-reported treated depression). We used multivariable linear and logistic regression models to assess the association between family incarceration, IMT, and subclinical CVD.

Results: Among 275 (14.9%) women having experienced family incarceration, obesity (40.4% vs. 37.8%), smoking (8.7% vs. 6.5%), hypercholesterolemia (20.4% vs. 17.5%), and depression (7.3% vs. 4.7%) were more common relative to women without family incarceration. We did not observe an association between family incarceration and IMT when comparing exposed to unexposed women (confounder-adjusted mean % difference=0.48; 95%CI -0.15, 2.11). The prevalence of sCVD was 28.4% in women who ever experienced family incarceration and 20.9% in women with no family incarceration. The confounder-adjusted odds ratio for sCVD among women that have ever had an incarcerated family member was 1.40 (95%CI 1.03, 1.91) relative to women with no family incarceration.

Conclusion: Having or having had an incarcerated family member was associated with increased sCVD in middle-aged Mexican women. Incarceration of a family member may exert a psychological burden that could
disproportionally affect women’s cardiovascular health.

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P322

The Relationship Between Neighborhood Food Environment and Adiposity Measures: Data From the Dallas Heart Study

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**Background:** Existing research has established a link between dietary intake and adiposity measures, including body mass index (BMI) and waist circumference (WC). However, less is known about the relationship between objective food environment quality measures and adiposity [BMI and WC], particularly in diverse populations.

**Methods:** Using cross-sectional data from the 2007-2009 Dallas Heart Study multi-ethnic cohort, we examined the relationship between local food environment quality and adiposity. We measured individuals’ census tract-level food environment quality using the CDC’s Modified Retail Food Environment Index (mRFEI), a ratio of healthy to unhealthy food stores within a ½ mile radius of each census tract (higher mRFEI=more healthy food access). We characterized BMI and WC as continuous measures. Using linear regression, we investigated the relationship between mRFEI and BMI/WC adjusting for confounders [age, gender, race/ethnicity, income, education, smoking status, and neighborhood deprivation index (NDI)]. Models were stratified by NDI to identify if these relationships were moderated by neighborhood deprivation.

**Results:** The study population (n=1835) was 58% non-Hispanic blacks, 27% non-Hispanic whites, and 15% Hispanics. The mRFEI ranged from 0 to 50 across census tracts. In the fully adjusted model, higher mRFEI was associated with higher BMI (β=0.06 p=0.01), but not WC (β=0.09 p=0.13). When stratified by NDI, higher mRFEI was associated with greater BMI and WC in low deprivation areas, but not in medium or high deprivation areas (Figure).

**Conclusions:** Better neighborhood food environment quality was paradoxically associated with higher adiposity in low NDI areas among a diverse population in Dallas County, Texas. Our findings contribute to growing literature around aggregate measures of food environment quality, highlighting potential limitations of the mRFEI in characterizing the impact of the spatial distribution of healthy food outlets on adiposity in lower resource environments.
Sleep Debt and Type II Diabetes Mellitus in Middle Aged and Older Women

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Background: Sleep disturbances can be both a cause and consequence of circadian disruption resulting in cardiometabolic dysregulation. However, little is known about sleep debt, defined as the average sleep duration difference >=2 hours between weekend versus weekday and type II diabetes (T2D) mellitus particularly in older women. Methods and Results: We analyzed 25,335 women free of cardiovascular disease (CVD) in the ongoing follow-up cohort from the Women’s Health Study (WHS). Utilizing the WHS stress questionnaire (2012-13) that assessed sleep duration among other chronic and acute stress measures, we computed sleep debt as the average sleep duration difference >=2 hours between weekend versus weekday. Of the 2539 women with physician confirmed T2D at the time of questionnaire administration, 216 women had sleep debt. Mean age for women with sleep debt and T2D versus no sleep debt and diabetes were 69.3 ± 4.4 and 72.7 +/- 6.1 years old respectively. Women with sleep debt and T2D were younger, more likely to have hypertension and hypercholesterolemia, use alcohol, be current smokers, had higher body mass index and be anxious or depressed. In logistic regression analyses, women with sleep debt had a 47% higher odds of T2D independent of age, race/ethnicity, and socioeconomic status (income and education) [odds ratio (OR): 1.47, 95% confidence interval (CI): 1.25 to 1.72, P<0.0001]. Adjustment for CVD risk factors, depression and anxiety symptoms resulted in attenuation of the relationship which maintained statistical significance [OR: 1.31, 95% CI: 1.10 to 1.55, P=0.0002]. When cumulative psychological stress (combination of chronic and acute stressors: e.g., life events, job stress, discrimination) was accounted for, the observed relationship between sleep debt and T2D persisted [OR: 1.28, 95% CI 1.09 to 1.53, P= 0.004]. (Table 1) Conclusion: Sleep debt was associated with higher odds of type 2 diabetes prevalence in middle-aged and older women.


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Association of Neighborhood Perception and Physical Activity in the Healthy Aging in Neighborhoods of Diversity Across the Lifespan (HANDLS) Study

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Introduction: As obesity rates rise, it is increasingly important to understand obesity-related health behaviors, including physical activity (PA). Less is known about the role of perceived neighborhood environment, particularly perceptions of crime and violence, in preventing PA.

Hypothesis: Unfavorable neighborhood perception is associated with lower PA levels, and may be moderated by socioeconomic status (SES).

Methods: Within the multiracial, socioeconomically diverse HANDLS cohort, we examined the association between self-reported neighborhood perception (Likert-scale questions) and physical activity (Baecke PA questionnaire). Factor analysis identified key neighborhood characteristics to develop a total neighborhood perception score (NPS), which was divided into quintiles for analysis. Higher NPS indicated less favorable neighborhood perception. Linear regression was used to determine the relationship between total NPS, factor scores, and PA.

Results: In Wave 4 [n=2167; mean age 56.6(9.1) years, 58.6% female, 61.1% black, 40.5% below poverty line], we identified five neighborhood perception factors: 1) concern about specific crime types 2) physical environment, 3) violent crime, 4) social environment and 5) violence beyond the neighborhood. Across NPS quintiles, those in quintile 5 were more likely to be younger (p < 0.001), white (p < 0.001), above the poverty level (p < 0.001), and more highly educated (p < 0.001), but less likely to be smokers (p = 0.05) or engage in leisure time PA (p < 0.001). Total PA decreased with increasing NPS in Factor 4 across all race/sex groups and with total NPS for white females. Total PA increased with increasing NPS in Factor 3 for white males. The NPS-PA relationship was not moderated by SES.

Conclusions: Poor perceived social cohesion is associated with decreasing PA, while paradoxically - increased perceived violent crime is associated with higher PA for white males. Further work should investigate potential mediators between social cohesion, crime and PA.


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P326

Perceived Neighborhood Crime is Associated With Serum Cholesterol Levels Among Females, but Not Males: Santiago Longitudinal Study

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Introduction: In a Chilean sample, adolescents’ CVD risk factors were associated with perceived neighborhood crime. To determine if this effect was sustained, we examined associations between adolescents’ perceived neighborhood crime and their serum cholesterol levels in young adulthood. Neighborhood stress has been cross-sectionally related to dyslipidemia in previous studies. Hypothesis: (1) Higher levels of perceived crime will be associated with higher low-density lipoprotein (LDL) cholesterol and lower high-density lipoprotein (HDL). (2) Sex will modify this association. Methods: Data were from adolescent (x̄=14 yrs) and young adult waves (x̄=22 yrs) of the Santiago Longitudinal Study (N=645). Perceived neighborhood crime was measured using three scale items about neighborhood drug use, muggings, burglaries and assaults. Crime was analyzed as a continuous and categorical variable. Fasting HDL and LDL cholesterol (mg/dL) were measured at 22 yrs. Associations between crime and HDL and LDL were analyzed by linear regression, adjusting for sex, age and SES. Effect modification by sex was tested with sex*crime interaction. Results: Participants were low-middle income and 55% female. Females perceived slightly more crime than males (F: x̄=9.1 M: x̄=8.8, p=0.30). There was a significant sex*crime interaction for HDL (p=0.03) and LDL (p=0.01). Among males, average HDL and LDL were 100±32 and 41±12; crime did not relate to either outcome. Among females, average HDL and LDL were 100±28 and 46±14; neighborhood crime was negatively associated with HDL and positively associated with LDL. For example, females reporting the most crime had, on average, 7.5 mm/dL lower HDL and 12.8 mm/dL higher LDL than females reporting the least amount of crime (Fig. 1). Conclusions: Perceived crime was prospectively associated with worse lipid profiles among females but not males. A sex-specific stress mechanism may be operating. Further study of the physiologic and behavioral mechanisms contributing to these findings is needed.


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P327

Stress Overload and Methylation of Hypertension Related Genes

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Background: Nearly 30% of U.S. adults are hypertensive with a high prevalence existing among Black Americans (42%). Exposure to psychosocial stress has been identified as a risk factor for hypertension and may explain part of the observed racial disparities. One pathway through which stress exposure may mechanistically alter biological functioning in a manner that affects risk of hypertension is via epigenetic modifications in hypertension-related genes, but this area remains understudied.

Aims and Hypothesis: In the present study, we investigate the relationship between stress exposure and methylation of 25 genes that have been associated with blood pressure in Blacks in previous genetic research. We hypothesize that stress exposure is associated with DNA methylation of blood pressure related genes.

Methods:
We conducted an epigenetic association study using data from the ongoing InterGEN Study, a longitudinal investigation of the psychological, environmental, and genetic factors that contribute to hypertension risk in African American mothers (n=74) and their young children. Stress exposure was measured using the 24-item Stress Overload Scale ($\alpha=0.95$), and a summary score was calculated by summing the Likert scale responses. Methylation was measured using the Illumina Infinium MethylationEPIC Beadchip, and M-values (i.e. log2 ratio of the intensities of methylated probe versus unmethylated probe) were calculated for association analysis. Linear regression was employed to assess the association between stress exposure and methylation in the a priori defined genes.

**Results:**
At p<0.05, we identified 45 methylation sites associated with stress overload. These sites represented 17 of the 25 investigated genes. The most statistically significant sites were related to the genes: insulin like growth factor binding protein 3 ($IGFBP3$), calcium voltage-gated channel subunit alpha1 H ($CACNA1H$), and solute carrier family 4 member 5 ($SLC4A5$) (p=0.001, p=0.002, and p=0.006, respectively).

**Conclusion:**
This study provides biological insight into DNA methylation as a mechanism whereby exposure to psychosocial stress affects risk of hypertension in Black women. Additional replication studies with a larger sample size and includes men are needed to validate and generalize the findings. Future research should further investigate the biological mediators between DNA methylation and hypertension manifestation.

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HRQOL, after adjustment for relevant covariates and other CVD or CVD RFs. All analyses accounted for the complex study design.

**Results:** In multivariable-adjusted models, CVD, diabetes, and current smoking were associated with 1.73, 2.04, and 1.48 times higher odds of fair/poor general health, compared to absence of CVD, normal glycemic status, and never-smoking, respectively. CVD, diabetes, obesity, physical inactivity, and low activity were associated with lower PCS scores. CVD, obesity, overweight, and current and former smoking were associated with lower MCS scores (Table).

**Conclusions:** CVD and CVD RFs are independently associated with poorer HRQOL among Hispanic/Latino adults with arthritis, suggesting presence of unmet health and lifestyle management needs in this group.

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**Prospective Association of Serum Uromodulin and Cardiovascular Disease in Chronic Kidney Transplant Recipients**

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Serum levels of the exclusively renal-derived glycoprotein, uromodulin, a putative tubular function index, were recently associated with the development of fatal and non-fatal cardiovascular disease (CVD) outcomes during longitudinal surveillance of two cohorts undergoing diagnostic coronary angiography (Leih rerer A et al. Int J Cardiol. 2017; 231:6-12; Delgado GE et al. 2017; 28: 2201-10). Using a case-cohort design (total n=685; random subcohort n=433) from the completed FAVORIT trial of chronic, stable kidney transplant recipients (KTRs), we examined the association between baseline serum uromodulin (mean ± standard deviation [SD]: 67.8 ±39.7 ng/mL), and the development of CVD (myocardial infarction, CVD death, stroke, & major revascularization procedures, pooled, n=311 events), during a median 3.7 years of follow-up. Unadjusted, weighted Cox proportional hazards modeling, based upon the subcohort uromodulin level SD (±39.7), revealed that each SD higher was associated with a 23% decreased risk for CVD (hazards ratio [HR]= 0.77; 95% confidence interval [CI]=0.65-0.92). This association was attenuated after adjustment for age, sex, smoking status, graft type, prevalent diabetes & CVD, systolic blood pressure gt140, diastolic blood pressure lt 70, estimated glomerular filtration rate [eGFR] gt45 mL/min per 1.73m², & natural log urinary albumin/creatinine [UACR]: (HR=0.83; 95% CI=0.67-1.04). Comparing subcohort uromodulin [ng/mL] quartile ranges (Q1=5.6-39.1; Q2=39.2-58.8; Q3=58.9-82.9; Q4=83.0-309.6), with the lowest quartile as referent, unadjusted Cox models
demonstrated that the risks for CVD were as follows: Q2 v. Q1 (HR=0.92; 95% CI=0.62-1.38); Q3 v. Q1 (HR=0.69; 95% CI= 0.46-1.03); Q4 v. Q1 (HR=0.56; 95% CI=0.37-0.85). Full adjustment yielded: Q2 v. Q1 (HR=1.16; 95% CI= 0.70-1.92); Q3 v. Q1 (HR= 0.77; 95% CI=0.44-1.37); Q4 v. Q1 (HR=0.76; 95% CI=0.44-1.31). Higher serum uromodulin, an ostensible indicator of better preserved tubular function, was associated with reduced risk for the development of CVD in a large cohort of chronic, stable KTRs, but this association did not persist upon adjustment for major CVD risk factors, eGFR, & UACR.


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Chronic Kidney Disease is Associated With Short-Term Risk of Hospitalization Among Older Adults

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Background: Chronic kidney disease (CKD) is now staged by estimated glomerular filtration rate (eGFR) and urinary albumin-to-creatinine ratio (ACR). Risks of cardiovascular disease, dialysis, and mortality are well described, but risks of hospitalization at older age have not been explored to the same depths.

Hypothesis: CKD stages will be associated with risk of all-cause hospitalizations.

Methods: The analysis was conducted on 5669 white and African-American participants of the ARIC Visit 5 (2011-2013) cohort (mean age, 76 y; female, 57%; African-American, 23%). CKD was staged according to KDIGO 2012 criteria with eGFR from serum cystatin C (eGFRcys) and ACR. The primary outcome of all-cause hospitalization risk was analyzed by using negative binomial regression to estimate incidence rate ratios (IRR), adjusted for demographics, behaviors, and comorbidities.

Results: Over a median follow-up period of 3.5 years (by December 31st, 2015), 6124 hospitalizations occurred over 19788 person-years (Crude Incidence Rate, 309 per 1000 person-years). Risk of hospitalization increased markedly with lower eGFRcys and higher albuminuria (Table 1). Other baseline comorbidities were also associated with hospitalization risk (IRR [95% CI] for heart failure, coronary heart disease (CHD), stroke, cancer were 1.7 [1.4-2.0], 1.5 [1.3-1.7], 1.3 [1.1-1.6], and 1.2 [0.9-1.5]).

Conclusions: Among older adults, both low eGFR and high ACR are strongly related to risk of hospitalization. These findings provide insight for risk stratification and prevention of CKD at older ages.

