

Aligning the food system to meet dietary needs: fruits and vegetables

Introduction to Session 1

Kathryn G. Dewey, PhD

Distinguished Professor, Dept of Nutrition

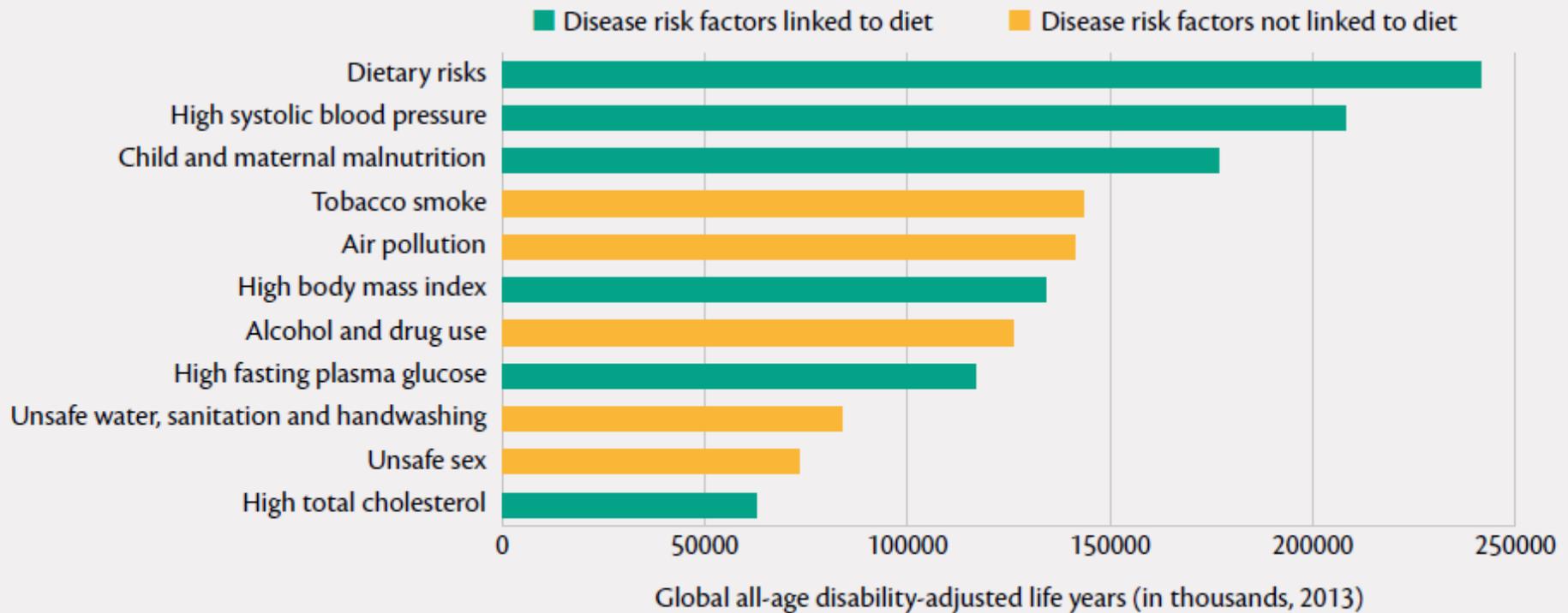
Director, Program in International & Community Nutrition

University of California, Davis

<http://picn.ucdavis.edu/>



Six of 11 key factors contributing to the global burden of disease are linked to low quality diet



Source: Global Burden of Disease Study 2013 Collaborators (2015), Figure 5

Note: The graph shows global disability-adjusted life years (DALYs) attributed to level 2 risk factors in 2013 for both sexes combined.

Pre-agricultural (prior to ~10,000 years ago) dietary quality was better than modern-day diets

	Pre-Agricultural Diet ¹	Modern Diet in Low-Income Countries
Animal protein	Very high [wild game, fish, shellfish, insects]	Low
Fat Total fat Fatty acid balance	Moderate to high High in omega-3	Low to moderate Generally low in omega-3
Carbohydrate Cereals Vegetables & fruits Refined sugars	None to minimal Very high None (honey)	40-90% of energy Low Moderate to high

