

# Global diet quality among adults in 187 countries

March 20, 2014  
AHA EPI/NPAM Scientific Sessions

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

Fumiaki Imamura<sup>1</sup>  
Shahab Khatibzadeh<sup>2</sup>  
Renata Micha<sup>2</sup>  
Saman Fahimi<sup>1,2</sup>  
Peilin Shi<sup>2</sup>  
John Powles<sup>1</sup>  
Dariush Mozaffarian<sup>2,3</sup>

<sup>1</sup>University of Cambridge  
<sup>2</sup>Harvard School of Public Health  
<sup>3</sup>Harvard Medical School

**Financial Disclosure:**  
the Bill and Melinda Gates Foundation  
MRC Epidemiology Unit Core Support  
[MC\_UU\_12015/5] (FI)

# 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.

*Ezzati et al., New Engl J Med, 2013*

*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.

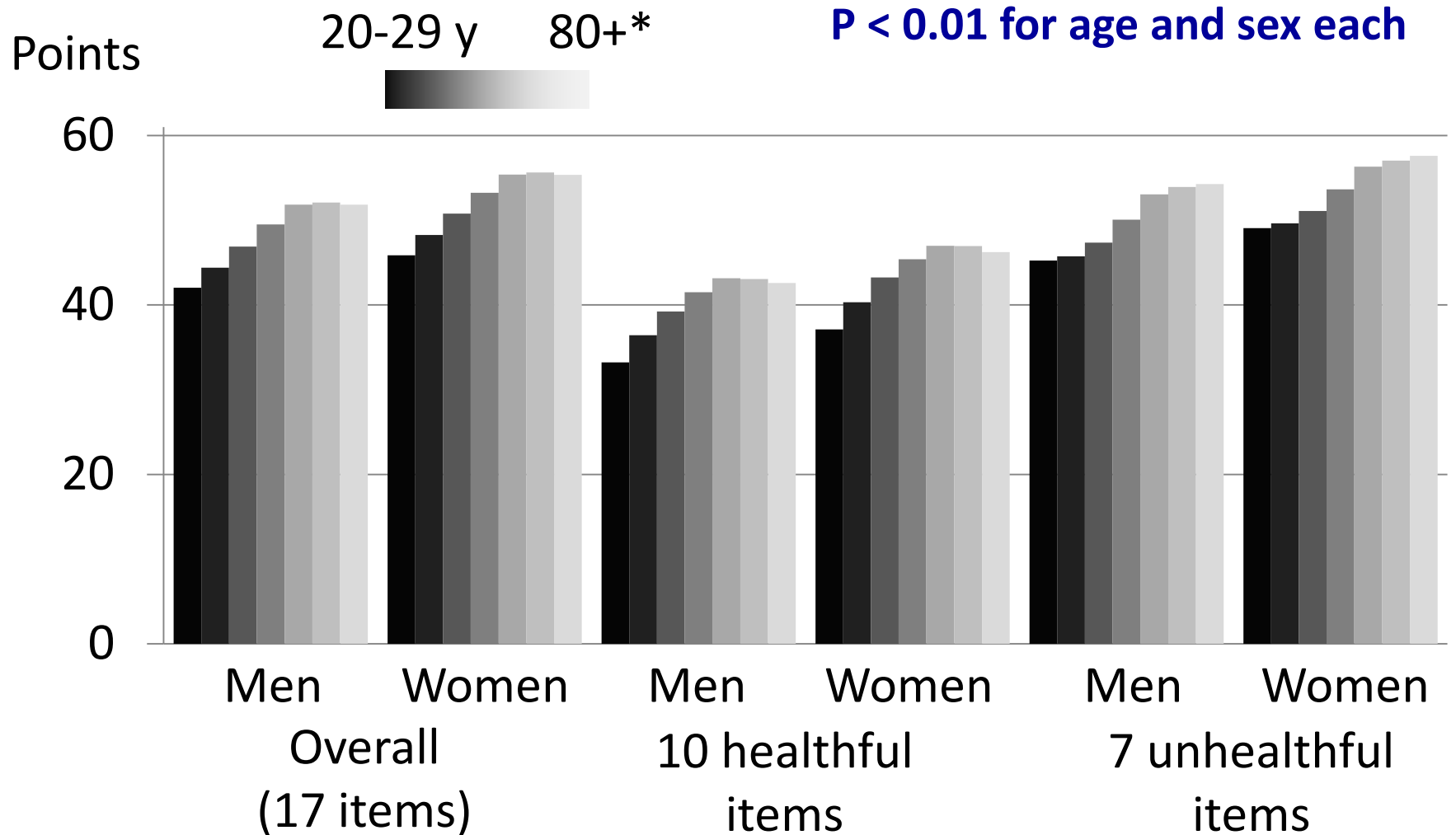
# Consumption of selected foods and nutrients among adults in 187 countries in 2010