Table 1. Risk of hospitalization by CKD stages defined by eGFR and ACR


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Association of Extraosseous Calcification With Pulmonary Hypertension in Patients Evaluated for Kidney Transplantation

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Background: Pulmonary hypertension (PH) is commonly reported in patients with end-stage renal disease (ESRD), and is associated with early graft failure and death in kidney transplant recipients. Calcifications of the lung, pulmonary vessels, heart, and kidney are frequently observed with ESRD, the consequence of secondary hyperparathyroidism. It follows that pulmonary artery vasculopathy, notably from extraosseous calcification, may contribute to PH. A popular, but unestablished, theory is that the stiffened pulmonary artery is unable to accommodate elevations in right ventricular stroke volume caused by arteriovenous (AV) hemodialysis shunts. We hypothesized that extraosseous calcification is related to PH in patients evaluated for kidney transplantation, and that the association is largely driven by AV shunts.

Methods: Established in 2006, the UNC Cardiorenal Registry offers ongoing enrollment to all patients with stage 4 or 5 chronic kidney disease (CKD) referred for pretransplant cardiac evaluation. Pulmonary artery systolic pressure (PASP) was derived from routine echocardiograms within 6 months of the registry visit. All echocardiograms followed a standardized protocol, and were interpreted by the same cardiologist. PH was defined by a tricuspid regurgitant jet velocity >2.8 m/s, corresponding to a PASP >40 mmHg. Classification of grade 2 diastolic dysfunction (impaired left ventricular relaxation with elevated left atrial pressure) required a transmitral E/A ratio ≥ 0.8, and a transmitral to myocardial relaxation E/e’ ratio ≥ 15. Mitral annular calcification (MAC) was visually assessed, and considered evidence of extraosseous calcification. Associations between MAC and PH were analyzed with logistic regression, adjusted for age, sex, BMI, diastolic dysfunction, mitral regurgitation, left atrial dilation, and hematocrit.

Results: From 2006-2013, 795 registry patients were screened preoperatively by echocardiography. Most were male (56%) and black (61%) with a mean age of 56 years. The majority (74%) received dialysis (13% peritoneal, 61% hemodialysis), for an average 2.8 years prior to the registry visit. PH, MAC, and AV shunts were present in 17%, 28%, and 62%; respectively. Relative to patients without MAC, those with MAC had higher odds of PH (ORadj=1.80; 95% CI: 1.17 – 2.78), which was not impacted by adjustment for AV shunts (ORadj = 1.78; 95% CI: 1.15 – 2.76). Further adjustment for years of dialysis modestly attenuated the association (ORadj = 1.55; 95% CI: 0.99 – 2.43).

Conclusion: MAC is associated with higher odds of PH in severe CKD, irrespective of factors associated with PASP in the general population (age, sex, BMI), sources of pulmonary congestion (diastolic dysfunction, mitral regurgitation, and left atrial dilation), and causes of hyperdynamic circulation (hematocrit). The association is independent of hemodialysis shunts and dialysis vintage.


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P332

Socio-environmental Influences on Youth Total Sedentary Time: Results From the Hispanic Community Health Study / Study of Latino Youth
Introduction: Sedentary behavior (SED) is associated with higher obesity and cardiometabolic risk in youth, independent of physical activity. Studies showing the association between screen time and SED among Hispanics/Latinos, have primarily focused on Mexican-origin Hispanics. Additional research is needed to examine other socio-environmental factors that can influence SED among diverse Hispanics/Latinos. This cross-sectional study examined the home-, neighborhood-, and school-environment to identify factors associated with total sedentary time among youth.

Methods: Data from 1,104 youth ages 8-16 years and 728 caregivers (mean age 43.1 ± 8.2 years) from four U.S. cities, who participated in the Study of Latino Youth (2012-2014), were examined. Associations between socio-environmental factors (measured by self-report) and total sedentary time (measured by one-week Actical accelerometry) were examined in linear regression models that included MVPA minutes/day, demographic covariates, and accounted for the complex survey design and sampling weights.

Results: Mean sedentary time was 10.1 ± 1.8 hours/day. Home environment factors, such as electronics in the bedroom and parent limit setting, were not associated with total sedentary time. Presence of barriers to physical activity in the neighborhood (e.g., muggings, gangs) was associated with 13.4 more minutes of sedentary time per day. Attending a school that never/rarely compared to sometimes offered after school physical activity opportunities was associated with more sedentary time (B=38.0 minutes/day; 95% Confidence Interval: 13.5-62.4).

Conclusions: The study findings highlight the need for future research to investigate other sources of sedentary behavior in the home for interventionist to focus on specific SED-based strategies to decrease sedentary time among youth. Minimizing barriers by identifying safe places to be active in participant’s neighborhoods may also support youth to spend less time indoors where sedentary time is prevalent.


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P333

Characteristics Associated With Lower Blood Pressure When Using a Sit-Stand Desk

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**Introduction:** In a recent randomized crossover trial, using a sit-stand desk to alternate postures resulted in small but statistically significant decreases in average blood pressure (BP) across a simulated workday.

**Hypothesis:** We tested the hypothesis that certain baseline characteristics are associated with a greater acute BP-lowering response to use of a sit-stand desk.

**Methods:** This secondary analysis used data from all subjects (n=25; 36% female; mean (SD) age 42 (12) years, screening baseline SBP 132 (9) mmHg and DBP 83 (8) mmHg, BMI 32 (5) kg/m²) completing a randomized crossover study with two simulated workday conditions: 1) continuous sitting (SIT) and 2) alternating sitting and standing every 30 minutes (SS). Oscillometric BP was measured hourly. Average time spent sitting and in moderate-to-vigorous intensity physical activity (MVPA) were reported using the Global Physical Activity Questionnaire. Linear regression models identified whether participant characteristics (morning BP per 10 mmHg; age > 50 years; sex (female); MVPA ≥ 150 mins/week; sedentary time ≥ 10 hours/day; BMI ≥ 30 kg/m²) were associated with a greater BP-lowering effect of using a sit-stand desk with a backward selection stepwise approach removing independent variables with P ≥ 0.2.

**Results:** Lower morning baseline SBP (β = 2.8 mmHg per 10 mmHg, P = 0.012) and higher MVPA (β = -4.4 mmHg, P = 0.025) were associated with a greater SBP-lowering effect; higher age (β = -3.8 mmHg, P = 0.170) and higher BMI (β = 4.2 mmHg, P = 0.067) were retained in the model but were not statistically significant. Higher MVPA (β = -3.0 mmHg, P = 0.040) and lower BMI (β = 4.1 mmHg, P = 0.002) were associated with a greater DBP-lowering effect; female sex (β = -1.7 mmHg, P = 0.172) was retained in the model but was not statistically significant (Figure 1).

**Conclusions:** In conclusion, physically active, non-obese adults with lower SBP experienced the most beneficial BP response to intermittent standing. Future studies should investigate the mechanisms explaining this acute BP response.


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**P334**

**The Effects of Inadequate Sleep on Blood Pressure and Endothelial Inflammation in Women: Findings From the American Heart Association Go Red for Women Strategically Focused Research Network**

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**Background:** Insufficient sleep impairs blood pressure regulation. However, the effects of milder, highly prevalent but frequently neglected sleep disturbances, including poor sleep quality and insomnia, on vascular health in women are unclear. We investigated whether poor sleep patterns are associated with blood pressure and endothelial inflammation in a diverse sample of women. **Methods:** Women who participated in the ongoing AHA Go Red for Women Strategically Focused Research Network population project were studied (n=323, 57% minority, mean age=39±17 y, range=20-79 y). Sleep duration, sleep quality, and time to sleep onset were assessed using the Pittsburgh Sleep Quality Index (score ≥5=poor sleep quality). Risk for obstructive sleep apnea (OSA) was evaluated using the Berlin questionnaire, and insomnia was assessed using the Insomnia Severity Index (ISI). In a subset of women who participated in the basic study (n=28), sleep duration was assessed objectively.
using actigraphy and endothelial inflammation was assessed directly in harvested endothelial cells by measuring nuclear translocation of nuclear factor kappa B (NFκB). Vascular reactivity was measured by brachial artery flow-mediated dilation (FMD). Systolic and diastolic blood pressure (SBP and DPB) were measured by trained personnel. Multivariate linear regressions were used to evaluate associations between sleep patterns and blood pressure, NFκB and FMD. **Results:** Mean sleep duration was 6.8 ± 1.3 h/night in the population study and 7.5 ± 1.1 h/night in the basic study. In the population study sample, 50% had poor sleep quality (25% in the basic study), and 37% had some level of insomnia (15% in the basic study). SBP was associated directly with poor sleep quality, and DBP with OSA risk after adjusting for confounders (p=0.04 and p=0.08, respectively). Poor sleep quality was associated with endothelial NFκB activation (β=30.6; p=0.03). Insomnia and longer time to sleep onset were also associated with endothelial NFκB activation (β=27.6; p=0.002 and β=8.26; p=0.02, respectively). Sleep patterns were not associated with FMD. **Conclusions:** These findings provide direct evidence that common but frequently neglected sleep disturbances such as poor sleep quality and insomnia are associated with increased blood pressure and vascular inflammation even in the absence of sleep deprivation in women.

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**P335**

**Associations of Sleep Duration and Sleep Quality With Physical Performance in Older Adults --The Chicago Healthy Aging Study (CHAS)**

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**Background:** Sleep duration (too short or too long) is associated with lower physical performance. However, the association of sleep duration and physical performance, taking into account the quality of sleep (e.g., sleep disturbance) in older populations, has not been thoroughly investigated. **Methods:** Using data from the Chicago Healthy Aging study conducted in 2007-10, we investigated a cross-sectional association of a combination of sleep duration and sleep disturbance with muscle strength (hand grip), and performance [4m gait speed and Short Physical Performance Battery (SPPB)]. The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep duration [categorized as short (≤ 6 hours), normal (7-8 hours), and long (≥ 9 hours)] and sleep disturbance (defined as either cannot fall asleep within 30 minutes or waking up in the middle of the night or early morning three or more times per week). (See Table and Table Footnote for definitions of sleep duration and disturbance, and physical performance categories). Multivariable logistic regression analysis was used. **Results:** The study sample consists of 952 men and 350 women, ages 65-84 (mean age 71) in 2007-10; 9% were African American.12.6 % had SPPB score ≤ 8, 6.8 % had gait speed on 4 meter course < 0.8 m/s, and 23.4 % had low sex-BMI specific handgrip strength. As compared to the group with normal sleep duration (7-8 hours) without sleep disturbance, adjusted odds (95% confidence interval) of low gait speed <0.8 m/s in those with short sleep duration (≤ 6 hours) and sleep disturbance was much higher [2.00 (1.06-3.75)]. Similarly, the odds of low sex-BMI specific handgrip strength was about 2 times higher in those with long duration of sleep (≥ 9 hours), compared to those with normal sleep duration without sleep...
disturbance. No association was found for Short Physical Performance Battery (see Table).

**Conclusion**: In older age, short sleep duration with poor quality as well as excessive sleep duration were associated with the greater likelihood of having low muscle strength and performance.


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P336

The Association Between Goal-Striving Stress, Sleep Duration and Sleep Quality in the Jackson Heart Study

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Introduction Research shows that compared to non-Hispanic whites, African Americans (AAs) have poorer sleep quality, lower mean sleep duration, and a higher prevalence of sleep-disordered breathing. AAs also report more frequent exposures to certain stressors over the life course, which may impact physiological processes that may impair sleep. Goal-striving-stress (GSS), the discrepancy between aspiration and achievement, weighted by the subjective probability of success, and the level of disappointment experienced if goals are not reached, may be an important stressor among AAs that may influence sleep; however this has yet to be explored. The objective of this study was to assess the relationship between GSS and sleep duration and sleep quality in AAs.

**Hypothesis** We assessed the hypothesis that high (versus low) GSS would be associated with short or long sleep duration and poor sleep quality.

**Methods** We utilized data from the baseline exam of the Jackson Heart Study (JHS; n=5306), an AA sample of women and men, 35-84 years old. There were a total of 5082 participants in the sample; 63.34% female with a mean age of 55.30 (± 12.75) and mean sleep duration of 6.43 hours (±1.51). The sample was categorized into GSS tertiles: low (n=2121), moderate (n=1716), high (n=1296). Participants self-reported sleep duration (hours) and rated their sleep quality. Sleep duration was categorized as short (<6 hours), normal (7 or 8 hours) and long (> 9 hours). Sleep quality was categorized as high (good/very good/excellent) and low (fair/poor). Logistic regression models were used to obtain odds ratios (OR, 95% confidence interval-CI) to assess the associations of GSS levels with sleep duration and sleep quality categories. Models were adjusted for sex, age, socioeconomic status, health behaviors, discrimination, and health outcomes. **Results** Significant results showed that participants who reported high (versus low) GSS had a 29% increased odds [1.29 (1.10, 1.52)] of short (versus normal) sleep after full adjustment. Participants who reported high (versus low) GSS had a 42% increased odds [1.42 (1.20, 1.67)] of low (versus high) sleep quality after full adjustment. **Conclusion** In conclusion, the deficit between goal aspiration and achievement is associated with short sleep duration and poor sleep quality. Potential interventions should consider the extent to which GSS may contribute to the development of short sleep duration and poor sleep quality.
Adolescent Sleep is Associated With Physical Activity and Sedentary Behavior Patterns

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Introduction: A decrease in sleep quantity and quality is a growing concern in the adolescent population. Concurrently, an increase in physical inactivity has been shown to be related to numerous health consequences. There is a lack of literature on the relationship between sleep, physical activity (PA) and sedentary behavior (SB) in the adolescent population, particularly looking at night-to-night sleep irregularity.

Hypothesis: We hypothesized that increased PA and decreased SB in both objective and subject modalities would be associated with greater habitual sleep duration (HSD) and lesser habitual sleep variability (HSV) in this adolescent population.

Methods: Objective and subjective sleep and activity measurements were collected from 295 adolescents in the Penn State Child Cohort follow-up examination. Objectively-measured variables were obtained through 7 consecutive days of actigraphy collection. HSD was calculated as the average sleep duration across 7 nights, and HSV was calculated as the standard deviation (SD) of intra-individual sleep duration. Subjects with <5 nights of sleep data were excluded from analysis. Self-administered questionnaires were used to collect subjectively-measured sleep, PA, and SB data. The relationships between sleep and behavior measures were assessed using linear regressions. All models were adjusted for age, sex, race and BMI percentile.

Results: On average, our sample was 16.8 years, 52% male, and 79% white. We found that higher SB was associated with shorter HSD. With one SD change in objectively-measured SB (1014 minutes), HSD is reduced by 16 (3.6) minutes (p<0.05). Although not statistically significant, subjective SB showed a similar pattern. Unexpectedly, both objective and subjective measures of increased PA were associated with shorter HSD. In terms of HSV, we found that higher subjective SB was associated with greater HSV; specifically, with one SD change in subjectively-measured SB (8.64 points), HSV increased by 0.011 (0.004) minutes. None of the PA measures were significantly associated with HSV.

Conclusions: In conclusion, objectively-measured sleep patterns are related to physical activity/inactivity. Our results emphasize the need of future studies to systematically assess the inter-relationship of sleep and physical activity in this population.

