Global diet quality among adults in 187 countries

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The Global Burden of Diseases Nutrition and Chronic Diseases Expert Group (NutriCoDE)

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Background

- Overall diet quality or dietary pattern is crucial for prevention of obesity and chronic disease.
- Little is known about diet quality and trend over time around the world.
- Limited prior studies.
  - A limited number of countries.
  - Limited methods (e.g. national means only).
  - Not account for healthful foods vs. unhealthful foods.

Teo et al., JAMA, 2013
Aim

- To characterize global diet quality
  - World region, country, age, sex, and national income.
  - Healthful vs unhealthful foods/nutrients.
  - Trend over time.
Global Dietary Database of NutriCoDE

- 326 national surveys covering 88.7% of the global adults populations.
  - Foods and nutrients related to non-communicable diseases.
  - Age, sex, population representativeness, dietary methods.
- Bayesian hierarchical model.
- Means (and uncertainty) of dietary consumption.
  - 13 age groups (20-25 to 80+ years) for men/women.
  - 187 countries.
    - $2 \times 13 \times 187 = 4,862$ data points.
  - 1990 and 2010.
  - Adjusted for 2000-kcal diet.

Micha et al., Euro J Clin Nutr, 2012
Barendregt JJ et al., Popul Health Metr, 2003
Global Diet Quality Scores

1. Overall diet quality score (conventional method):
   • Higher intakes of 10 healthier items: fruits, vegetables, beans/legumes, nuts/seeds, whole grains, milk, fish, fiber, polyunsaturated fats, plant omega-3’s.
   • Lower intakes of 7 unhealthful items: sugar-sweetened beverages, processed meats, unprocessed red meats, saturated fat, trans fat, dietary cholesterol, and sodium.
   • Assigned points (1 to 5) for each item, based on quintiles of intake in all age, sex, and country groups in 2010.

2. Diet quality score based on healthful items only:
   • Higher intakes of 10 healthful items=higher scores.

3. Diet quality score based on unhealthful items only:
   • Lower intakes of 7 unhealthful items=higher scores.

Each standardized to range from 0 to 100.
Statistical Analysis

- Descriptive statistics.
- Hierarchical regression.
- Association between of each global diet quality score with: age, sex, national income.
  - Each country equally weighted.
  - Within-country age-sex distributions.
  - Sex, age, national income (World Bank).
    - Mutually adjusted.
  - Statistical test by Monte Carlo approach, using means and uncertainty estimates by Global Diet Database.
Consumption of selected foods and nutrients among adults in 187 countries in 2010

<table>
<thead>
<tr>
<th></th>
<th>Medians of quintile categories age-, sex-, and country-specific estimates (n=4,862)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st</td>
</tr>
<tr>
<td><strong>Healthful items</strong></td>
<td></td>
</tr>
<tr>
<td>Whole grains, g/d</td>
<td>12</td>
</tr>
<tr>
<td>Vegetables, g/d</td>
<td>73</td>
</tr>
<tr>
<td>Fish, g/d</td>
<td>11</td>
</tr>
<tr>
<td><strong>Unhealthful items</strong></td>
<td></td>
</tr>
<tr>
<td>Sugar-sweetened</td>
<td>33</td>
</tr>
<tr>
<td>beverages, g/d</td>
<td></td>
</tr>
<tr>
<td>Processed meat, g/d</td>
<td>3.9</td>
</tr>
<tr>
<td>Sodium, g/d</td>
<td>2.3</td>
</tr>
</tbody>
</table>
Global Diet Quality in 2010, by Age and Sex

20-29 y

80+*

P < 0.01 for age and sex each

* Age groups: incremented by 10 years
Global Diet Quality, by National Income

- Overall (17 items)
  - 10 healthful items
  - 7 unhealthful items

*Income categories based on World Bank per capita income:
  - Low, <$1025
  - Lower-mid, $1025-4036
  - Upper-mid, $4037-12475
  - High, >$12474

P trend < 0.01 for each
Global Diet Quality, 187 Countries
17 both healthful and unhealthful items

Observed range=27.4 to 75.2
Global Diet Quality
10 healthful items

Observed range=14.0 to 64.7
Global Diet Quality
7 unhealthful items

Observed range=15.3 to 96.0
Trends over time in global dietary quality

Change in diet score based on more healthful Items (points)

Change in diet score based on fewer unhealthful Items (points)

P<0.03 for each change
## Trends over time, selected nations

<table>
<thead>
<tr>
<th></th>
<th>More Healthy Items</th>
<th></th>
<th>Fewer Unhealthy Items</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1990</td>
<td>2010</td>
<td>Change</td>
<td>1990</td>
</tr>
<tr>
<td>Brazil</td>
<td>34.8</td>
<td>40.2</td>
<td>+5.5</td>
<td>28.3</td>
</tr>
<tr>
<td>Russia</td>
<td>45.1</td>
<td>52.0</td>
<td>+6.9</td>
<td>25.3</td>
</tr>
<tr>
<td>India</td>
<td>38.5</td>
<td>38.3</td>
<td>-0.2</td>
<td>81.4</td>
</tr>
<tr>
<td>China</td>
<td>34.2</td>
<td>29.9</td>
<td>-4.3</td>
<td>75.3</td>
</tr>
<tr>
<td>France</td>
<td>38.3</td>
<td>39.9</td>
<td>+1.6</td>
<td>37.6</td>
</tr>
<tr>
<td>Spain</td>
<td>50.2</td>
<td>50.7</td>
<td>+0.5</td>
<td>35.6</td>
</tr>
<tr>
<td>Ecuador</td>
<td>38.5</td>
<td>35.3</td>
<td>-3.2</td>
<td>39.6</td>
</tr>
<tr>
<td>Peru</td>
<td>39.7</td>
<td>38.4</td>
<td>-1.1</td>
<td>39.1</td>
</tr>
<tr>
<td>Philippines</td>
<td>36.4</td>
<td>35.3</td>
<td>-1.2</td>
<td>47.7</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>27.4</td>
<td>36.8</td>
<td>+9.3</td>
<td>54.0</td>
</tr>
<tr>
<td>USA</td>
<td>35.7</td>
<td>37.0</td>
<td>+1.2</td>
<td>21.0</td>
</tr>
</tbody>
</table>
Strengths and Limitations

**Strengths**
- Global dietary data from individual surveys.
  - 187 countries.
- Separate estimates: healthful vs. unhealthful foods/nutrients.

**Limitations**
- Measurement errors.
- The socioeconomic variable was limited to a national level.
  - Urbanization.
  - Income variation.
Conclusions

- Substantial variety of diet quality across the world.
  - by age, sex, and national income and between neighboring countries.
  - With national-income, diet quality based on healthful items showed a positive association, but diet quality based on unhealthful foods/nutrients showed a strong inverse association.

- Since 1990, consumption of more healthful items has increased in most countries, but not in low income nations.

- Since 1990, consumption of less healthful items has increased globally, particularly in middle and low income nations.

- To evaluate global diet quality and inform policy priorities, it is crucial to separate healthful vs. unhealthful foods/nutrients.