---

	Medians of quintile categories age-, sex-, and country-specific estimates (n=4,862)				
	1st	2nd	3rd	4th	5th
<b>Healthful items</b>					
Whole grains, g/d	12	24	40	70	157
Vegetables, g/d	73	109	130	160	222
Fish, g/d	11	18	26	35	52
<b>Unhealthful items</b>					
Sugar-sweetened beverages, g/d	33	57	85	137	293
Processed meat, g/d	3.9	6.7	12	20	34
Sodium, g/d	2.3	2.9	3.5	4.0	4.6

---

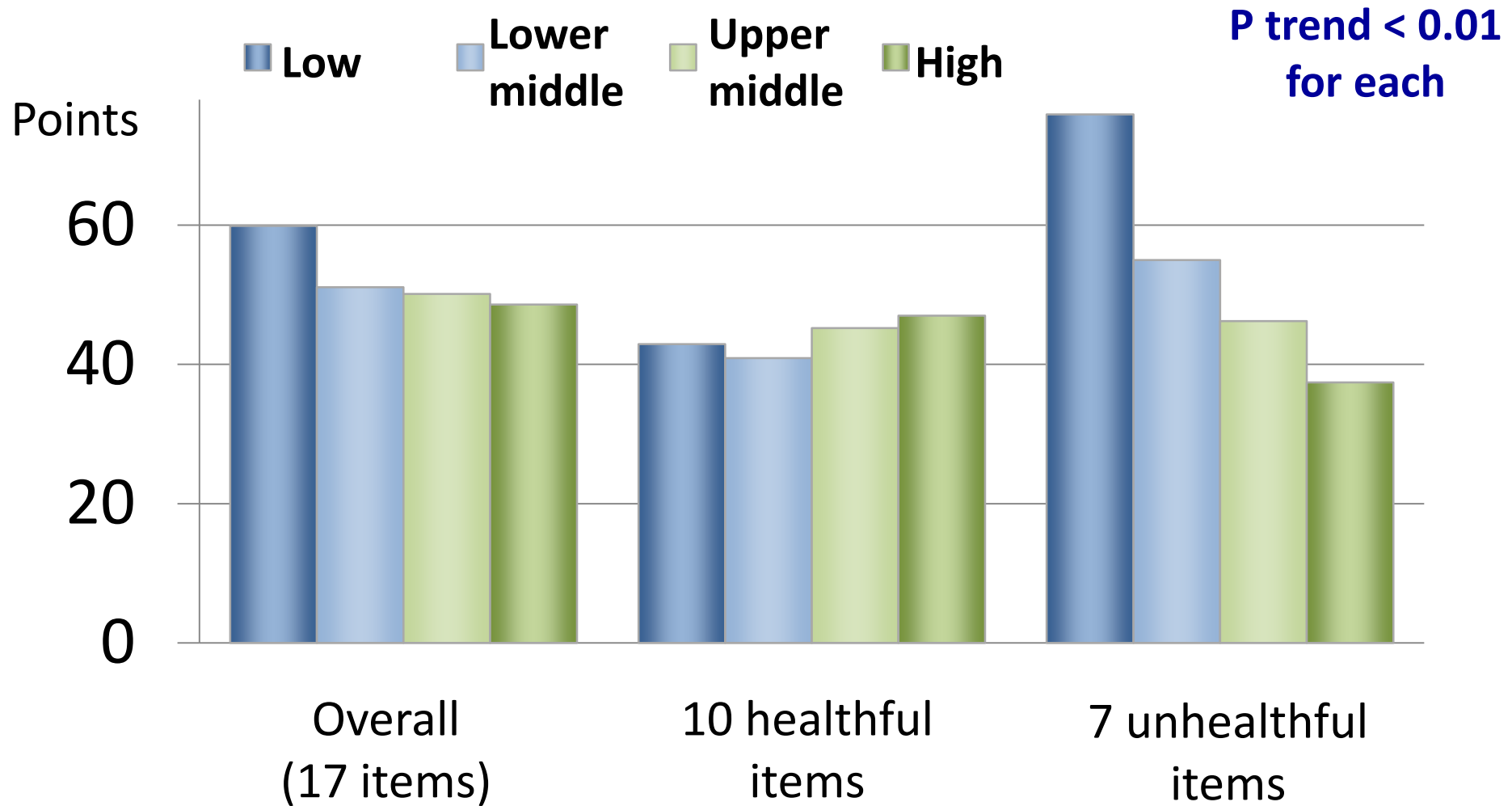
# Global Diet Quality in 2010, by Age and Sex