Introduction: Obesity is a primary risk factor for obstructive sleep apnea (OSA), and weight loss is a common recommendation for adults with OSA. However, we previously found that adults with OSA lost less weight than those without OSA during a 12-month behavioral weight loss intervention. The potential mechanisms underlying the blunted weight loss among those with OSA are currently unclear; however, one potential explanation may be lower adherence to the intervention and its prescribed behaviors. Purpose: These analyses examined whether measures of adherence to a behavioral weight loss intervention differed between adults with and without OSA. Methods: The sample was comprised of adults who were overweight or obese (N=114; 50.4±10.5 y, body mass index [BMI]: 34.0±4.6 kg/m²; 90.4% female, 82.5% white) who participated in a 12-mo behavioral weight loss intervention study. Participants wore a home sleep testing device (ResMed ApneaLink Plus) for one night at baseline (BL), 6 mo (6M), and 12 mo (12M). Those with an apnea-hypopnea index ≥ 5 were categorized as having OSA. Adherence to the intervention was assessed by: 1) attendance at group intervention sessions over 12 mo; 2) frequency of meeting daily caloric intake goals over 12 mo; 3) objectively-measured changes from BL in physical activity (steps/day, sedentary time, moderate-vigorous physical activity [MVPA]). Linear mixed models estimated the impact of OSA on these measures of intervention adherence following adjustment for sex, age, race, marital status, smoking status, and baseline BMI, while considering participant to be a random effect. Results: About half (52%) of the participants had OSA at BL, while 41% had OSA at 6M. Attendance at group sessions did not differ between those with and without OSA over 12 mo (74.5 vs. 75.7%; P=.72). However, adults with OSA met their caloric intake goal less frequently than those without OSA (25.2 vs. 34.8%; P=.006), and adults with OSA increased their steps/day (+378.3 vs. 1060.1; P=.047) and MVPA min/day (+2.1 vs. +6.4; P=.056) less than those without OSA. Reductions in sedentary behavior (min/day) did not differ between those with and without OSA (-7.1 vs. -9.1; P=.81). Conclusions: These data suggest that the blunted weight loss observed among adults with OSA may be at least partially attributable to lower levels of adherence to prescribed goals for caloric intake and physical activity. Additional strategies (e.g., OSA screening and treatment referral, supplemental sessions on diet and MVPA) may be needed to achieve improved adherence to the lifestyle behaviors that lead to weight loss among adults with OSA.


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Funding Component:
P339

Impaired Cardiac Autonomic Modulation in Adolescents: Role of Insomnia Symptoms, Objective Short Sleep Duration and Night-To-Night Sleep Variability

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Introduction: Impaired cardiac autonomic modulation (CAM), as measured by heart rate variability (HRV), has been associated with increased risk of cardiovascular morbidity. Inadequate sleep has been shown to contribute to impaired CAM, however, it is not clear what sleep problems are independently associated with impaired CAM in adolescents, a population in which insomnia symptoms, short sleep duration and night-to-night sleep variability are highly prevalent. Hypothesis: Insomnia symptoms, objective short sleep duration and high sleep variability are independently
associated with worse HRV indices in adolescents. **Methods:** Data from the Penn State Child Cohort, a randomly-selected sample of 421 adolescents (12-23y) was used. Insomnia symptoms were defined by the presence of self-reported difficulties falling and/or staying asleep on the Pediatric Sleep Questionnaire. All subjects underwent 9-hour, in-lab polysomnography (PSG) and wore an actigraphy (ACT) monitor in the non-dominant wrist for 7 days. Mixed-effect regression models predicting HRV indices included insomnia symptoms, PSG sleep duration and ACT sleep duration and its variability (standard deviation) adjusted for each other as well as for sex, race, age, body mass index, and apnea/hypopnea index. **Results:** Shorter PSG sleep duration and higher ACT sleep variability were independently associated with decreased parasympathetic and increased sympathetic nervous activity [e.g., SDNN: 2.05±0.70, p<0.01 and -4.50±1.14, p<0.01 and Log-HF: 0.10±0.03, p<0.0 and -0.10±0.05, p=0.05, respectively], while ACT sleep duration or self-reported insomnia symptoms were not [e.g., SDNN: -0.57±0.84, p=0.49 and 0.90±1.26, p=0.47 and Log-HF: -0.06±0.04, p=0.12 and 0.05±0.06, p=0.37, respectively]. **Conclusions:** Objective, but not subjective, measures of sleep are associated with impaired CAM in adolescents. Interestingly, short PSG sleep duration and high ACT sleep variability are independently associated with impaired CAM in adolescents. Future studies should examine whether a more severe type of insomnia symptoms, i.e., chronic insomnia, is associated with impaired CAM in adolescents.

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

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**P340**

**Information on Bedtimes and Wake Times Improves the Relation Between Self-Reported and Objective Assessments of Sleep in Adults**

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**Introduction:** Epidemiological studies often utilize self-reports to characterize total sleep time (TST). Studies provide discordant information on the association between self-reported and objective TST with some finding weak or no correlations and bias in reporting based on sex and body mass index. **Objective:** Our goal was to investigate the correlation between self-reported and objective measures of TST in a diverse sample of adult men and women volunteering to participate in sleep studies and determine whether sex, race/ethnicity, and weight status influence this association. **Methods:** Participants were individuals who screened for participation in sleep studies for whom we had >7 d of wrist actigraphy sleep data (TSTobj) and subjective total sleep time (TSTPSQI) reported using the Pittsburgh Sleep Quality Index (PSQI) questionnaire (n=53 men and 60 women; n=67 minority/Hispanics; age 30.9±9.7y; BMI 26.2±3.2kg/m²). Results: Average TSTPSQI was greater than TSTobj (0.63±0.99h, p<0.0001). In univariate regression analyses, the difference between TSTPSQI and TSTobj did not vary by sex (ß=0.12, p=0.52), race/ethnicity (ß=0.15, p=0.48), age (ß=-0.01, p=0.27), or BMI (ß=0.04, p=0.13). Overall, there was no correlation between TSTobj and TSTPSQI (r=0.12, p=0.22), which did not vary when sex was analyzed separately (men: r=0.20, p=0.15; women: r=0.046, p=0.73). Interestingly, there were moderate and highly significant correlations between self-reported and objective assessments of bedtime (r=0.42, p<0.0001) and wake time (r=0.35, p<0.0001). We therefore used bedtime, wake time, and time to fall asleep information on the PSQI to...
calculate a new TST_{bed/wake}. Average TST_{bed/wake} was greater than TST_{obj} (0.79±0.76h, p<0.0001). This measure was correlated with TST_{obj} (r=0.57, p<0.0001); with strong correlation in women (r=0.76, p<0.0001) and moderate correlation in men (r=0.36, p=0.0082). In univariate regression, the difference between TST_{bed/wake} and TST_{obj} varied by age (β=-0.020, p=0.0051), BMI (β=0.054, p=0.0021), race/ethnicity (β=0.36, p=0.021), and sleep efficiency (β=-0.089, p<0.0001). Conclusions: Self-reported bedtimes and wake times were more accurately reported than estimated TST_{PSQI} and provided a more reliable estimate of TST. In general, the degree of over-reporting was greater in younger and heavier individuals, non-White/Hispanics, and those with low sleep efficiency. Although self-reported assessments of sleep duration over-estimated objective measures by approximately 45 min, using information on habitual bedtimes, wake times, and time to fall asleep improved the relation in both men and women.

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P341

Poor Sleep Patterns Are Associated With Decreased Performance on the Montreal Cognitive Assessment in Both Younger and Older Women

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Introduction: Poor cardiovascular health has been linked to an increased likelihood of cognitive impairment in older adults. Cognitive impairment has also been identified as an emerging co-morbidity of obstructive sleep apnea, a highly prevalent sleep disorder, particularly in patients with neurological conditions. Whether other aspects of sleep, including sleep duration, sleep quality, sleep onset latency, and insomnia are associated with cognition is not established. Objective: The aim of this study was to evaluate whether specific sleep patterns were associated with cognitive function in a diverse population of both younger and older, neurologically healthy women, and to determine whether this association is mediated by cardiovascular disease (CVD) risk factors. Methods: This was a baseline analysis of 392 women (59% racial/ethnic minority, mean age=39±16.53y, range 20-76y) participating in the ongoing American Heart Association Go Red for Women Strategically Focused Research Network population-based study at Columbia University Medical Center (CUMC). Cognitive function was assessed by the validated Montreal Cognitive Assessment (MoCA) screening instrument. Sleep duration, sleep quality, and time to sleep onset were assessed using the Pittsburgh Sleep Quality Index; insomnia was assessed using the Insomnia Severity Index. Blood lipids and glucose were measured in the biomarker core laboratory at CUMC. Multivariable linear regression models were used to evaluate associations between sleep, CVD risk factors, and MoCA scores, adjusted for age, race/ethnicity, education, health insurance, and tested for interactions between age and sleep. Results: The prevalence of abnormal MoCA (score <26) was 38%; mean scores were lower in adults ≥55y vs. <55y (p<0.0001), and racial/ethnic minorities vs. whites (p<0.0001). Average nightly sleep duration was 6.75±1.29 h, and 50% of women had poor sleep quality. In multivariable models testing for interactions, lower MoCA scores were associated with shorter sleep duration (p=0.007), worse quality sleep (p=0.0005), and higher insomnia level (p=0.04). In stratified analyses, associations between MoCA scores and sleep duration, sleep quality, and insomnia persisted among both younger (<55y) and older (≥55y) groups. Lower MoCA scores were also associated with higher
triglycerides (p=0.0001) and lower HDL-cholesterol (p=0.0006); formal tests of mediation suggested that the relation between cognition and insomnia was mediated by triglyceride level. **Conclusions:** Poor sleep patterns were highly prevalent and associated with lower cognitive function, even in younger women in this diverse population. Sleep patterns should be further investigated as a potential mechanism to identify individuals at risk of cognitive decline. Whether the relation is causal or mediated through traditional CVD risk factors deserves further study.

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**P342**

**Associations Between Sleep Duration and Sleep Quality and Long-Term Weight Status in Post-Bariatric Surgery Patients**

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**Introduction:** The prevalence of obesity continues to rise since 1980. This obesity epidemic has been paralleled by a trend of reduced sleep duration and sleep quality throughout the years. However, there is limited research on the relation between sleep duration and quality and its association with weight loss maintenance. The purpose of this study was to examine the association between sleep duration and quality and weight status in post-bariatric surgery patients at 9-y post-surgery. We tested the hypothesis that participants’ post-surgical weight change would be related to sleep duration and quality at 9-y.

**Methods:** Sleep data were collected on a subset of participants (mean body weight = 94.1 kg ± 18.9) enrolled in an ancillary study to the Longitudinal Assessment for Bariatric Surgery trial. Self-reported hours of sleep per night and overall sleep quality were assessed once, at the 9-y visit using the Pittsburgh Sleep Quality Index (PSQI) questionnaire.

**Results:** Complete data were available on 14 participants (10 females and 4 males, age 52.1 ± 15.6 y), current weight 94 kg ± 18.9. Average total weight loss from pre-surgery was 28.5% ± 10.6, with an average weight gain of 0.3 ± 6.2 % over the last 2 y of follow-up. Participants reported average sleep duration of 6.8 ± 2.0 h/night at the 9-y evaluation visit and an average score of 7.9 ± 3.7 on the PSQI. There was no relation between sleep duration and current weight or percent weight change after maximum weight loss, which occurred around 2-y post-surgery. However, there were trends for an association between sleep quality and percent weight change after maximum weight loss (p=0.057) and percent weight change in the last 2-y of follow-up (p=0.066). In general, participants who lost more weight over the last 2 y of the study had lower scores on the PSQI, indicating better quality of sleep.

**Conclusion:** Our results showed no association between sleep quality or duration and long-term changes in weight for patients who underwent bariatric surgery. However, those with better sleep quality tended to have more beneficial changes in weight over the latest 2-y. It is important to note that this study cannot address causality and whether improved weight influenced sleep quality or whether sleep quality influenced weight change. Further studies should examine the temporality of these association. Sleep quality may be an important sleep metric to consider for long-term weight loss maintenance.

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Sex Differences in Cardiovascular/Cerebrovascular Mortality Risk Associated With Chronic Insomnia

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Introduction: It remains unknown whether individuals with chronic insomnia are at increased risk of mortality, particularly cardiovascular or cerebrovascular (CVD/CBV) mortality. Given the higher prevalence of insomnia in women than in men, it is unknown whether its prognosis in terms of mortality is also different across sexes. Hypothesis: The risk of CVD/CBV mortality associated with chronic insomnia is significantly higher than in non-complaining individuals and this risk is modified by sex. 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 their cause of death up to 15 years. Sleep difficulty was assessed based on three levels of severity: chronic insomnia (i.e., a complaint of chronic sleep difficulties lasting at least 1 year), poor sleep (i.e., moderate-to-severe sleep difficulties at any given time) and none (i.e., absence of either of the two categories). Cox regression models controlled for potential confounders, including age, race, body mass index, years of education, smoking, sleep disordered breathing, alcohol use, mental health problems, hypertension, diabetes, heart disease, stroke and other physical health problems. Results: Poor sleep and chronic insomnia were significantly more prevalent in females (26.7% and 10.7%, respectively) than males (17.6% and 4.1%, respectively). A significant interaction (p = 0.04) showed that the risk of CVD/CBV mortality associated with chronic insomnia was modified by male sex, while poor sleep was not significantly associated with increased risk of CVD/CBV mortality in either males or females. Chronic insomnia was associated with a 2.9-fold (95%CI=1.53-5.61) increased risk of CVD/CBV mortality in males even after adjusting for all confounders, while this risk was not significantly elevated in females (HR=1.13, 95%CI=0.56-2.31). Conclusions: Chronic insomnia is associated with increased risk of CVD/CBV mortality in males, while it has a better prognosis in females despite its higher prevalence. These data suggest potential sex-related vulnerabilities in the underlying mechanisms linking chronic insomnia with CVD/CBV morbidity and mortality.


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P344

Sleep Duration and Obesity: Impact of Demographics, Socioeconomic Status, Health Behaviors, and Health Status

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Introduction: Many studies have shown that sleep duration is associated with obesity. It is unclear, though, whether this relationship exists equally across groups and whether it depends on demographics, socioeconomics, or aspects of health. Methods: Nationally-representative data from the 2016 BRFSS was used. Obesity was calculated as BMI≥30. Sleep duration was categorized as very short (≤4), short (5-6), normal (7-8), and long (≥9). Covariates included demographics (age, sex, race/ethnicity, education, marital status), socioeconomic (education, income, employment, # children), health risk factors (smoking, heavy drinking, sedentary lifestyle, access to a doctor, foregoing medical care due to cost), and health status (physical health, mental health, health-related limitations). Weighted logistic regression examined 5 models (unadjusted, demographics, add socioeconomics, add health behaviors, add health status). Whether relationships depended
on covariates were evaluated with interaction terms and followed up by stratified analyses. Results: See Table for associations between sleep duration and obesity across all 5 models. In all models, very short, short, and long sleep were all associated with obesity, with very short sleep carrying the greatest risk. Note that as the number of covariates increased, the analytic samples were smaller. Interaction terms for all variables were statistically significant (p<0.001). Very short and short sleep effects were strongest in the youngest adults. Relationships were stronger in women. Sedentary individuals, heavy drinkers, and smokers demonstrated a weaker relationship. Lack of care was associated with a stronger relationship. Conclusions: Both short and long sleep are associated with obesity, even after accounting for many covariates. However, this relationship depends on factors such as age, sex, race/ethnicity, socioeconomic status, and health. This will help towards understanding risk and targeting interventions.

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P345

Short Sleep Duration is Associated With Atrial Fibrillation in a Clinical Cohort

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Introduction: Patients who self-report short sleep duration are thought to have a higher risk of atrial fibrillation (AF), but objective data are lacking and it is not clear if this association is independent of sleep apnea. In this cross-sectional investigation, we evaluated the association between objectively measured sleep duration and AF in patients undergoing diagnostic sleep study.

Methods: We evaluated all 30,572 patients who underwent in-laboratory diagnostic sleep study at one of six centers within the University of Pittsburgh Medical Center system from March 1999 to December 2015. Total sleep time (TST), apnea hypopnea index (AHI), percent sleep with oxygen saturation < 90% (Per90), and cardiac rhythm on overnight EKG were extracted from sleep study reports using automated algorithms. Multivariable linear regression was used to model TST as a function of rhythm accounting for age, sex, body mass index (BMI) and sleep apnea severity using both AHI and Per90. We also performed a sensitivity analysis using patients whose AF status was confirmed by an inpatient or outpatient ICD-9 code at any point up to one day prior to the date of the sleep study.