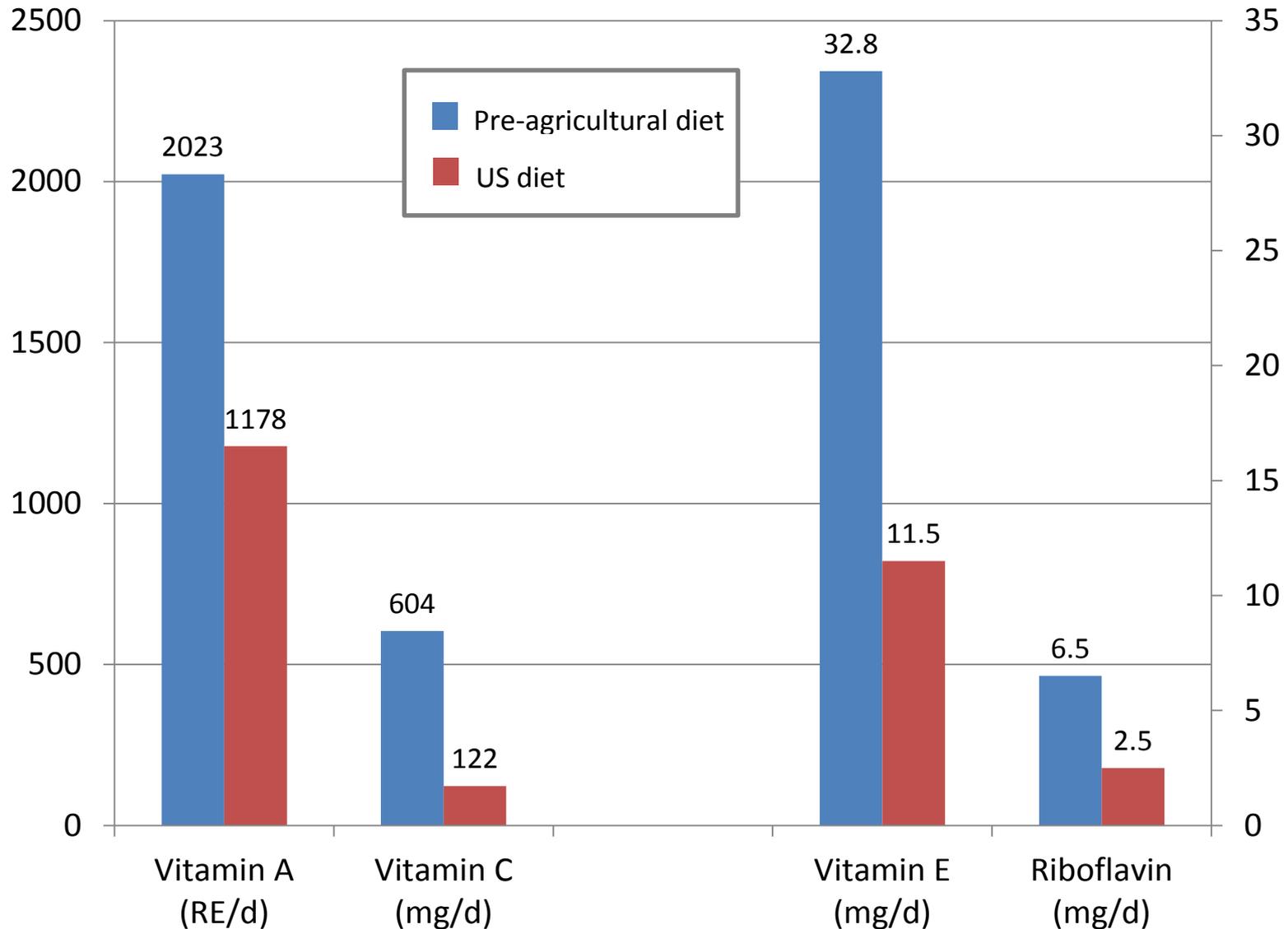
¹Source: Boyd Eaton & Boyd Eaton III, 2000

What did pre-agricultural humans consume?