\* Age groups: incremented by 10 years



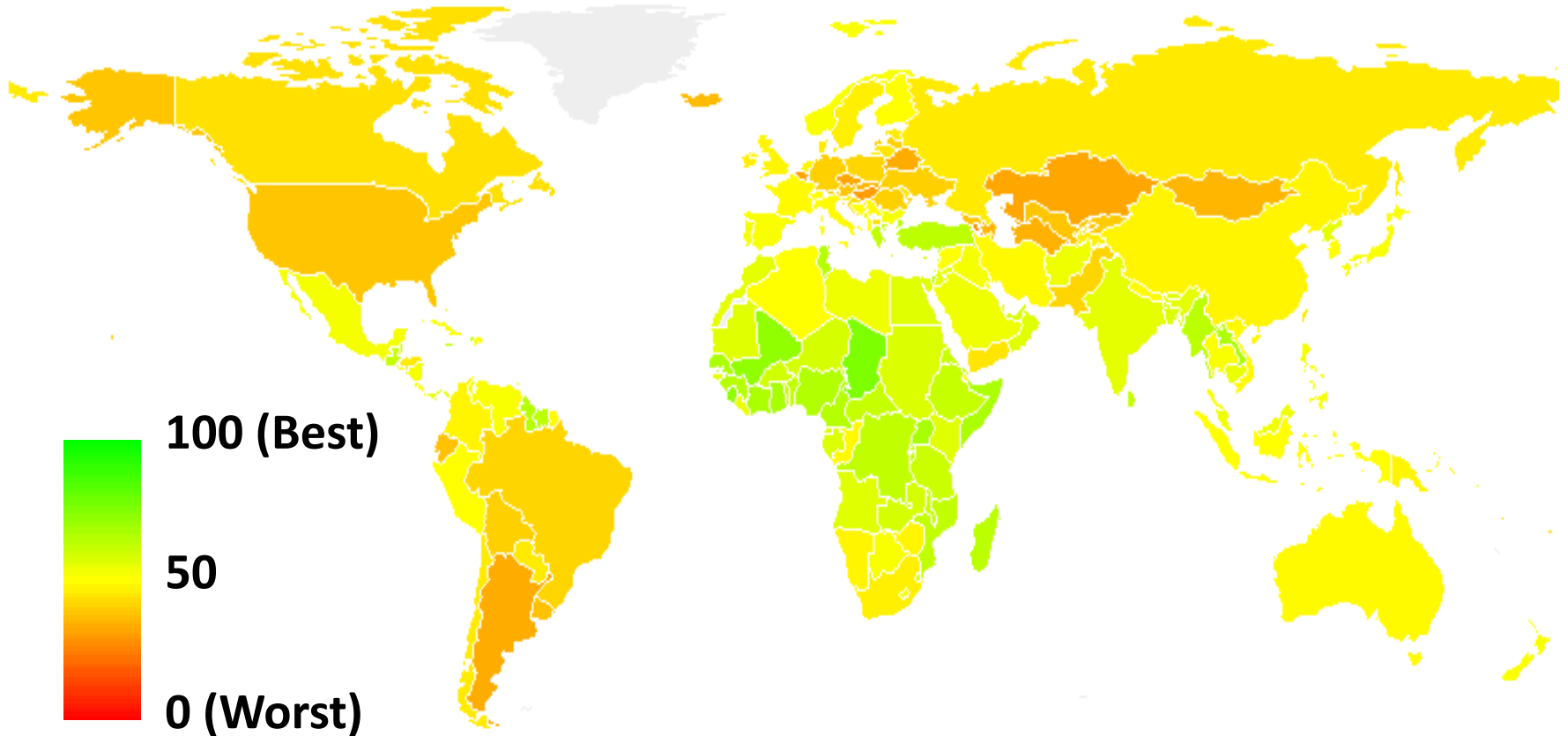
# Global Diet Quality, by National Income