Results: The cohort was 52.0% female, aged 50.8±14.6 years (mean ± std dev), had a BMI of 33.7 ± 8.7 kg/m², and an AHI of 17.4 ± 22.6 events/hr. Of the 30,572 patients, 369 (1.2%) had AF, 60 had a paced rhythm, 28,844 were in sinus, and 1299 had unclear rhythm. After adjusting for age and sex, TST was lower by 34 minutes (95% confidence interval, 26-42) in patients in AF compared to those in sinus rhythm. After further adjustment for BMI, AHI and Per90, TST was 28 minutes (18-38) lower for those in AF. The TST difference between patients in AF and sinus was primarily related to reduction in stage 2 non-REM sleep; AF patients had 32 minutes (22-41) less stage 2 sleep after adjustment. In a sensitivity analysis limited to 268 AF subjects with at least one AF diagnostic
code and 26,239 sinus rhythm subjects without an AF diagnostic code, TST was 29 minutes (17-41) shorter in AF patients after adjustment. Conclusion: After accounting for differences in demographics and sleep apnea severity, patients with AF sleep about half an hour less on objective assessment. Our findings support an association between short sleep and AF. Future prospective studies are needed to determine if short sleep may be a novel mechanism for the development of AF.


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P346

Joint Associations of Obstructive Sleep Apnea and Excessive Daytime Sleepiness With Incident Cardiovascular Disease

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Background: Although excessive daytime sleepiness (EDS) is a common symptom of obstructive sleep apnea (OSA), and both EDS and OSA have separately been associated with increased risk of cardiovascular disease (CVD), their joint association with CVD risk is unknown. Examining the association of EDS and OSA with CVD risk may help refine the OSA phenotype.

Methods: Among 3,874 Sleep Heart Health Study participants without prevalent CVD, moderate to severe OSA was defined by an apnea hypopnea index (AHI) ≥ 15 events per hour on in-home polysomnography. EDS was defined as an Epworth Sleepiness Scale score ≥ 11. Incident CVD events included adjudicated myocardial infarction, coronary revascularization and stroke. Cox proportional hazards models adjusted for age, sex, alcohol, smoking, and body mass index.

Results: Mean age was 63.0 years with 55.4% female, mean AHI 9.3 events/hour, and 23.4% with EDS. Over a median of 10.4 years of follow-up, we identified 653 incident cases of CVD. In adjusted analyses, EDS (Hazard ratio: 1.22, 95% CI 1.01-1.47) but not moderate-severe OSA (HR: 0.98, 0.81-1.20) was associated with incident CVD. In stratified analyses, the CVD incidence rate varied from 15.6/1000 person-years in those with no OSA or EDS to 26.0/1000 person-years in those with OSA and EDS (figure). In multivariable analyses, the hazard ratio for moderate-severe OSA and EDS compared to no OSA and no EDS was 1.26 (0.91-1.73). Formal tests of statistical significance of the OSA and EDS interaction were not significant on either the additive or multiplicative scales.

Conclusions: Having both EDS and moderate-severe OSA was not associated with an increased risk of CVD in our data.


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P347

Association Between Sleep Patterns and the American Heart Association Life’s Simple 7 Among Women

Nour Makarem, Marie-Pierre St-Onge, Ming Liao, Brooke Aggarwal, Columbia Univ Medical Ctr, New York, NY
Introduction: The American Heart Association’s Life’s Simple 7 (AHA LS7) is a measure of cardiovascular health that evaluates seven lifestyle behaviors and clinical risk factors to track the population’s progress towards the AHA 2020 strategic goals. Sleep is an emerging lifestyle risk factor for cardiovascular disease that is not currently included in the AHA LS7. Our aim was to assess the relation of sleep with the AHA LS7 within a diverse sample of women.

Hypothesis: We hypothesized that a longer sleep duration, good sleep quality, low risk for obstructive sleep apnea (OSA), and absence of insomnia and snoring would be associated with a higher global AHA LS7 score and its component scores, as measures of compliance to overall and individual AHA LS7 guidelines.

Methods: Baseline data from the AHA Go Red for Women Strategically Focused Research Network cohort at Columbia University Medical Center, an ongoing prospective study, were examined (n=323, >50% minority/Hispanic, mean age: 39y, range: 20-76y). Sleep was self-reported using validated questionnaires. A standardized scoring system was used to compute the global AHA LS7 score using criteria for smoking, diet, physical activity, body mass index (BMI), blood pressure (BP), total cholesterol, and fasting glucose. Women received a score of 2 (optimal), 1 (average), or 0 (poor) based on their compliance with each AHA LS7 guideline. The seven component scores were summed to create the global AHA LS7 score. T-tests, Fischer’s exact test and multivariable-adjusted regression models were used to evaluate associations between sleep and the global AHA LS7 score and its components.

Results: The median global AHA LS7 score was 10; 31.3%, 33.3% and 35.3% of women had a score of 0-8 (poor), 9-10 (average), and 11-14 (optimal), respectively. Participants with sleep duration ≥7 hours, lack of insomnia and snoring, and low risk for OSA were more likely to meet ≥4 of the AHA LS7 metrics (ps0.04). Those with sleep duration ≥7 hours, good sleep quality, no insomnia and snoring, and at low risk of OSA were more likely to meet the AHA LS7 optimal guideline for physical activity, BMI, BP, glucose, and cholesterol (ps0.04). In multivariable-adjusted linear regression models, a lower global AHA LS7 score was associated with a higher Pittsburgh Sleep Quality Index, indicative of poorer sleep quality (β=-0.08, p=0.019), higher insomnia severity index (β=-0.05, p=0.027), and higher risk for OSA (β=-0.84, p=0.016).

Conclusions: In this cohort of women, better sleep habits were associated with meeting the AHA LS7 guidelines. Our results warrant confirmation in larger prospective studies and within other population groups, but nonetheless highlight the potential importance of screening for sleep habits in conjunction with other lifestyle behaviors to identify those at risk of cardiovascular disease.


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P348

Association Between Sleep Apnea and Blood Pressure Control Among African-Americans, the Jackson Heart Study

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Background: African-Americans have the highest prevalence of elevated blood pressure...
(BP) and poorer BP control than other racial/ethnic groups in the US. Untreated sleep apnea, common among minority populations, may explain the high prevalence of uncontrolled BP. We studied the association of objective measurements of sleep apnea severity with resistant hypertension and uncontrolled BP among African-Americans in the Jackson Heart Study (JHS) Sleep Ancillary study.

Methods: Between 2012 and 2016, JHS participants (N=913) underwent an in-home sleep apnea study (measuring nasal pressure, abdominal and thoracic inductance plethysmography, oximetry, position, ECG); resting blood pressure; anthropometry; and completed questionnaires. Sleep apnea was defined as an apnea-hypopnea index >15 and nocturnal hypoxemia was quantified as % sleep time <90% oxyhemoglobin saturation (%Sat<90%). Elevated BP was defined as systolic BP ≥ 140 mmHg or diastolic BP>90mmHg. Controlled BP was defined as systolic BP <140mmHg or diastolic BP <90mmHg. Uncontrolled BP was defined as having elevated BP with use of <2 antihypertensive medications. Resistant hypertension was defined as having elevated BP while on 3-4 antihypertensive medications with one being a diuretic; or use of >4 antihypertensive medications. The study sample was limited to individuals with prevalent hypertension (N=613). Multinomial models were fit to determine the association between sleep apnea severity and resistant hypertension or uncontrolled BP (vs. controlled BP) adjusted for age, sex, education, smoking status, obesity (body mass index>30) and diabetes.

Results: The study sample had a mean age of 54.8 years, were predominately female (69.8%), obese (57.8%), and college educated (52.7%). Approximately 40.5% had sleep apnea, which was untreated in 95% of individuals. Among the sample, 25.4% had uncontrolled BP and 4.9% were classified as resistant hypertension. After adjustment for confounders, individuals with sleep apnea had a 2.6-fold higher odds of resistant hypertension (95% confidence interval: 1.1, 5.9). A standard deviation higher %Sat<90% was associated with a 41% higher odds (1.1, 1.8) of resistant hypertension after adjustment for covariates. Sleep apnea and %Sat<90% were not related to uncontrolled BP. Conclusion: Among our sample of African-Americans in the JHS, sleep apnea was related to resistant hypertension but not uncontrolled BP. The study identifies the high burden of untreated sleep apnea in African-Americans and its association with resistant hypertension, a significant risk factor for stroke and heart disease. Research is needed on the impact of treating sleep apnea as a strategy for decreasing resistant hypertension, and thus, narrowing cardiovascular health disparities.


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P349

Accelerometer-measured Sleep Duration and Markers of Cardiometabolic Health: Findings From a Large Racially Ethnic Diverse Cohort of Older Adult Women

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Background: Cross-sectional and prospective studies have demonstrated that self-reported short sleep is a predictor of cardiometabolic conditions including obesity, Type 2 Diabetes, and cardiovascular events. The relationship may be non-linear, with short and long sleep related to markers of cardiometabolic risk. Research on
sleep duration and cardiometabolic health is limited by use of single item self-report sleep measures and homogeneous populations. The current study tested the hypothesis that accelerometer-measured sleep duration would be significantly associated with objective markers of cardiometabolic risk in older adult women. **Methods:** Cross-sectional data were analyzed in 2662 women (mean age: 79.05, 52.8% white, 29.8% black, 17.4% Hispanic), from the Objective Physical Activity and Cardiovascular Health Study, ancillary study to the Women’s Health Initiative. Women wore accelerometers on the hip for 24 hours over 7 days and completed a daily sleep log. To be included in the present analysis women must have validated night wear for at least 3 nights. Sleep data were scored according to a standard protocol using sleep logs and visual inspection of the accelerometer data. Body mass index (BMI) and fasting blood samples were obtained at home visits prior to accelerometer monitoring. Adjusting for age and race/ethnicity, linear regression models estimated the relationship between sleep duration and BMI (kg/m^2), HDL cholesterol, triglycerides, and glucose (mg/dL each), and C-reactive protein (CRP; mg/L). A quadratic term for sleep was included in the models to evaluate nonlinearity. **Results:** The mean nightly sleep duration in the sample was 489.6 mins per night (8.16 hours) with 14.8% of the sample sleeping less than 7 hours per night and 21% sleeping more than 9 hours per night. After adjusting for age and race/ethnicity, sleep duration was significantly related to BMI (regression coefficient [B]: -0.034, p<.01), and the relationship appeared to be non-linear (quadratic, p=.02). The estimated quadratic function indicated a decreasing BMI as sleep duration increased up to 500 minutes/night, and then an increasing BMI as sleep duration continued to increase beyond 500 minutes/night. Additionally, sleep duration was significantly related to CRP (B: -0.005, p=.03), triglycerides (B: 0.002, p=.03) and glucose (B: -0.125, p=.05), with both the CRP (quadratic, p =.02) and glucose (quadratic, p =.03) relationships appearing to be u-shaped and the triglyceride relationship linear. Sleep duration was not significantly related to HDL cholesterol. **Conclusions:** In older women, there is a significant relationship between sleep duration and cardiometabolic risk factors, independent of age and race/ethnicity. These cross-sectional relationships should be further explored in prospective studies to inform sleep guidelines for better cardiovascular health in older adult women.


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P350

**Suboptimal Sleep and Metabolic Syndrome Risk Among White, Black, and Hispanic Women in the United States**

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**Introduction:** Previous studies identify suboptimal sleep as a risk factor for metabolic syndrome (Mets), but many lack racial/ethnic minorities. Our study objective was to investigate the relationship between suboptimal sleep and risk of MetS by race/ethnicity.

**Hypothesis:** We hypothesized that the positive association between suboptimal sleep and MetS is stronger among Black and Hispanic compared to White women.

**Methods:** We used longitudinal data (2003-2015) from 50,884 female participants (aged 35-74 years) of the Sister Study who were non-pregnant and without cardiovascular disease or
cancer. We defined suboptimal sleep by:
duration (short: <7 hours, recommended: 7-9
hours, long: ≥9 hours) and dichotomized
(yes/no) sleep parameters including sleep
irregularity (|average weekend-weekday sleep
duration| ≥2 hours), weekly napping, and
insomnia symptoms. We estimated prevalence
and cumulative incidence of MetS (defined as
obesity (BMI ≥ 30 kg/m²) and ≥2 self-reports of
either type 2 diabetes, hypertension, or
dyslipidemia as determined by physician
diagnoses or medication use). Among women
without prevalent MetS, we applied Poisson
regression, in the absence of date of onset, to
estimate MetS risk among women reporting
suboptimal versus favorable sleep parameters
by race/ethnicity. We adjusted for age at
baseline, socioeconomic characteristics, health
behaviors, and other confounders.

Results: Among 36,440 women at baseline,
mean age was 54.8 ± 8.8 years, 8.7% were non-
Hispanic Black, and 5.1% were Hispanic. Short
sleep (36% vs. 13%), irregular sleep (15% vs.
10%), napping (34% vs. 25%) and insomnia
symptoms (34% vs. 25%, all p<0.01) were higher
among Black compared to White women.
Hispanic women also had a higher prevalence of
short sleep and insomnia symptoms. Among
29,639 women
without MetS at baseline, compared to Whites
(cumulative incidence: 4.5%), Black women
(cumulative incidence: 9.7%; relative risk
(RR):1.32; 95% confidence interval (CI):1.14-
1.53, p<0.01) had a higher risk of MetS while
there was no difference for Hispanic women.
Only weekly napping was associated with
increased risk of MetS, and it was solely among
Whites (RR:1.19; 95% CI:1.06-1.34). All
interaction terms for racial differences were
non-significant (p>0.10).

Conclusions: Though higher among
racial/ethnic minorities, most suboptimal sleep
parameters were not associated with MetS risk,
and the relationships did not vary by race.
Future research in diverse populations is
warranted.

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P351

Evaluation of Analytic Approaches to Ceiling
Effect in Patient-Reported Functional Status
After Stroke

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Setting
Researchers use several tools to measure
functional status in stroke patients. Analyses
often use simple linear models, which assume a
common treatment effect regardless of stroke
severity. However, patients with mild stroke or
TIA may perform at the maximum of an
instrument, or the ceiling. The presence of a so-
called ceiling effect conflicts with the normality
assumption of linear models and can diminish
the ability to detect efficacy, unless addressed
in study design and analyses.

Objectives
Our objectives were to (1) review the literature
describing the instruments used to measure
functional status and the analytic methods used
in the presence of ceiling effect; and to (2)
valuate methods which may be used to account
for treatment effect heterogeneity induced by
ceiling effect in comparative effectiveness trials
of post-stroke functional status outcomes.

Methods
The literature review was conducted by two
reviewers using PubMed. To compare type I
error control and power in the presence of a
ceiling effect, we used simulation studies and
compared linear, logistic, and cumulative
logistic models. Data were simulated to mirror
the empirical distribution of instrumental
activities of daily living (IADL) scores found in the published data from the Secondary Prevention of Small Subcortical Strokes (SPS3) clinical trial, a study of lacunar stroke patients, in which there was a pronounced ceiling effect. To accommodate treatment effect heterogeneity induced by ceiling effect, we explored stratification by stroke severity.

**Results**

Our literature review yielded 262 stroke clinical trials that included patient reported outcomes. Only 41% of trials cited ceiling effect in the functional status instrument used; most did not account for it in their analyses. Our simulation studies demonstrate that while linear modeling may result in well controlled type 1 error rates in the presence of pronounced ceiling effect, study power may be unacceptably low. Dichotomizing the outcome and directly modeling the probability of maximum scores with logistic models may be preferred. In contrast, when outcome scores in the untreated group cover the range of the instrument, use of a linear model may be advantageous over logistic models that categorize the outcome.

**Conclusions**

It is important to consider the distribution of functional outcome scores in target stroke population when developing the analysis strategy for a study, perhaps by conducting a pilot study. Specifically, it is important to evaluate if the instrument being used can identify change in outcomes in low-severity groups. Lastly, powering the study to identify lesser treatment effect in low-severity patients may be useful as a secondary trial aim rather than attempting to establish benefit in all patients as a primary outcome.