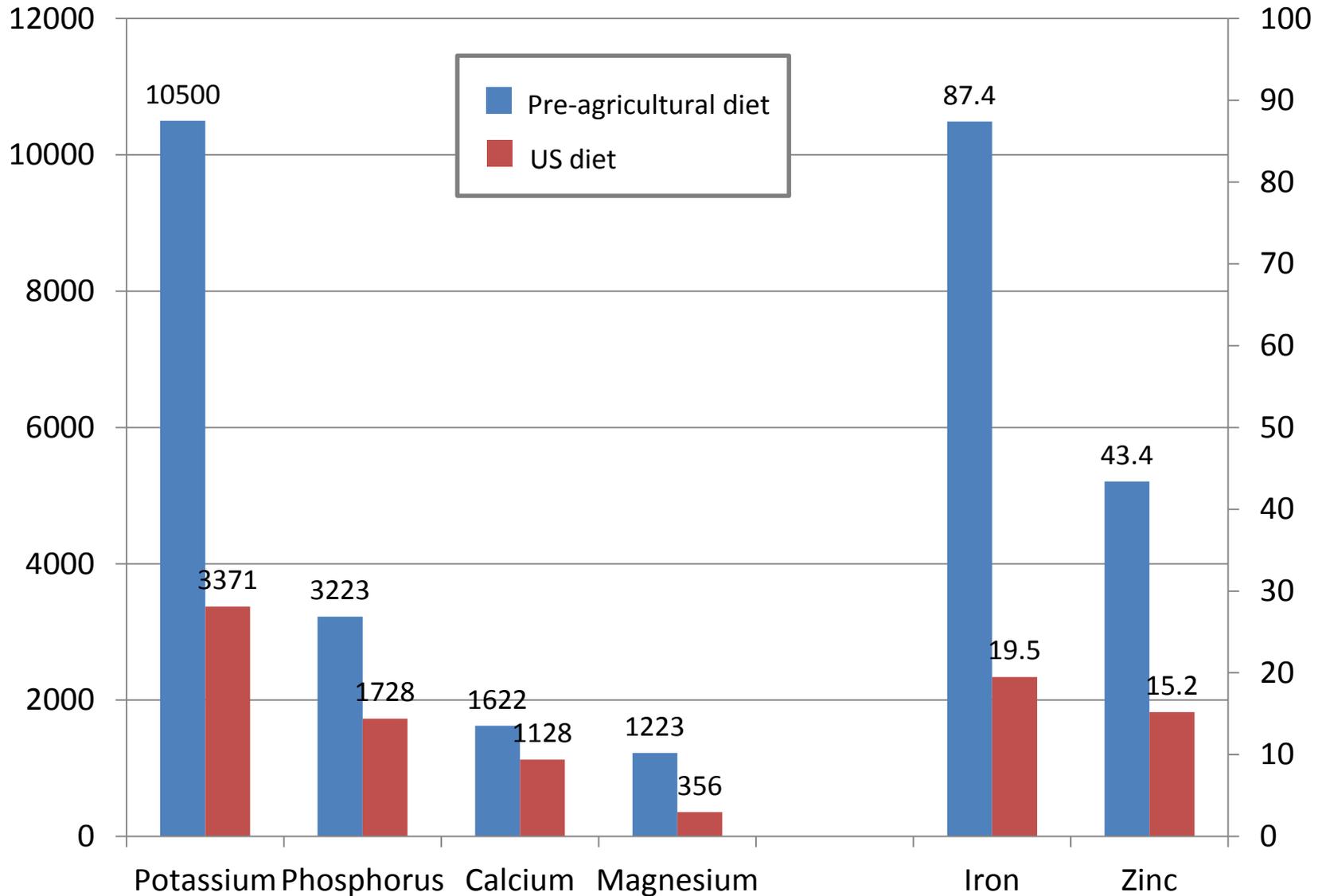
Composite hypothetical pre-agricultural diet (Eaton & Eaton 2000):

- Assumes 35% of energy from animal-source foods, 65% from plant sources
- Animal-source foods: average nutrient content of 85 wild animal foods
- Plant source foods: weighted average of 236 wild plants used by recent hunter-gatherers (weights based on forager diets in eastern & southern Africa)
- Excluded food sources with extreme outlier values for any of the nutrients included

Vitamin content of pre-agricultural diets was much higher than the average U.S. diet [Boyd Eaton 2000]



Mineral content of pre-agricultural diets was much higher than the average U.S. diet [Boyd Eaton 2000]



Biofortification and food fortification: will they solve the problem?

Biofortified crops: vitamin A, iron and zinc are current targets

- Maize (vitamin A)
- Sweet potato (vitamin A)
- Cassava (vitamin A)
- Banana (vitamin A)
- Plantain (vitamin A)
- Wheat (zinc)
- Rice (zinc)
- Beans (iron)
- Millet (iron)
- Cowpea (iron)
- Sorghum (zinc, iron)
- Potato (zinc, iron)
- Lentils (zinc, iron)

Food fortification: multiple nutrients can be added, but:

- There are > 30 essential nutrients
- Choice of food vehicles is challenging
- Excess intake is a risk

Foods provide more than nutrients

Bioactive substances have health effects

- Example categories of bioactive substances:

Flavonoids

Flavonols

Flavonols

Phytoestrogens

Lignans, coumestran

Isoflavones

Resveratrol

Lycopene

Organosulfur compounds

Soluble dietary fibers

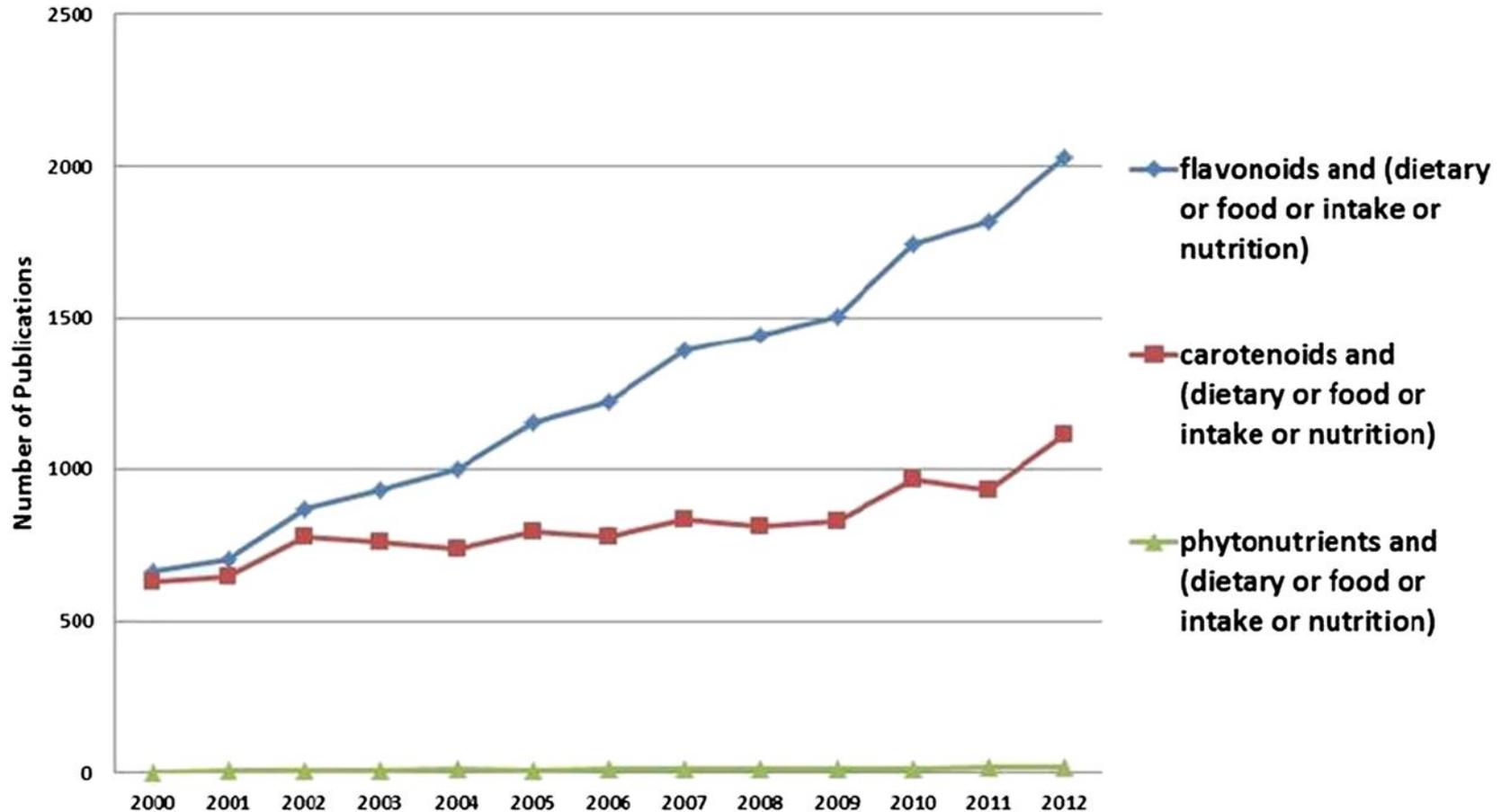
Isothiocyanates (ITC)

Monoterpenes

Plant sterols

Olive oil

Numbers of publications on flavonoids, carotenoids, and phytonutrients and health outcomes