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

# Global Diet Quality, 187 Countries

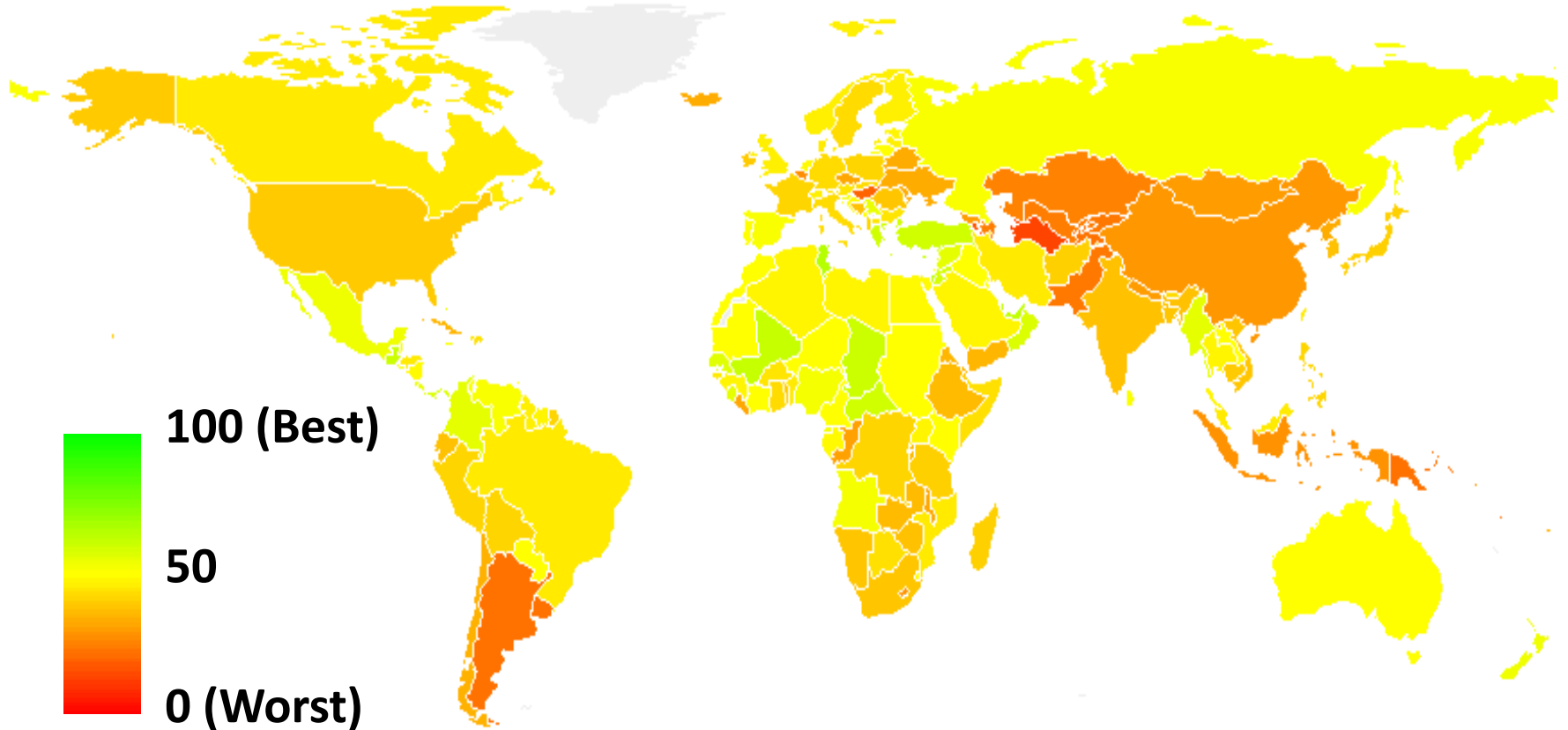
## 17 both healthful and unhealthful items