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**P352**

**Racial Disparity in Post-stroke Readmission - a South Carolina 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. During our pilot investigation using 90-day post-stroke readmissions data at Medical University of South Carolina (MUSC), we found significant disparities between African Americans and Caucasians. **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 Health Sciences South Carolina (HSSC) Clinical Data Warehouse (CDW). The data was comprised of three institutions: Medical University of South Carolina (MUSC), Palmetto Health and Greenville Hospital System University Medical Center. The data consisted of on adult admissions with index diagnosis considered as an ischemic stroke (or closely related) using International Classification of Diseases, Ninth and Tenth Revision (ICD-9, ICD-10) codes between January 2011 and April 2017. Of these, we will determine readmission and reason for readmission over 90-day period. Readmission can be hospital or emergency room readmission. **Results:** Our database contains 32,548 patients who have been provided clinical care for stroke. Out of these patients, 8,308 (25.5%), 23,085 (70.9%) and 1,155 (3.5%) are African Americans, Caucasians and others, respectively. We will present
weekly readmission trends over 90 days and evaluate if there are disparities across races. We will apply chi-square test and Student’s t-test to determine statistical significance. For weekly readmission trends over 90 days, we will apply Kolmogorov-Smirnov test to identify difference in readmission patterns across races. We will also identify confounders like socioeconomic status and age and their influence in the racial disparity. Conclusions: From a single center retrospective data, we found that 90-days readmission rates involve African Americans in a disproportionate manner. This multicenter data analysis will further shed light on the etiology of readmission, confounders and the care offered.


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P353

Paradoxical Secular Trends in Stroke and Hypertension Incidences among Men and Women in Rural Areas of China: Results from Two Population-based Cohorts

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Background: Stroke has been the leading cause of death in China and hypertension accounts for about one-third of deaths due to stroke in Chinese adults. The current study aimed to examine the secular trends of stroke and hypertension in two population-based samples. Methods: The study included three cohorts (2004-2008, n=38,949; 2008-2010, n=38,264; and 2013-2016, n=8,880) from two population-based studies: Fuxin Cardiovascular Cohort Study (FCCS) and Northeast China Rural Cardiovascular Health Study (NCRCHS).

Results: There was a significant increasing trend for incidence of stroke in both men and women (P for trend <0.001). The age-adjusted incidence of stroke (per 100,000 person-years) among the 3 Cohorts was 575.3, 893.0, and 1382.7 in men and 358.9, 456.5, and 1046.2 in women, respectively. With the 2004 Cohort as the reference group, we observed a 52.9% increase in 2008-2010 and a 169.9% increase in 2013-2016 among men. However, hypertension incidence decreased steeply in both sexes from 2004-2008 (15.2 in men and 12.6 in women per 100 person-years) to 2013-2016 (9.6 in men and 7.1 in women per 100 person-years) (P for trend <0.0001).

Conclusions: Incidence of stroke has increased and incidence of hypertension decreased since 2004, which has implications for prevention of both diseases in China.

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P354

Assessment of Phased Implementation of a Mobile Stroke Unit for Acute Ischemic Stroke Treatment

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Introduction: The timing of administering tissue-type plasminogen activator (tPA) in patients with an ischemic stroke is directly related to clinical outcomes. The use of a mobile stroke unit (MSU) is a strategy to provide acute ischemic stroke assessment and treatment in a more rapid fashion compared to standard stroke transport and management. Our program initiated the use of a MSU in 2017 as a part of a phased implementation program. We sought to determine the impact of the MSU on the timing
of stroke care in the region as it related to proximity to the hospital.

**Methods**
We collected data during the first 9 months of 2017 on patients who were transported to the hospital as pre-hospital stroke alerts (PHSA) via conventional ambulance or via the MSU. Using a retrospective case-controlled design we compared process metrics associated with the phased implementation of the MSU with conventional pre-hospital stroke alerts as standard of care (SOC).

**Results**
There was a total of 178 stroke alert patients; 72 in the MSU group and 106 in the PHSA group. 35 patients received tPA, 16 in the MSU, 19 in SOC. There was no significant difference in age, body weight, race, gender, and length of stay in the hospital in the two groups. The time from 911 call to arrival on scene was 12.06 min versus 20.4 min in the PHSA and MSU groups, respectively. Despite a longer time for arrival TPA administration for patients within a 5 miles radius of the hospital was 89 ± 25 mins in the SOC group and 78±12 mins in the MSU group (p=0.11). For 911 calls originating 10-20 miles from the hospital, the time for 911 call to tPA was 106 ± 23 mins in the PHSA group (n = 4) and 86 ± 2 mins in the MSU group (n = 4).

**Conclusion**
Our initial results are comparable with previously reported data. Our data suggests the MSU may have a greater impact on reducing time to tPA for those further from the hospital or where transport time is delayed. The role of the MSU for non tPA patients such as mechanical thrombectomy, intracerebral hemorrhage and subarachnoid hemorrhage warrants further investigation.

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**P355**

**Socioeconomic Factors and Race Negatively Impact Performance Based Motor Skills Following Stroke: Evidence From the Health and Retirement Study**

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**BACKGROUND:** Evidence suggests that racial and ethnic minorities consistently have poorer post-stroke functional outcomes. **HYPOTHESIS:** We hypothesized that race in addition to socioeconomic status (SES) would correlate with poorer measures of functional outcomes in stroke patients. **METHODS:** Our aim was to identify factors that contribute to disparate functional outcomes among middle- and retirement-aged non-Hispanic whites (white) and non-Hispanic African Americans (AA). Through retrospective analysis of data from the Health and Retirement Study (HRS), we analyzed 2,831 respondents who reported incident stroke between 1999 and 2014. Respondents were asked to report perceived difficulty with gross and fine motor function and basic activities of daily living (ADL). Linear and logistic regression analysis determined independent predictors of post-stroke motor function and ADL. **RESULTS:** The analysis included 2,314 (82%) whites and 517 (18%) AA adults with stroke. The AA median age was 71 ± 11.3 while the white median age was 76 ± 10.5 (p<0.0001). Factors associated with more difficulty with ADL, fine motor function, and gross motor function included older age, female gender, AA race, and higher numbers of household residents. Surprisingly, the comorbidity score was only associated with difficulty in gross motor function. Moreover, the time since stroke did not associate with any performance measure. Increased difficulty with performance-based ADL, fine, and gross motor skills in AAs relative to whites, was associated with younger age, more residents in the home, and less household income. Although our analysis was limited due to the lack of long-
term follow-up in the HRS study, these data can help direct future stroke recovery health disparity studies. **CONCLUSIONS:** Our findings highlight the importance of examining contributing factors to racial disparities in post stroke outcomes.

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**P356**

**Prevalence of Left Ventricular Hypertrophy versus Atrial Fibrillation on Electrocardiogram in Stroke Patients**

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Background: While atrial fibrillation is a well established cause of stroke, a strong association has been previously postulated between left ventricular hypertrophy (LVH) and stroke. The prevalence and significance of LVH by electrocardiogram in stroke patients, however, is not clear. Objectives: To examine the prevalence of left ventricular hypertrophy by electrocardiographic (EKG) criteria, versus atrial fibrillation or flutter, in patients receiving an EKG for a diagnosis of stroke. Methods: An EKG database from a university cardiology noninvasive lab was examined for the diagnosis of stroke or CVA over a one year period. The EKGs were evaluated for the presence of LVH or atrial fibrillation/flutter. The results were analyzed using a categorical Chi square test. Results: There was a total of 14,798 EKGs performed over one year, 1,439 of which reported LVH (9.7%). There were 272 EKGs with a diagnosis of acute stroke or CVA (1.7% of total EKGs). Out of these, there were 174 EKGs in sinus rhythm without LVH (64%), 78 EKGs in sinus rhythm with LVH (29%, P < 0.05), and 20 EKGs in atrial fibrillation or atrial flutter (7.4%). Discussion: Stroke is major health problem associated with increased mortality and morbidity. Hypertension is a well established risk factor for stroke in addition to cardiovascular events, and when long-standing and uncontrolled, causes left ventricular hypertrophy on EKG. In our cohort nearly one third of patients with stroke were in sinus rhythm, but had left ventricular hypertrophy by EKG, a prevalence that was four time that of atrial fibrillation or atrial flutter, and three time the prevalence of LVH in the overall database. Therefore, LVH by EKG appears to predict an increased risk of stroke, and thereby need for aggressive work-up and risk factor modification. Further studies to examine blood pressure and other cardiovascular risk factors as correlates of LVH on EKG will help shed further light on this important observation.

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**P357**

**Trajectories of Stroke Risk Factors Before Stroke Onset With a 24-year Follow-up of Japanese People Living in an Urban Area: The Suita Study**

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Preventive Med and Public Health, Keio Univ, Shinjuku, Japan; Yoshihiro Miyamoto, Ctr for Cerebral and Cardiovascular Disease Information, Natl Cerebral and Cardiovascular Ctr, Suita, Japan

Introduction

Many studies investigated associations of stroke risk factors assessed at one point in time with stroke onset. However, few studies investigated growth curves (trajectories) of the stroke risk factors assessed at multiple points in time before stroke onset.

Hypothesis

We assessed the hypothesis that people with stroke, compared with their controls, would have higher values of the stroke risk factors at multiple points in time and higher change rates by year (slopes) of those factors before stroke onset.

Methods

The present study used a nested case-control design based on the Suita study that is a cohort study launched in 1989 with 15,746 community-dwelling participants in an urban city, Suita, Japan. During a 24-year follow-up, 201 cases (43.8% in women) were identified. Corresponding to the cases, 2010 controls (51.5% in women) matched by age (± 4 years) were identified by incidence density sampling. As the stroke risk factors, we included systolic blood pressure (SBP), diastolic BP (DBP), blood glucose level, body mass index, waist circumference, non-HDL cholesterol, and triglyceride assessed every two years on health check-ups. Linear mixed models were performed to investigate adjusted mean differences in the stroke risk factors between the stroke cases and the controls at 20, 15, 10, 5 years and the last assessment before stroke onset. Mean differences in slopes of the stroke risk factors before stroke onset were also investigated.

Results

The linear mixed models showed that SBP and DBP were significantly higher in the cases than the controls at any points in time before stroke onset (the adjusted mean differences [95% CI] at the last assessment before stroke onset: 4.52 [1.4, 7.64] mmHg for SBP and 2.93 [1.23, 4.63] mmHg for DBP). However, slopes of SBP and DBP were not significantly different between the cases and the controls. We observed no significant difference between the cases and the controls in blood glucose level at 20 years before stroke onset (the adjusted mean difference: 2.24 [-0.26, 4.74] mg/dl). However, compared with the controls, the cases significantly had a steeper slope of blood glucose increase (the adjusted mean difference in the slope per year: 0.21 [0.02, 0.40] mg/dl; and the adjusted mean differences at 15, 10, and 5 years and the last assessment before stroke onset: 3.29 [1.31, 5.26], 4.34 [2.51, 6.16], 5.39 [3.25, 7.52], 6.44 [3.69, 9.19] mg/dl, respectively). We observed no significant differences of means and slopes in BMI, waist circumference, non-HDL cholesterol, and triglyceride between the cases and the controls.

Conclusions

In conclusions, multiple assessments of the stroke risk factors on health check-ups can be useful to early identify people who will be likely to develop stroke by observing SBP and DBP at any points in time, and the trajectory of blood glucose level.


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P358

Relation of Microvascular Endothelial Function and Cognitive Performance in the ELSA-Brasil Study

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Introduction: Microvascular endothelial dysfunction may be implicated in the etiology of cognitive decline. Yet, current data on this association are inconsistent. Hypothesis: More impaired endothelial function (EF) is related to worse cognitive performance in adults.

Methods: In the ELSA-Brasil baseline examination, 1,521 non-demented participants underwent peripheral arterial tonometry (PAT) to quantify microvascular EF [PAT-ratio and mean baseline pulse amplitude (BPA)] and cognitive tests covering the domains of memory, semantic and phonemic fluency, and executive function. Linear regression and generalized linear models were used to assess the association between EF, global and specific cognitive performance. Adjustments were made for sex, age, level of education, alcohol intake, BMI, systolic blood pressure, antihypertensive use, diabetes mellitus, total/HDL cholesterol, smoking, prevalent cardiovascular disease, and use of neuroleptics.

Results: In unadjusted analyses, more impaired PAT measures was associated with worse global cognitive performance [difference per unit increase, BPA: -0.07 (95%CI: -0.11; -0.03), PAT-ratio: 0.11 (95%CI: 0.01; 0.20)]. Specifically, BPA and PAT-ratio were related to worse learning memory [difference per unit increase, BPA: -0.54 (95%CI: -0.78; -0.31), PAT-ratio: 0.96 (95%CI: 0.43; 1.48)], delayed memory [difference per unit increase, BPA: -0.26 (95%CI: -0.37; -0.14), PAT-ratio: 0.51 (95%CI: 0.25; 0.77)], and semantic fluency [difference per unit increase, BPA: -0.46 (95%CI: -0.77; -0.14), PAT-ratio: 0.72 (95%CI: 0.01; 1.43)]. However, adjustments for age, sex and level of education rendered the associations statistically non-significant.

Conclusions: The association between microvascular EF and cognition are explained by age, sex, and educational level. Measures of microvascular endothelial function may therefore be of limited value with regard to preclinical cognitive deficits.


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P359

Non-Alcoholic Fatty Liver Disease Severity is Associated With Aortic Stiffness Independently From Adiposity and Cardiovascular Risk Factors

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Background: Nonalcoholic fatty liver disease (NAFLD) encompasses a spectrum of conditions closely related to adiposity, hypertension, diabetes, and dyslipidemia. NAFLD has been consistently associated with adverse-health cardiovascular outcomes and subclinical atherosclerosis markers. However, there are contradictory findings (most of them with few participants) of the relationship between NAFLD and aortic stiffness: ones describing as an independent association, others as an association mediated by traditional cardiovascular risk factors. Hypothesis: NAFLD presence and severity is associated independently with aortic stiffness. Methods: We addressed this question among civil servants aged 35 to 74 years, 54% of them, women, and free of cardiovascular disease during the baseline of the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). The presence and severity of NAFLD were assessed by ultrasound hepatic attenuation validated with computerized tomography. Aortic stiffness was measured by the carotid-femoral pulse wave velocity (cf-PWV) by a non-invasive
certified device (Complior SP). We applied ANOVA to compare the estimated cf-PWVs means and 95% Confidence according to NAFLD categories. These values were adjusted for age, sex, race, waist circumference, diabetes, dyslipidemia, high sensitivity C reactive protein, mean arterial pressure, and use of anti-hypertensive drugs. Results: Among 7,156 participants, 63.5% did not have NAFLD, 22.7% were classified as mild NAFLD, 11.7% as moderate, and 2.1% as severe. An overview of crude means from the absence of NAFLD to severe NAFLD there were slightly older individuals, a higher proportion of men, lower frequency of current smokers, and people with at least or hypertension or diabetes or dyslipidemia. In the fully adjusted analysis, the cf-PWV (m/s) values were similar among subjects with absence of NAFLD [9.27 (9.18 to 9.36)] compared with the presence of either grade of NAFLD [9.24 (9.15, 9.32)] (p=0.285). However, there was a significant difference between cf-PWV for people without NAFLD [9.23 (9.15, 9.32)] compared with subjects with severe NAFLD [9.51 (9.31, 9.70)]. A significant high cf-PWV was significant thru NAFLD categories. (p-value for trend=0.045]). There was no effect modification of this association across age strata, sex, race, waist circumference and body mass index strata, and presence of hypertension, diabetes, and dyslipidemia. Conclusion: In a population of individuals free of cardiovascular disease, NAFLD severity was associated with aortic stiffness regardless of adiposity and the traditional cardiometabolic risk factors.