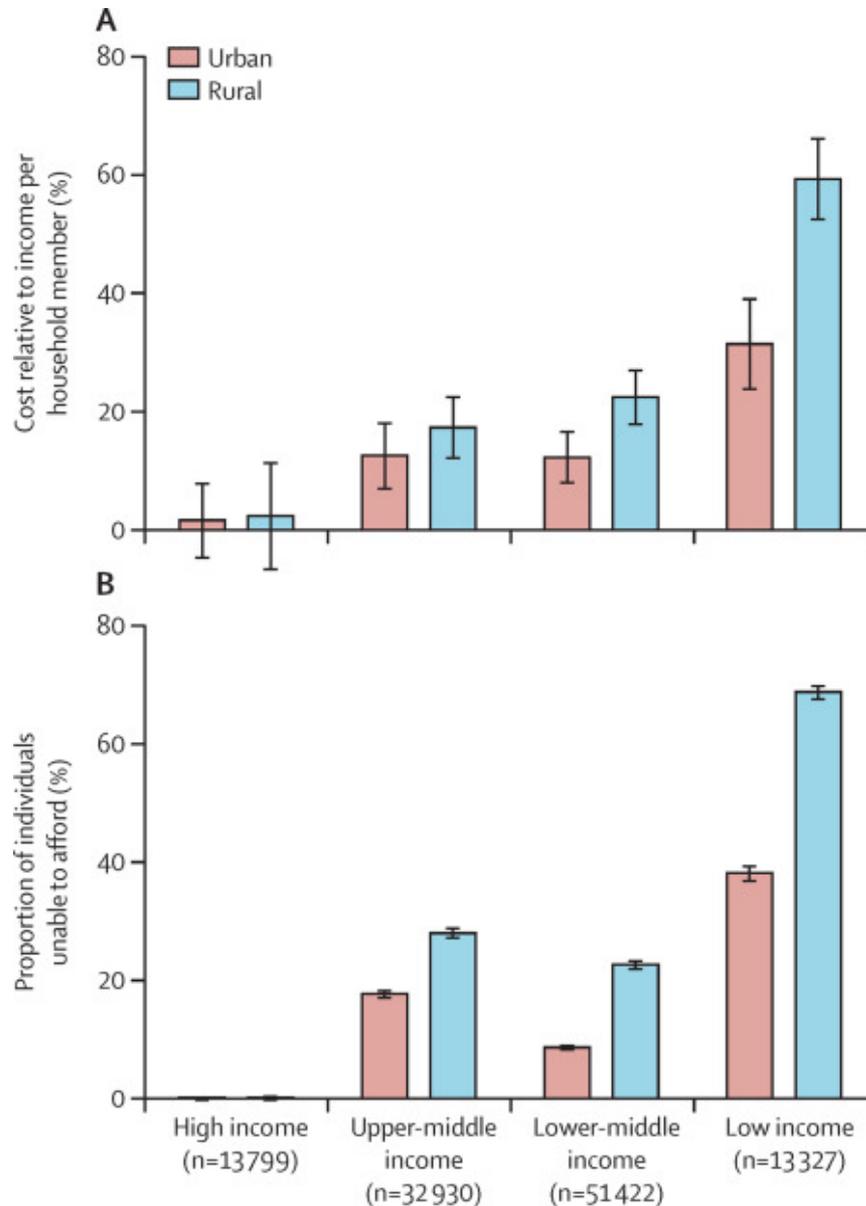


Connie M. Weaver Adv Nutr 2014;5:306S-311S

Goal: Diets that both reduce nutrient deficiencies and help prevent chronic disease

- Consumption of nutrient-rich foods including fruits, vegetables, nuts, beans and animal-source foods, is linked to nutrient adequacy.
- “Healthy” dietary patterns designed for prevention of overweight and chronic diseases also emphasize these food groups.

Availability, affordability, and consumption of fruits and vegetables in 18 countries across income levels: findings from the Prospective Urban Rural Epidemiology (PURE) study. Lancet Glob Health. 2016 Oct;4(10):e695-703.



(A) Mean proportion of income per household member required to purchase three servings of vegetables and two servings of fruits per day

(B) Proportion of individuals who were unable to afford three servings of vegetables and two servings of fruit per day

Local foods can meet micronutrient needs for women in urban Burkina Faso, but only if rarely consumed micronutrient-dense foods are included in daily diets: a linear programming exercise.

[Arimond M, Vitta BS, Martin-Prével Y, Moursi M, Dewey KG. Mat Child Nutr 2017; e12461.]

- Objective: to identify lowest cost options for meeting micronutrient needs, based on dietary data for urban women
- Modeled various scenarios with or without nutrient supplements
 - When allowing only commonly consumed foods ($\geq 10\%$ of recall days), micronutrient needs could not be met without supplements
 - When allowing all foods, micronutrient needs could be met but only if several nutrient-dense but rarely consumed foods were included in relatively large amounts:
 - E.g., Sesame seeds, **Baobab leaves, African locust bean**
- Strategies needed to increase consistent availability, economic access and demand for nutrient-dense local foods

Figure 1: Conceptual framework of links between diet quality and food systems²



Source: Global Panel, Improving nutrition through enhanced food environments, 2017