Observed range=27.4 to 75.2

# Global Diet Quality

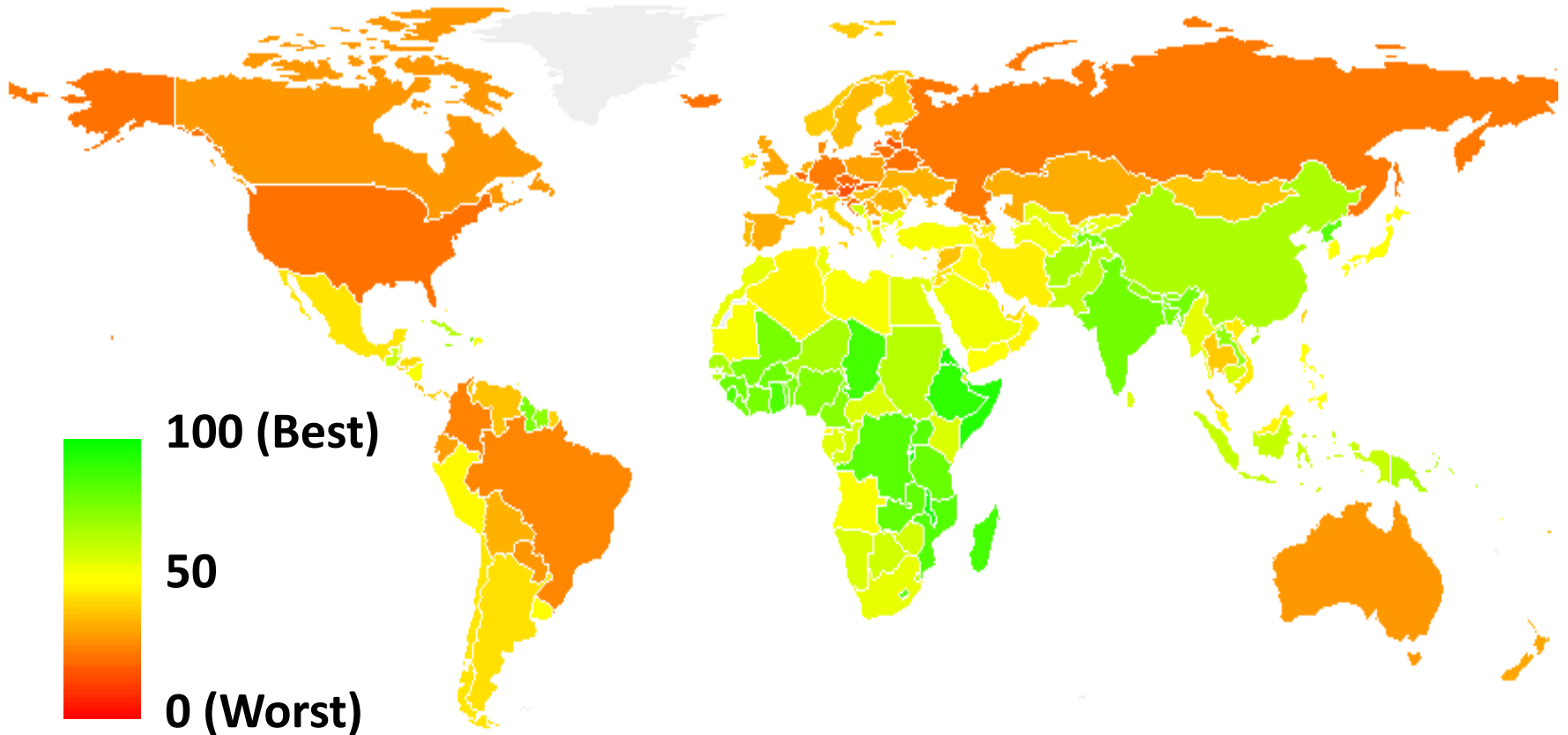
## 10 healthful items



Observed range=14.0 to 64.7

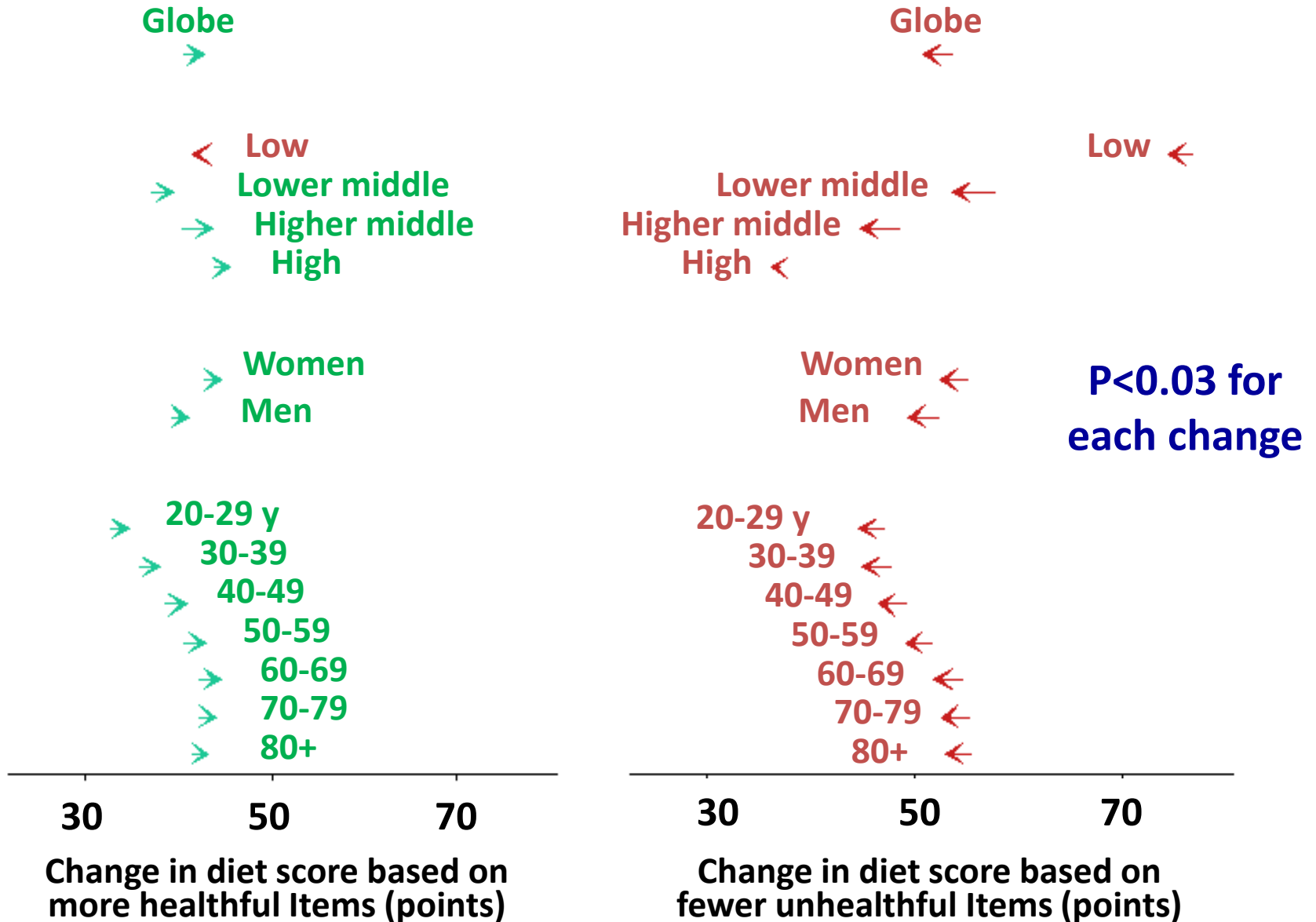
# Global Diet Quality

## 7 unhealthful items



Observed range=15.3 to 96.0

# Trends over time in global dietary quality



# Trends over time, selected nations

---

	More Healthy Items			Fewer Unhealthy Items		
	1990	2010	Change	1990	2010	Change
Brazil	34.8	40.2	+5.5	28.3	24.1	-4.4
Russia	45.1	52.0	+6.9	25.3	23.5	-8.2
India	38.5	38.3	-0.2	81.4	76.8	-4.6
China	34.2	29.9	-4.3	75.3	66.5	-8.7
France	38.3	39.9	+1.6	37.6	40.7	+3.0
Spain	50.2	50.7	+0.5	35.6	32.3	-3.3
Ecuador	38.5	35.3	-3.2	39.6	30.9	-8.6
Peru	39.7	38.4	-1.1	39.1	44.0	+4.8
Philippines	36.4	35.3	-1.2	47.7	43.7	-4.0
Viet Nam	27.4	36.8	+9.3	54.0	39.8	-14.1
USA	35.7	37.0	+1.2	21.0	23.8	+2.8

---

# Strengths and Limitations

## ● Strengths

- Global dietary data from individual surveys.
  - 187 countries.
  - 1990, 2010.
- 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.