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P360

Comparison of Screening Electrocardiogram and Transthoracic Echocardiogram Abnormalities With ASCVD Risk Score Among Community Dwelling Women

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Background: Increased detection of heart disease in women has been advocated nationally in recent years. The atherosclerotic cardiovascular disease (ASCVD) risk score was validated as determinant of the 10-year risk for first occurrence of nonfatal myocardial infarction, coronary heart disease death, or fatal or nonfatal stroke in 2013. While measurement of blood pressure, glucose, and lipid levels are common in screening, the utility of non-traditional methods such as electrocardiogram (ECG) and transthoracic echocardiography (TTE) remains unknown. We examined the association of ECG and TTE abnormalities with ASCVD risk score among asymptomatic women from a community-based event.

Methods: Data were gathered from 355 women (mean age 53±13 years, 24.2% African American, 59.7% Caucasian, 6.2% Hispanic, 9.9% Others) from a voluntary cardiovascular community screening event sponsored by the 2BigHearts Foundation and Rush University Medical Center in February 2007 and May 2008. Demographics, lipid panel, blood pressure, self-reported medication lists, co-morbidities, screening TTE, and ECG were obtained. The 10-year ASCVD risk score was ascertained for the cohort (283 persons, 79.7%). Chi-square testing was used to determine association of ECG and/or TTE abnormalities with ASCVD risk score. Results: The average ASCVD risk score for the entire cohort was 5.49%, with a range from 0.1-49.2. The mean ASCVD risk score was elevated in patients with either ECG or TTE abnormalities compared to those with normal findings (ECG: 7.59±9.46 vs. 4.62±5.39, p<0.0014; TTE:...
8.19±10.12 vs. 4.81±5.73, p<0.037). The presence of both ECG and TTE abnormalities was associated with a higher mean ASCVD risk score compared to having either ECG or TTE abnormalities alone (ECG+TTE: 13.07±14.32 vs. ECG: 5.7±6.19 vs. TTE: 5.27±4.65, p<0.006).

**Conclusion:** Detection of ECG and/or TTE abnormalities are associated with elevated ASCVD risk scores in this cohort of asymptomatic women and could potentially identify patients at higher risk for cardiovascular events, and facilitate aggressive risk factor modification. Further studies are needed to confirm ECG and TTE as viable additional screening tools to traditional risk screening.

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P361

**Inflammatory Burden May Partially Mediate the Relationship Between Everyday Discrimination and Carotid Plaque Height in Midlife Women**

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**Introduction:** Self-reported experiences of discrimination have been associated with greater risk of incident cardiovascular events and all-cause mortality across racial/ethnic groups. However, questions remain regarding the potential mechanisms through which perceived discrimination may influence cardiovascular risk. Furthermore, the relationship between self-reported discrimination with markers of subclinical cardiovascular disease (CVD) such as atherosclerotic plaque presence, burden, and characteristics remains unclear. We hypothesized that perceived discrimination is associated with subclinical measures of carotid atherosclerosis indicative of greater CVD risk and that inflammation is a mechanism contributing to this relationship.  

**Methods:** Late peri- and postmenopausal women without clinical CVD (n=300) completed the Everyday Discrimination Scale, developed in order to assess day-to-day experiences of interpersonal mistreatment, and underwent B-mode ultrasound to assess carotid atherosclerosis. Associations between everyday discrimination and measures of carotid plaque presence, burden (total number of plaques, total plaque area), and characteristics (maximum height, grey-scale median, and calcification) were evaluated using linear and logistic regression models adjusted for demographics, as well as CVD and psychosocial risk factors. Overall circulating inflammatory burden, comprising C-reactive protein, interleukin-6, and fibrinogen was identified via exploratory factor analysis and was evaluated as a potential mediator of the relationship between everyday discrimination and subclinical CVD through the ratio of the natural indirect effect and the total effect by inverse probability weighting.  

**Results:** The sample was predominately white (72% white (n=216); 22% black (n=66)), nearly half the women (n=138) had at least one carotid plaque, and 40% (n=120) reported experiencing high levels of everyday discrimination. After adjustment, women who reported high levels of discrimination had a maximum carotid plaque height 0.29 mm higher (p=0.03) than those who reported lower levels of discrimination. Circulating inflammatory burden was identified
as a partial mediator of the relationship between high discrimination and carotid plaque height explaining 31% of the relationship. There were no significant associations of plaque presence, burden, or other plaque characteristics with discrimination, and the results did not vary by race/ethnicity.

**Conclusions:** These findings add to the growing evidence that perceived discrimination may be associated with elevated cardiovascular disease risk among women of various racial/ethnic groups. These results suggest that increased inflammatory burden may be a mechanism through which experiences of discrimination may be associated with the development of atherosclerosis in midlife women.

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**P362**

**Central Arterial Stiffness Increases Within One Year-interval of the Final Menstrual Period in Midlife Women: Study of Women’s Health Across the Nation (SWAN) Heart**

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**Introduction:** Substantial hormonal and adverse lipid changes have been reported within one-year interval of the final menstrual period (FMP) suggesting this interval as a critical time period in midlife women. Significant structural vascular remodeling has been documented during the late peri-menopausal stage, a stage characterized by amenorrhea for at least 3 months. Whether vascular functional changes also accompany the menopause transition and occur within one-year interval of the FMP is not clear. Central arterial stiffness as measured by aortic pulse wave velocity (aPWV), is a marker of vascular functional changes and a significant predictor of CVD events. Our aim was to test whether the change in aPWV differs by time elapsed since the FMP in midlife women. We hypothesized that aPWV would significantly increase within one-year of the FMP independent of aging and traditional CVD risk factors.

**Methods:** We evaluated participants with no self-reported CVD from the Study of Women’s Health Across the Nation (SWAN) Heart Ancillary study, a study of subclinical measures of atherosclerosis in midlife women at the Pittsburgh and Chicago sites. Women had up to two aPWV scans over a median of 2.2 years of follow-up and known FMP dates. Yearly % changes in aPWV were estimated in three time segments relative to the FMP (segment 1: more than 1 year before FMP, segment 2: within 1 year before and after FMP, and segment 3: more than 1 year after FMP) and compared using piecewise linear mixed-effects model with random intercepts. Final model was adjusted for time-varying age, race, study site, baseline systolic blood pressure, waist circumference, insulin resistance, physical activity, and history of hormone therapy use.

**Results:** The study included 304 women (At baseline: age mean(SD): 51.1(2.8) y; 62% White, 38% Black; 10% premenopausal, 52% early perimenopausal, 12% late perimenopausal, and 26% postmenopausal). In final model, estimates of the annual % change (95% CI) in aPWV were: -0.6% (-2.1%, 0.8%) for more than one year before the FMP, 3.8% (0.3%, 7.4%) within one year-interval of the FMP, and -2.1% (-4.0%, -0.1%) for more than one year after the FMP. The estimated annual % change in aPWV within the one year-interval of the FMP was significantly greater than the estimated changes
in the other two segments in final model, p<0.05 for both comparisons.  

Conclusions: The one year-interval around the FMP is a critical period in women's life when vascular functional alterations occur in central arteries independent of aging. These results are consistent with previous findings showing significant vascular structural changes and lipid levels worsening around the time of the FMP. Future research should examine the impact of the reported vascular functional changes on CVD risk after menopause.


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Visceral, but Not Subcutaneous Adiposity by Computed Tomography is Associated With Increased Aortic Wall Thickness in Psoriasis Patients

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Introduction: Patients with psoriasis (PSO), an inflammatory skin disease, experience increased cardiovascular disease and obesity. Traditional measures of obesity, such as BMI and waist-to-hip ratio (WHR), do not fully capture the increased cardiovascular risk. Assessment of adipose tissue distribution via CT scan enables characterization of visceral adiposity (VAT) versus subcutaneous adiposity (SAT), which is clinically useful as excess VAT is known to be associated with cardiovascular events. Aortic Wall Thickness (AWT) is a validated measure of subclinical atherosclerosis. However, the relationship between adiposity distribution and AWT is unknown. Hypothesis: We hypothesized that VAT, but not SAT, BMI, or WHR, would be associated with increased AWT in PSO patients. Methods: Consecutive PSO patients (n=164) underwent quantification of VAT and SAT via CT, and AWT via MRI of the descending aorta. Interrelationships were analyzed via multivariable regression. Results: Patients were middle-aged (mean 50.4), predominantly male (56%), and were at low cardiovascular risk (median Framingham risk 3), despite high prevalence of hyperlipidemia (47%). VAT was significantly associated with AWT (β=0.18, p=0.04), SAT, BMI, or WHR did not demonstrate similar association. This association persisted beyond adjustment for SAT, Framingham score, insulin resistance, and systolic BP (β=0.30, p=0.03). Conclusions: Visceral adiposity demonstrated an association with AWT, a marker of early atherosclerosis, whereas subcutaneous adiposity, BMI, and WHR did not. These findings add to a growing body of literature that visceral fat and its assessment may provide incremental data for risk of subclinical CVD.


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P364

Baseline and Change in Blood Pressure Are Associated With Central Arterial Stiffening and
Pressure Pulsatility in Older Adults: The Atherosclerosis Risk in Communities Study - Neurocognitive Study (ARIC-NCS)

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Background: Greater central arterial stiffness and pulsatility predict target organ small vessel disease and all-cause mortality. Understanding change in artery stiffness and pulsatility and their determinants has implications for prevention. Reports of the temporal association of blood pressure with arterial stiffness and pulsatility are conflicting.

Objective: Characterize the prospective association of blood pressure with changes in arterial stiffness and pulsatility in a population of older black and white adults.

Methods: This is a preliminary analysis of 864 adults (508 women; 164 black; mean age 74 years) examined in both visits 5 (2011-2013) and 6 (2016-2018; n=4,215 expected) of the population-based ARIC-NCS. At both visits, certified staff measured arterial stiffness (carotid-femoral PWV (cfPWV), brachial-ankle PWV (baPWV)) and pulsatility (central pulse pressure (cPP)). Associations of baseline (visit 5) and annual change in SBP, diastolic blood pressure (DBP), and central SBP (cSBP) with the annual change in PWV and cPP were evaluated by multivariable linear regression. We adjusted for age, sex, race-center, and visit 5 heart rate, body mass index, smoking status, hypertension medication, and type 2 diabetes.

Results: Over the 5 years between visits, cfPWV increased by 28 cm/s/y, baPWV increased by 28 cm/s/y, and cPP increased by 0.62 mmHg/y. Higher baseline SBP, DBP, and cSBP were associated with lower annual change in cfPWV, baPWV, and cPP (Table). Higher annual changes in SBP, DBP, and cSBP were associated with greater annual change in cfPWV, baPWV, and cPP. Their effect on annual change in cfPWV, baPWV, and cPP were “double that of the baseline measures. Conversely, baseline PWV was not associated with annual changes in blood pressure.

Conclusion: Annual changes in SBP, DBP, and cSBP are modifiable traits that were positively associated with change in arterial stiffness and pulsatility. Lowering blood pressure, therefore, may reduce the progression of arterial stiffness among older adults.


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Objectively Measured Snoring is Associated with Carotid Vascular Remodeling in Overweight and Obese Adults

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Introduction: Snoring is often used as a surrogate measure for obstructive sleep apnea (OSA), a sleep disorder associated with elevated cardiovascular disease (CVD) risk. Although the literature supports a link between snoring and CVD, it is not clear if this association is independent of OSA. The objective of our study was to explore the association between snoring and subclinical CVD in adults with and without OSA. We hypothesized that snorers would have a greater burden of subclinical CVD, including thicker carotid intima media thickness (CIMT) and higher pulse wave velocity (PWV).

Methods: Cross-sectional analyses were conducted using 24-month follow up data from the Slow Adverse Vascular Effects (SAVE) study, a randomized controlled trial evaluating the effects of weight loss, increased physical activity, and reduced dietary sodium intake on vascular health. The original population included 349 men and women aged 20-45 years and BMI 25-40 kg/m². Participants (n=122) with objective measures of sleep-disordered breathing from a home-based sleep assessment (ResMed ApneaLink) were grouped into three categories using the snoring index (SI) and oxygen desaturation index (ODI). SI is defined as the number of vibratory snoring events per hour of recording time. ODI is the number of oxyhemoglobin desaturations of ≥4% per hour of recording. The snoring categories were: OSA (ODI≥5; n=41), heavy snoring (ODI<5, above-median SI; n=40), and normal snoring (ODI<5, below-median SI; n=41). Vascular measures such as carotid-femoral PWV (cfPWV), femoral-ankle PWV (faPWV), brachial-ankle PWV (baPWV), CIMT, and carotid inter-adventitial diameter were compared across snoring groups. We used multiple linear regression to assess the association between snoring and subclinical CVD independent of age, sex, BMI, mean arterial pressure, and intervention group.

Results: Participants were on average 40.1 ± 5.9 years old (BMI of 31.6 ± 4.4 kg/m²; 76.2% women and 82% white). Across snoring severity categories, most CVD risk factors worsened including age, blood pressure, BMI, lipids, and fasting glucose (ANOVA; all p <.05). Similarly, vascular measures including faPWV, baPWV, CIMT, inter-adventitial diameter and bulb IMT differed across snoring categories with differences occurring mainly between the normal snoring and OSA groups. Differences in carotid inter-adventitial diameter and CIMT were noted between normal and heavy snoring groups (6.52 ± 0.49 vs. 6.83 ± 0.49; 0.58 ± 0.06 vs. 0.63 ± 0.07; mm), respectively. Following covariate adjustment, differences in carotid inter-adventitial diameter and IMT persisted between normal and heavy snoring categories (p <.05).

Conclusion: Our findings suggest that, in overweight and obese adults, objectively measured snoring is related to indices of local vascular remodeling and aging, even in those without OSA. Snoring severity may be associated with CVD risk.

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Repeatability of Cardio-Ankle Vascular Index in Morbidly Obese Individuals

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Background: The AHA 2016 Statement for arterial stiffness evaluation introduced several novel parameters. Cardio-ankle vascular index (CAVI) is one of them and has a unique property of being largely independent of blood pressure (BP) at the time of examination. The repeatability of CAVI has been confirmed in
healthy population but not in morbidly obese individuals. **Methods** We investigated 76 participants (mean age 44 years, and mean BMI 48 kg/m² [ranged from 36-70]) in the BARI-Heart Study, who underwent 2 standardized visits (1-10 months apart) before bariatric surgery. CAVI was measured twice 5-minute apart at each visit using oscillometric device VaSera VS-1500 (Fukuda Denshi, Tokyo, Japan) at a supine position. We calculated intra-class correlation coefficient (ICC), minimal detectable change (MDC₉₅) and minimal detectable difference (MDD) using a nested random-effects analysis of variance model for CAVI. As a contrast, we also calculated these repeatability statistics for brachial and ankle BP measured using the same device when CAVI was measured. **Results** At the first visit, average CAVI was 6.2 (SD 1.1) and average brachial systolic and diastolic BP was 146 mmHg (SD 13) and 86 mmHg (SD 7). For short-term repeatability in 5 minutes at the first visit, the ICCs were very high for both CAVI and brachial and ankle BPs (all with ICC ≥ 0.82 bilaterally). When we observed longer term repeatability over several months, the ICCs were fair for BPs (ranged from 0.42-0.57) but remained very high for CAVI with ≥0.72 for both sides. The MDC₉₅ between repeated measures within an individual across two visits was 1.6-1.7 for CAVI and 15-35 mmHg for BP parameters. In this scenario, the MDD for two independent samples of 100 per group was ~0.5 for CAVI and 4-8 mmHg for BP parameters. **Conclusion** The short- and longer-term repeatability of CAVI was overall good even among morbidly obese individuals. Our results suggest that a longitudinal change of CAVI by 1.6-1.7 indicates a change beyond the measurement error.

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P367

**Association Between Resting Heart Rate and Progression of Valvular Calcification**

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**BACKGROUND**
Mitral annular calcification (MAC) and aortic valvular calcification (AVC) are progressive and linked to increased cardiovascular disease (CVD) morbidity and mortality. Few known modifiable risk factors associated with the progression of MAC and AVC exist. Resting heart rate (RHR) is an established independent risk factor for CVD. Due to the potential hemodynamic effects of RHR on development or progression of valve calcification, we assessed whether RHR is associated with the incidence and progression of MAC and AVC in a community-based cohort free of CVD and atrial fibrillation at baseline. **METHODS**
We obtained RHR from baseline 12-lead electrocardiograms of 5,498 MESA cohort participants. We studied RHR as a continuous variable (per 1 SD increment) and also categorized at clinical cut points of < 60, 60 - 69, 70 - 79, and ≥ 80 bpm. MAC and AVC were quantified using Agatston scoring from cardiac computed tomography scans obtained at baseline and at follow-up examinations 2 or 3. We examined associations between RHR and incident MAC/AVC and annual change in MAC/AVC scores, after adjusting for demographics, CVD risk factors, physical activity, and atrioventricular nodal blocker medication use. We used progressively adjusted parametric survival models for incident MAC/AVC and linear regression models for annual change in MAC/AVC.

RESULTS
At baseline, participants had a mean age of 62±10 years and mean RHR of 63±10 bpm; 12.3% and 8.9% had prevalent AVC and MAC [Agatston Units (AU) >0], respectively. Over a median follow up time of 2.3 years, 4.1% and 4.5% developed incident AVC and MAC, respectively. Each 10 bpm higher RHR was significantly associated with incident MAC [Hazard Ratio 1.18 (95% CI 1.03-1.36)], but not incident AVC. However, RHR (per 10 bpm) was associated with AVC progression [β coeff 1.62 (0.45-2.80) AU/year], but not MAC progression. The association of RHR on annual change in AVC was modified by age and sex (p-interactions 0.006 and <0.02, respectively) but not race/ethnicity. Each 10 bpm higher RHR was significantly associated with AVC progression for age > 62 years [β coeff 2.94 (0.55, 5.34) AU/year] and male sex [3.49 (1.31, 5.67) AU/year]. The association between RHR and AVC progression was not significant for age ≤ 62 or female sex. Similar trends were seen using clinical cut-points for RHR.

CONCLUSION
Higher RHR predicted incident MAC and AVC progression independent of traditional CVD risk factors. Future studies are needed to determine whether this association is causal and whether modification of RHR through lifestyle or pharmacologic interventions can reduce valvular calcium progression.


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Neighborhoods and Subclinical Cardiovascular Disease

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Background: Research on the health impact of the built environment has focused on health behaviors such as diet and exercise, and conditions such as obesity and diabetes. Few studies have examined its influence on downstream outcomes such as cardiovascular disease. We investigated the proportional variance in the 10-year and 30-year Framingham risk score (FRS) attributable to neighborhoods in the Framingham Heart Study. Methods: Offspring- and Generation 3 cohort members’ homes at the time of exam 7 (Offspring, 1998-2001) or exam 1 (Generation 3, 2002-2005) were geocoded to 2000 Census block groups. We evaluated Framingham Offspring and Generation 3 cohort participants inhabiting private residences in block groups within Massachusetts containing the residences of 5 or more participants. Analyses of the 10-year FRS were further restricted to participants aged 30-74 at the time of the relevant exam and those of the 30-year FRS to participants 20-59 years old. Cardiovascular risk was determined on the bases of sex, age, systolic
blood pressure, anti-hypertensive medication, smoking, diabetes, total cholesterol, and HDL. The outcomes were the standardized residuals of log-transformed FRS regressed on age and sex. We analyzed the percentage of variance of FRS explained at the block-group level and 95% confidence intervals using multilevel linear regression. An empty model was first used to estimate the total variance and the following factors were then added singly to evaluate their influence on the group-level FRS variance explained by education, body mass index, waist circumference, physical activity score, and depression (CES-D score ≥16). Analyses were repeated stratified by sex.

Results: The analysis of 10-year FRS included a total of 2,882 participants in 188 census block groups. The block-group-level variance explained for this outcome was 1.77% (95% CI=0.69, 4.44). Upon the addition of BMI to the model, the variance explained dropped to 1.11% (95% CI=0.28%, 4.30%). None of the other covariates had a substantial impact. Among 1,363 women in 117 block groups, the block level group explained a total of 2.03% of the FRS variance at the block level group (95% CI=0.61, 6.56), which dropped to 0.64% (95% CI=0.03, 13.82) when BMI was added to the model. Results were somewhat stronger in analysis of the 30-year FRS. The group-level FRS variance explained by census blocks was 3.56% (95% CI=1.75, 7.12) among 2096 participants in 156 neighborhoods. Similar to the 10-year CVD risk score, the variance explained among women (959 in 97 block groups) was higher (6.06%, 95% CI=2.75, 12.83), but null among males.

Conclusions: In this relatively homogenous suburban white population, census block groups explained a small percentage of the variance in CVD risk. The explained variance was higher among women (19% non-working vs. 5% of males), and largely explained by the clustering of obesity.

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Relation of Breast Arterial Calcification With Ankle Brachial Index

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Presence of breast arterial calcification (BAC) has been shown to be independently associated with increased risk of subclinical cardiovascular disease (CVD), angiographically-defined coronary disease and with incident coronary heart disease, stroke and heart failure. However, a relationship between BAC and peripheral vascular disease has not been established. The ankle brachial index (ABI) is an indicator of the severity of peripheral arterial disease (PAD) that predicts future CVD risk. We utilized cross-sectional data collected at the baseline examination (2012-15) of the MultiethNic Study of BrEst ARterial Calcium Gradation and CardioVAsular Disease (MINERVA Study), a cohort study of 5,145 post-menopausal women who were members of the Kaiser Permanente Medical Care Program of Northern California (KPNC) who were free of clinical CVD at baseline. Presence and gradation (in mg of calcium mass) of BAC in digital mammograms was ascertained with a validated densitometry method. ABI, the average of two ankle systolic pressure readings divided by the average of two brachial systolic pressure readings, was measured by trained and certified personnel after a ten-minute rest. A total of 3,693 women had complete data on all variables of interest; their mean (SD) age was 66 (4) years and 64% were white, 12% African-
American, 14% Asian, 9% Latina and 1% mixed or other. While 28.2% presented with any detectable BAC (i.e., BAC mass > 0 mg), 5.4% had an ABI < 0.90. Three women had ABI>1.40 and were excluded from analyses (none had BAC>0). Prevalence of ABI < 0.90 was 4.8% (27/2,653) in women with BAC=0 and 6.9% (72/1,040) in women with any detectable BAC. The Odds Ratio of ABI<0.90 associated with any BAC was 1.39 (95% CI, 1.03-1.89) in a model adjusting for age and race/ethnicity, and was 1.38 (95% CI, 1.02-1.88) in a model with further adjustment for BMI, smoking status, diabetes, hypertension, LDL cholesterol, HDL cholesterol and hs-CRP. However, among women with any detectable BAC, standardized log_BAC mass (mg) was not significantly associated in bivariate linear regression analysis with ABI (slope=-0.0030 [SE=0.0031]; p=0.32). Our study demonstrates (for the first time) an independent association between presence of BAC and ABI indicative of PAD, with no apparent linear dose-response relationship.


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Utility of Cardiovascular Risk Algorithms in Prediction of Subclinical Atherosclerosis in the Young

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Background: Prediction of cardiovascular risk in younger patients is particularly challenging. Most current risk estimators underestimate risk potentially leading to under-treatment in younger patients with significant risk factors for atherosclerosis. Methods: A retrospective analysis of patients age 20 to 50 (n = 274) referred to a cardiology clinic between 2013 and 2016 and undergoing carotid ultrasound for risk stratification and statin initiation was conducted. A medical history was obtained by chart review at the time of carotid ultrasound. The 2008 Framingham general risk score was used to calculate a 10-year cardiac risk. Carotid plaque was defined using standard definitions as carotid artery focal wall thickening 50% or greater than the surrounding vessel wall or a focal region > 1.5 mm protruding into the lumen. Results: Average age was 41 ± 7.9 years, 60% male, 77% Caucasian, 4% diabetes. Ten percent (n = 27) had carotid plaque noted on ultrasound. Those with plaque compared to those without were older (46 ± 4.3 vs. 41 ± 7.5, p < 0.01), more likely to have hypertension (HTN) (52% vs. 20%, p < 0.01), more likely to be active smokers (19% vs. 6%, p = 0.02) and had higher total cholesterol (222 ± 53 mg/dl vs. 202 ± 45 mg/dl, p = 0.04) and LDL-C (140 ± 40 mg/dl vs. 121 ± 43 mg/dl, p = 0.04). No differences were noted in gender, race, body mass index, diabetes or family history of early heart disease. The average cardiac risk score was 5.9 ± 3.5% for those with plaque and 4.2 ± 3.2% for those without (p < 0.01). When assessing the same population by number of risk factors, 93% (n = 25) of individuals with carotid plaque had ≥ 2 cardiac risk factors (one point each for age 40 to 50, smoking, family history of heart early disease, obesity, LDL > 160 mg/dl, DMII or HTN). This compared to 37% (n=10) who had carotid plaque on imaging and a risk score ≥ 7.5%. Receiver operator curve characteristics to predict plaque were similar for the cardiac risk score (AUC 0.674) and number of cardiac risk factors (AUC 0.674, p = 0.96). Conclusion: In patients 50 years or younger, ≥ 2 cardiac risk factors revealed a higher percentage of carotid plaque than a Framingham cardiac risk score cut off value of ≥ 7.5%. In younger patients with cardiac risk factors, novel algorithms are needed to more accurately guide medication therapy.
Introduction: Stroke after acute myocardial infarction (AMI) is an important complication resulting in increased morbidity and mortality. However, limited long-term trends data are available about the incidence and death rates associated with this serious complication.

Objective: The aim of this study is to examine the 25-year trends in the incidence rates and outcomes of initial episodes of stroke complicating AMI.

Hypothesis: We hypothesize that the incidence and outcomes of stroke complicating AMI would decrease over time with recent advances in the management of both diseases.

Methods: The study population consisted of 11,433 adults hospitalized with validated AMI at all 11 medical centers in central Massachusetts on a biennial basis between 1986-2011.

Results: Of 11,436 patients (mean age = 69 years; 42% female) without a history of stroke hospitalized with confirmed AMI, 159 patients (1.4%) experienced an acute stroke during their index hospitalization. The proportion of patients with AMI who developed a stroke increased through the 1990s but declined slightly thereafter (Figure 1). Patients who experienced an acute stroke were significantly older, more likely to be female, had a previous AMI, had a significant burden of comorbidities, and were more likely to have developed atrial fibrillation, heart failure, and have died (32.1% versus 10.8%; p<0.001) during their index hospitalization compared with patients who did not develop a stroke. Patients developing a stroke in the most recent years (2003-2011) were 5 times more likely to have died during hospitalization compared to those who did not develop a stroke (OR, 5.05; 95% CI, 2.34-10.90).

Conclusions: In conclusion, the incidence rates of acute stroke complicating AMI remained relatively stable during the years under study but with an increased likelihood of dying during hospitalization. Better characterization of factors associated with the risk of stroke remains important for the more optimal care of this vulnerable population.

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Standardized rates (per 100,000 population) were calculated applying the direct method and temporal trends compared using Poisson regression models. Trends in disease severity, defined as 3-vessel and/or left main coronary artery disease (CAD), were assessed using logistic regression models. Results: Between 2000 and 2015, 11,691 coronary angiographies were performed (63% men; 54% ≥ 65 years of age). The age- and sex-standardized rates of angiography decreased over time (p_{trend} < 0.001; Figure). Overall, 30% of the subjects had 3-vessel and/or left main CAD, and this proportion decreased over time (age- and sex-adjusted odds ratios (95% CI) for severe CAD: 0.68 (0.62-0.76) in 2005-2009 and 0.69 (0.63-0.77) in 2010-2015 compared with 2000-2004). Among 5,222 coronary revascularization procedures performed, 78% were PCI and 22% CABG. The age- and sex-standardized rates of any revascularization declined during the study period, reflecting temporal decreases in both PCI and CABG (all p_{trend} < 0.001; Figure). The declines in angiography rates, CAD severity, and revascularization utilization were consistently greater in women than men (all P for interactions < 0.01). Conclusions: Declines in all forms of coronary revascularization, which were greater in women than men, have occurred in Olmsted County, MN, from 2000-2015. The declines occurred in the context of fewer angiograms performed in the population and reduced severity of anatomic CAD.

Introduction: There are five different definitions of prediabetes currently used in clinical practice. How cardiovascular risk may differ by these different definitions of prediabetes and whether trends in cardiovascular risk in persons with prediabetes have changed over time is largely uncharacterized. Hypothesis: We expect the prevalence of cardiovascular risk factors will vary by prediabetes definition and will be highest among those who meet clinical definitions with higher cutoff values. We hypothesize awareness, treatment and control of hypertension and hypercholesterolemia have increased over time among those with prediabetes. Methods: We analyzed data for adults ages ≥ 20 years from the 1999-2014 National Health and Nutrition Examination Survey (NHANES). We used calibrated HbA1c and FPG values to estimate prediabetes prevalence. We examined the prevalence and trends of hypertension and hypercholesterolemia among those who met each clinical definition of prediabetes, as well as awareness, treatment, and control. Results: The prevalence of prediabetes by each definition remained stable across survey years. The prevalence, awareness, treatment, and control of hypertension and hypercholesterolemia by clinical definition modestly increased over time. Conclusion: The prevalence of hypertension and hypercholesterolemia was higher among individuals who met HbA1c-based definitions of prediabetes than other measures and was...
highest when more restrictive criteria for prediabetes were used. Awareness, treatment, and control of cardiovascular risk factors increased over time by any definition, but the high prevalence of cardiovascular risk factors highlights the need for improvement in risk factor management in people with prediabetes.


Funding: No

Funding Component:

P374


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Introduction: The decline in cardiovascular disease mortality in the US has stalled in recent years, though patterns have varied by age and sociodemographic characteristics. Trends in prevalence of hypertension, as well as awareness, treatment, and control in population subgroups can shed light on opportunities for improving hypertension management and CVD prevention.

Hypothesis: There has been greater improvement in hypertension control among adults aged ≥65 years than in middle- and younger-age (45-64 and 25-44 years) adults and that race and socioeconomic disparities may be narrower among adults aged ≥65 years.

Methods: We analyzed data for adults aged ≥25 years from the 1999-2014 National Health and Nutrition Examination Survey (NHANES). We examined mean systolic blood pressure (SBP), prevalence of hypertension, and among those with hypertension, prevalence of awareness, treatment, and control by age category and survey cycle. We fit linear regression models for trends with interaction terms for age category and time.

Results: Among those aged ≥65, mean SBP decreased 10.4 mmHg, from 143.2 to 132.9 mmHg, a significantly greater decrease than among those aged 45-64 (-3.1 mmHg) or 25-44 (-0.1 mmHg), though absolute SBP values are highest among those aged ≥65 (Table). Hypertension awareness, treatment, and control increased significantly each age category, but to a lesser extent among those 45-64 than those ≥65 (p-values for interaction: 0.031, 0.054, 0.051, respectively). Differences in hypertension control and mean SBP among whites and blacks were greater among those 45-64 than those ≥65. Within age categories, there were few significant differences in trends over time by race/ethnicity, education, or poverty to income ratio.

Conclusions: Our findings highlight the need to address hypertension management among middle- and younger-age adults. Persistent disparities in hypertension control over time demonstrate that prevention and management of hypertension is a priority health equity issue.


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Funding Component:

P375
Secular Trends in Validity of Troponin I Assays for Myocardial Infarction Classification Among Four US Communities: Findings From the ARIC Study

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Introduction: The Atherosclerosis Risk In Communities (ARIC) study conducted community surveillance of hospitalized myocardial infarction (MI) from 1987 to 2014 among four US communities (Jackson MS, Forsyth County NC, Washington County MD, and Minneapolis MN). Surveillance of MI during the troponin era (1996 - ) has been complicated by increasing sensitivity of troponin I assays. It is unclear to what extent increased assay sensitivity has affected the validity of event classification. We hypothesized that among events that would have been classified as a definite/probable MI or a suspect/no MI regardless of cardiac biomarker levels, the sensitivity and specificity of troponin I assays to identify abnormal enzyme levels (ARIC community surveillance criterion: 2x upper limit of normal) has changed over time in hospitals participating in ARIC community surveillance.

Methods and results: From 33,995 community hospitalizations with suspicion of MI or coronary heart disease with a troponin I measurement that occurred between 1996 and 2014, 2,143 met ARIC criteria as MI cases (ARIC computer algorithm classification of definite or probable MI regardless of cardiac biomarkers, the sensitivity and specificity of troponin I assays to identify abnormal enzyme levels (ARIC community surveillance criterion: 2x upper limit of normal) has changed over time in hospitals participating in ARIC community surveillance.

Conclusions: For most of the troponin era among the four ARIC communities, hospitalizations that were classified as an MI regardless of cardiac biomarker levels were equally likely to have or not have abnormal troponin I. In recent years, the likelihood that hospitalizations that were classified as no MI regardless of cardiac biomarker levels had normal troponin I decreased, potentially affecting the usefulness of troponin I measurements to separate hospitalized MIs from non-MIs in the context of community surveillance, particularly among hospitalizations with few other signs of MI. These shifts in assay validity were likely due in part to a decrease in ULN for troponin I in the four ARIC communities.

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P376

Improving Cardiovascular Health Among African-Americans Through a Community-based Mobile Health Lifestyle Intervention: The FAITH! (Fostering African-American Improvement in Total Health) App! Pilot Study

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Introduction: Compared to Whites, African-Americans (AAs) have 82% lower odds of meeting ideal levels for five or more cardiovascular (CV) health components that comprise the American Heart Association’s Life’s Simple 7, an evidenced-based metric of seven health promoting behaviors and biological factors that improve CV outcomes. Given expanding mobile technology use among AAs, mobile health (mHealth) interventions are promising avenues to promote CV health within this population.

Hypothesis: An evidence-based, theory-informed, culturally relevant, community-based mHealth lifestyle intervention would improve CV health among AAs adults.

Methods: Five predominately AA churches collaborated in a community-based participatory research approach to develop a 10-week CV health and wellness digital application-based program (FAITH! App). We enrolled AA adults [N=50, mean age 49.6 (SD 12.7), 70% women (35/50)] into a single group, 10-week intervention centered on the FAITH! App with adjunct in-person sessions. The FAITH! App included ten core video education modules from health professionals on CV health, interactive diet/physical activity self-monitoring and a sharing board. The primary outcome was change in individual CV health behaviors (body mass index, physical activity, diet, cigarette smoking) and biological factors (blood pressure (BP), total cholesterol, fasting glucose) from baseline to post-intervention at 28 weeks.

Results: Participants were overall high CV risk at baseline (hypertensive [40% (20/50)] with poor/intermediate physical activity [79% (37/47)] and diet [72% (36/50)]). At 28 weeks, there were substantial improvements in CV health factors (systolic and diastolic BPs), CV health behaviors (diet, physical activity) and psychological/psychosocial variables to promote behavior change (Table 1).

Conclusions: This study supports the benefits of a culturally relevant, community-based mHealth lifestyle intervention to promote CV health among AAs with high cardiometabolic risk.


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P377

Multicomponent Workplace Wellness Program Results in Weight Loss and Improved Cardiometabolic Indices

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Introduction. Workplace wellness programs offer opportunities for decreasing obesity in adults. The effectiveness of such programs varies and is influenced by key intervention components (e.g. duration, intensity, content). We developed a multicomponent workplace wellness program, MyWay to Health (MW2H),
which was adapted from an evidence-based weight loss intervention with demonstrated efficacy and meets the 2013 Guideline for the Management of Overweight and Obesity in adults. The purpose of this one-group pretest-posttest study was to evaluate program acceptability and effectiveness of MW2H on primary and secondary outcomes.

**Hypotheses.** We hypothesized that MW2H would result in 1) clinically meaningful weight loss of ≥5%, and 2) improvements in cardiometabolic indices.

**Methods.** During weeks 1-26, participants met privately with an interventionist for up to 24 weekly, 40-minute sessions, receiving training in eating and physical activity behavior change, self-regulation, and socioenvironmental strategies. During weeks 27-52, participants received maintenance support through phone calls, email, or in-person visits. Our primary outcome was percent weight loss. Secondary outcomes included improvement in BMI, waist circumference, HbA1c, cholesterol, and blood pressure. Outcomes were compared at baseline and 26 weeks; body weight only was measured at 52 weeks. Wilcoxon Signed Rank Tests were used to examine outcomes.

**Results.** Participants (N=154) were mostly female (85%), White (75%), had a median age of 50 (Interquartile Range (IQR): 17) years, a median baseline BMI of 34.7 (IQR: 8.8), a median household income of $70,000 (IQR: $50,000), and 54% had a college degree or higher. Median number of in-person sessions attended was 19 (IQR: 4.0). Percent weight loss at 26 weeks (median [IQR]: 7.5% [6.8%]) was clinically meaningful, with 71% of participants achieving ≥5% weight loss. Statistically significant improvements in BMI, waist circumference, HbA1c, cholesterol, and blood pressure (p<0.001 for all) were observed. At week 52, body weight data were available for 106 (69%) participants. Median percent weight loss from baseline was 7.0% (IQR: 9.3%). Of participants who achieved ≥5% weight loss at week 26, 94% maintained this level of weight loss at week 52.

**Conclusions.** The MW2H workplace wellness program was acceptable to participants, evidenced by high program attendance, and resulted in clinically meaningful and statistically significant improvements in body weight and cardiometabolic indices. A majority of participants achieved ≥5% weight loss by 26 weeks, and nearly all participants for whom data was available maintained this level of weight loss at week 52. Additional research is needed to optimize intervention components, identify factors that contribute to weight maintenance, and examine MW2H effectiveness in a more diverse population.

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P378

**Excess Mortality Among Indiana Firefighters, 1985-2013**

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**Introduction:** Firefighters are exposed to toxic agents in combustion products at fire scenes increasing their risk for cancer and cardiovascular disease. Inconsistent findings in
previous research examining excess heart disease and cancer mortality have led to the need for further investigation of cause-specific death among firefighters. **Objective:** Using death certificate data, we tested the hypotheses that there is no difference in the likelihood of cancer and cardiovascular mortality between firefighters and a matched population of non-firefighters from the general population. **Methods:** Firefighter death records (n=2,818) were exactly matched to four non-firefighter (n=11,272) death records on age at time of death, sex, race, ethnicity and year of death between 1985-2013. Underlying cause of death was coded using the 9th and 10th revision of the *International Classification of Diseases* (ICD). Mortality odds ratios and 95% confidence intervals comparing firefighters to non-firefighters were calculated using conditional logistic regression to account for matching. **Results:** The risk of death due to all malignant cancers was significantly higher for firefighters than non-firefighters (OR: 1.19; 95% CI 1.08, 1.30). Firefighters had high risks of mortality due to malignancies of the buccal cavity and pharynx (OR 2.15, 95% CI 1.19, 3.79), other parts of the buccal cavity (OR 4.00, 95% CI 1.07, 14.96), pharynx (OR 2.26, 95% CI 1.05, 4.65), pancreas (OR 1.45, 95% CI 1.01, 2.06), and kidney (OR 1.84, 95% CI 1.17, 2.83). Deaths due to malignancies of other and unspecified sites (OR 1.27, 95% CI 1.02, 1.56) were also elevated among firefighters, due specifically to connective tissues (OR 2.5, 95% CI 1.01, 5.86) and brain and other parts of the nervous system (OR 1.98, 95% CI 1.23, 3.12). There was no difference in risk for heart disease deaths, including ischemic heart disease, between the two groups. However, the risks for undefined types of circulatory system deaths (OR 0.80, 95% CI 0.68, 0.94), specifically cerebrovascular disease (OR 0.82, 95% CI 0.67, 0.99) were significantly lower among firefighters than non-firefighters. Accidental poisoning deaths were also significantly lower (OR 0.43, 95% CI 0.43, 0.96) among firefighters. **Conclusions:** Deaths due to specific malignant cancers were found to be statistically higher in Indiana firefighters than non-firefighters. The study suggest the importance of early and effective health-promoting prevention strategies among firefighters. **Clinical Significance:** Firefighters need access to clinical evaluations focused on modifiable occupational and lifestyle risk factors. Biometric, fitness, psychological and self-reported data gathered during these examinations should be utilized for the development and assessment of specific occupational risk intervention programs.

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P379

**Adoption of Workplace Policies to Improve Heart Health: Results From the First and Second Year of the American Heart Association’s Workplace Health Achievement Index**

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**Background**
The American Heart Association’s Workplace Health Achievement Index (WHAI) uses a data-driven, quality improvement approach to assist companies in evaluating the quality of their current workplace health policies and promote a culture of healthy living in the workplace.

**Objective**
The objective of this study was to use the WHAI to: 1) describe changes in adoption of
workplace health strategies and employee health over time, 2) assess longitudinal differences in performance between smaller (<250 employees) and larger companies (250+ employees), and 3) identify the most and least adopted strategies among smaller and larger companies.

Methods
The WHAI score is derived from 55 structure and process (SP) measures across 7 best-practice domains and performance metrics based on employee Life’s Simple 7 (LS7) data. The initial data collection period was Feb 1 – Mar 31, 2016 and the follow-up round of data collection occurred Apr 1 – Mar 31, 2017. Data were stratified according to smaller (n=26) vs. larger (n=119) company size. SP measure frequencies were tabulated to identify the most and least frequently adopted strategies by company size. Differences were assessed using Kruskal-Wallis rank sum tests and Chi-Square tests as appropriate.

Results
From 2016-2017, company enrollment increased 49%, from 667 to 992. An estimated 82% (812 of 992) completed all 55 SP questions, an increase of 240% from the previous year. In addition, 36% (297 of 825) companies submitted employee health data, up from 15% to 37%. The median WHAI score increased from 89 to 197 points (p<0.01; max points = 217), with larger companies achieving a greater increase (120 vs. 104; p<0.05). Regarding improvements to SP scores, smaller companies did not significantly improve (p = 0.10) whereas larger companies did (p<0.01). In 2017, the median Heart Health Score (range: 0-10 points) was 7.49, 7.20 for smaller and 7.74 for larger companies (p=<.01). Larger companies 82% (482 of 589) were more likely than smaller companies 59% (120 of 204) to provide adequate tobacco cessation coverage (p<0.01). Conversely, compared to larger companies (75%, 441 of 589), managers at smaller companies (82%, 167 of 204) were more likely to allow employees time off during the day to engage in physical activity (p<0.05).

Implications
WHAI enrollment and reporting of employee health data improved over time. This may reflect quality improvement efforts, the larger sample size, or a combination of both. While total scores increased overall, smaller companies did not significantly improve their SP scores. Results indicate there are differences in workplace health strategies adopted among smaller and larger companies. Customized resources and technical assistance may help each group to efficiently address the specific gaps identified through the WHAI.


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P380

Impact of Gain or Loss of Individual Fat Depots on Cardiac Structure and Function: The Dallas Heart Study

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Introduction
Body fat depots are differentially related to cardiac structural phenotypes in cross-sectional studies. The impact of changes in visceral adipose tissue (VAT), subcutaneous abdominal adipose tissue (SAT), and lower body fat (LBF) on the left ventricle (LV) over time are unknown.

Methods
Participants without baseline cardiovascular disease or LV dysfunction in the Dallas Heart...
Study underwent assessment of fat distribution by dual-energy X-ray absorptiometry (DXA) and cardiac structure/function by MRI between 2000-2002 and repeated ~7 years later. Associations between changes in VAT, SAT, and LBF with alterations in LV structure and function were assessed.

**Results**
The study cohort (n=1303) was mean age 44 years with 57% (747/1303) male, 43% (558/1303) black, and 36% (470/1303) obese. Those with >5% VAT gain were younger and more likely to have lower BMI, triglycerides, LDL-C, and hs-CRP, at baseline and had greater increases in blood pressure, glucose, cholesterol, and hs-CRP over follow up. The relationship between VAT change and change in LV concentricity (mass/volume) was linear (Fig. A), indicating worsening concentric remodeling with VAT gain and improvement with VAT loss. In multivariable linear regression models, gain in all fat depots was significantly associated with increases in LV mass, LV wall thickness, concentricity, cardiac output, and decreased systemic vascular resistance (Fig. B). After additional adjustment for BMI change, only VAT gain remained significantly associated with concentric remodeling; other associations were attenuated. Fat depot changes were not associated with changes in LV end-diastolic volume or ejection fraction.

**Conclusion**
Expansion of fat depots over time is associated with adverse cardiac remodeling. In the case of VAT, this association is independent of changes in BMI. These data suggest that reduction in VAT is a potential target to prevent adverse concentric LV remodeling, itself an important intermediate phenotype in the progression to heart failure.


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Funding Component:

P382

**Canola and High-Oleic Acid Canola Oils Improve Lipid/Lipoprotein Parameters Compared to an Oil Blend Characteristic of a Western Dietary Pattern in Individuals at Risk for Metabolic Syndrome: A Randomized Crossover Clinical Trial**

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**Introduction:** Identifying dietary interventions for cardiometabolic disease prevention in individuals with metabolic syndrome is relevant to a significant portion of the population. Numerous studies have investigated the effects of canola oil on cardiovascular disease risk; however, no studies have compared canola oil diets to a control diet with a fatty acid composition characteristic of Western intakes in individuals with metabolic syndrome risk factors. The objectives of this study were to evaluate effects of canola oil, high-oleic acid canola oil (HOCO), and a control oil (blend of butter, safflower, coconut, and flaxseed oils formulated to represent a Western diet fatty acid profile) on lipids, lipoproteins, and apolipoproteins.

**Hypothesis:** We tested the hypothesis that the two canola oil diets would elicit beneficial effects on the total lipid/lipoprotein profile compared to the Western (control oil) diet.

**Methods:** In a multi-center, double blind, randomized, three-period crossover, controlled feeding clinical trial, 119 individuals with an increased waist circumference plus at least one additional metabolic syndrome risk factor consumed prepared isocaloric, weight maintenance diets containing canola oil [17.5% E from monounsaturated fatty acids (MUFA), 9.2% polyunsaturated fatty acids (PUFA), 6.6% saturated fatty acids (SFA)], HOCO (19.1% E from MUFA, 7.0% PUFA, 6.4% SFA), or control oil (11% E from MUFA, 10% PUFA, 12% SFA) for six-weeks each separated by 4-12 week washouts. The differences at the end of 42 days of feeding were tested.

**Results:** The canola oil and HOCO resulted in lower endpoint total cholesterol (TC), low-density lipoprotein-cholesterol (LDL-C), the TC: high-density lipoprotein-cholesterol (HDL-C) ratio, apolipoprotein (apo) B, the apoB: apoA1 ratio, and non-HDL-C compared to control oil ($P<0.0001$ for treatment effect), with no differences between HOCO and canola oil for these parameters. Endpoint apoA1 did not significantly differ between the two canola oils and control, but was higher after the HOCO compared to canola oil ($1.46 \pm 0.02$ g/L vs. $1.43 \pm 0.02$ g/L, $P = 0.0462$). There were no differences among the three diets in endpoint triglycerides or HDL-C.

**Conclusions:** Incorporating canola or high-oleic acid canola oils into the diet improves blood lipids and lipoproteins compared to a contemporary Western diet in individuals with at least two criteria for metabolic syndrome.


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