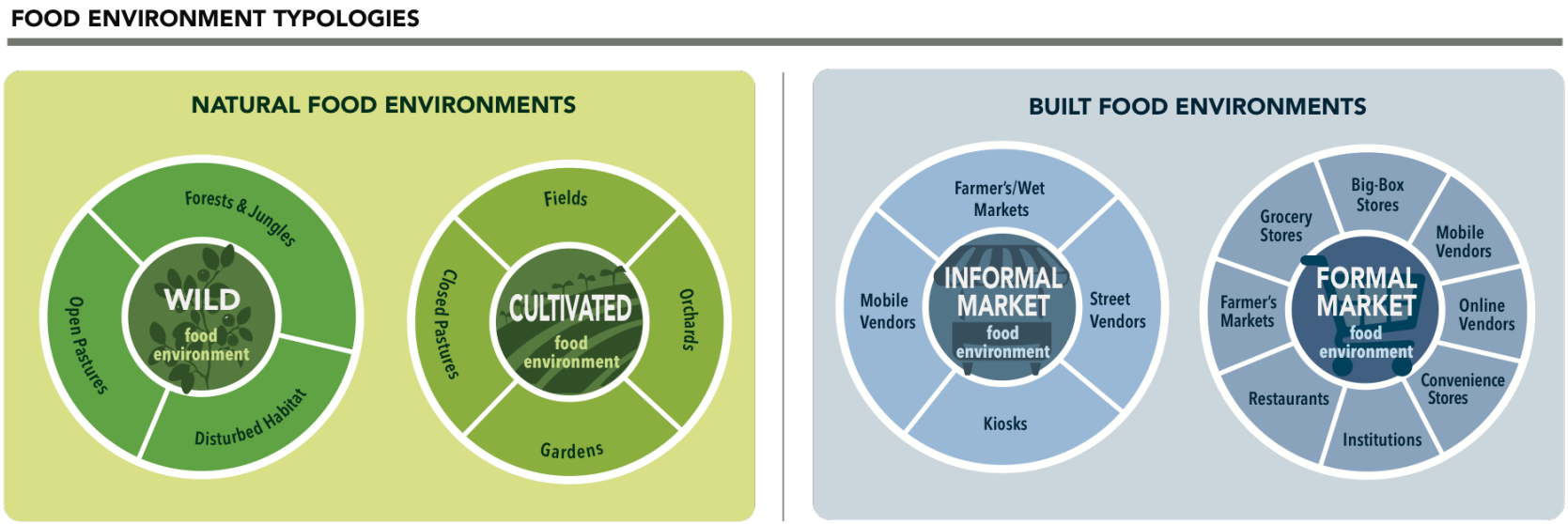
The Food Environment Transition Towards Sustainable Diets



Speaker: Selena Ahmed, Assistant Professor of Sustainable Food Systems

Co-authors: Shauna Downs, Anna Herforth, Carmen Byker Shanks, Jessica Fanzo

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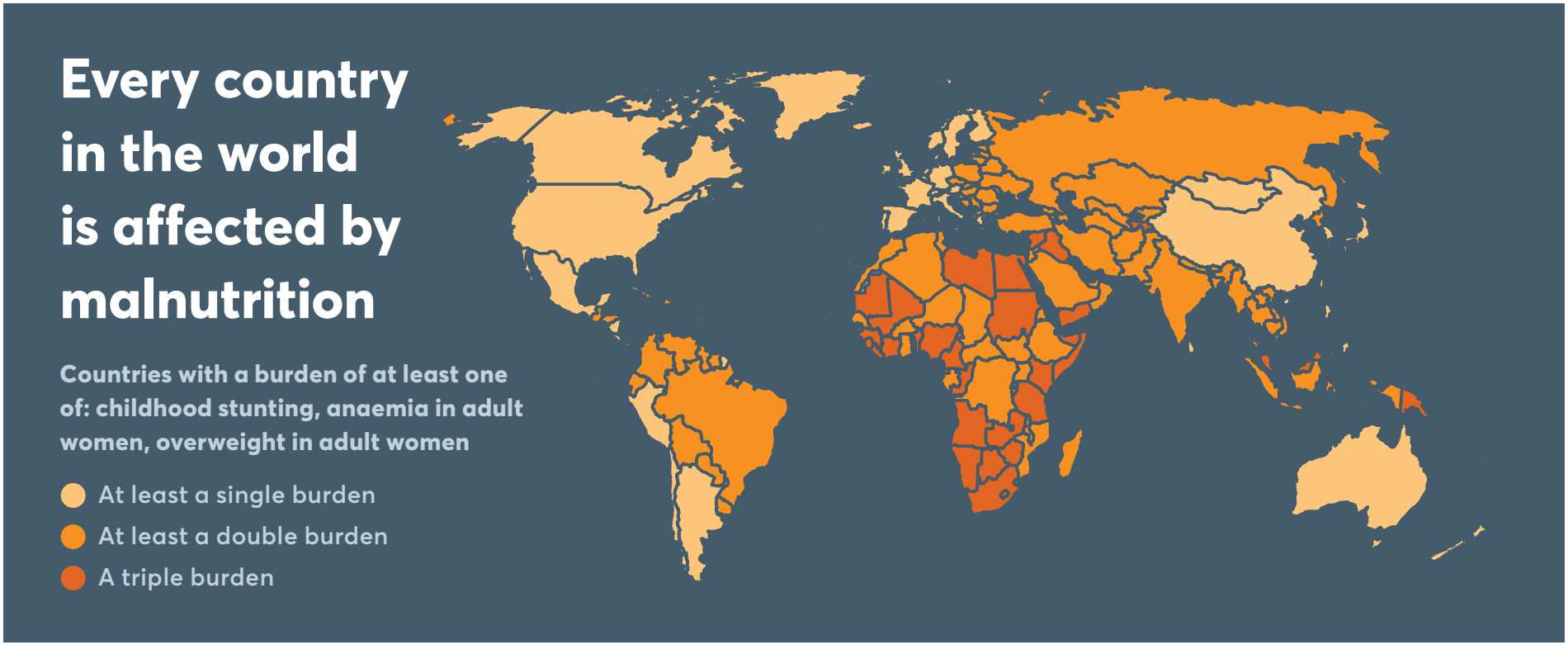
Key Challenge of the Anthropocene: Supporting Healthy Diets and Planetary Health

Food + UN Sustainable Development Goals

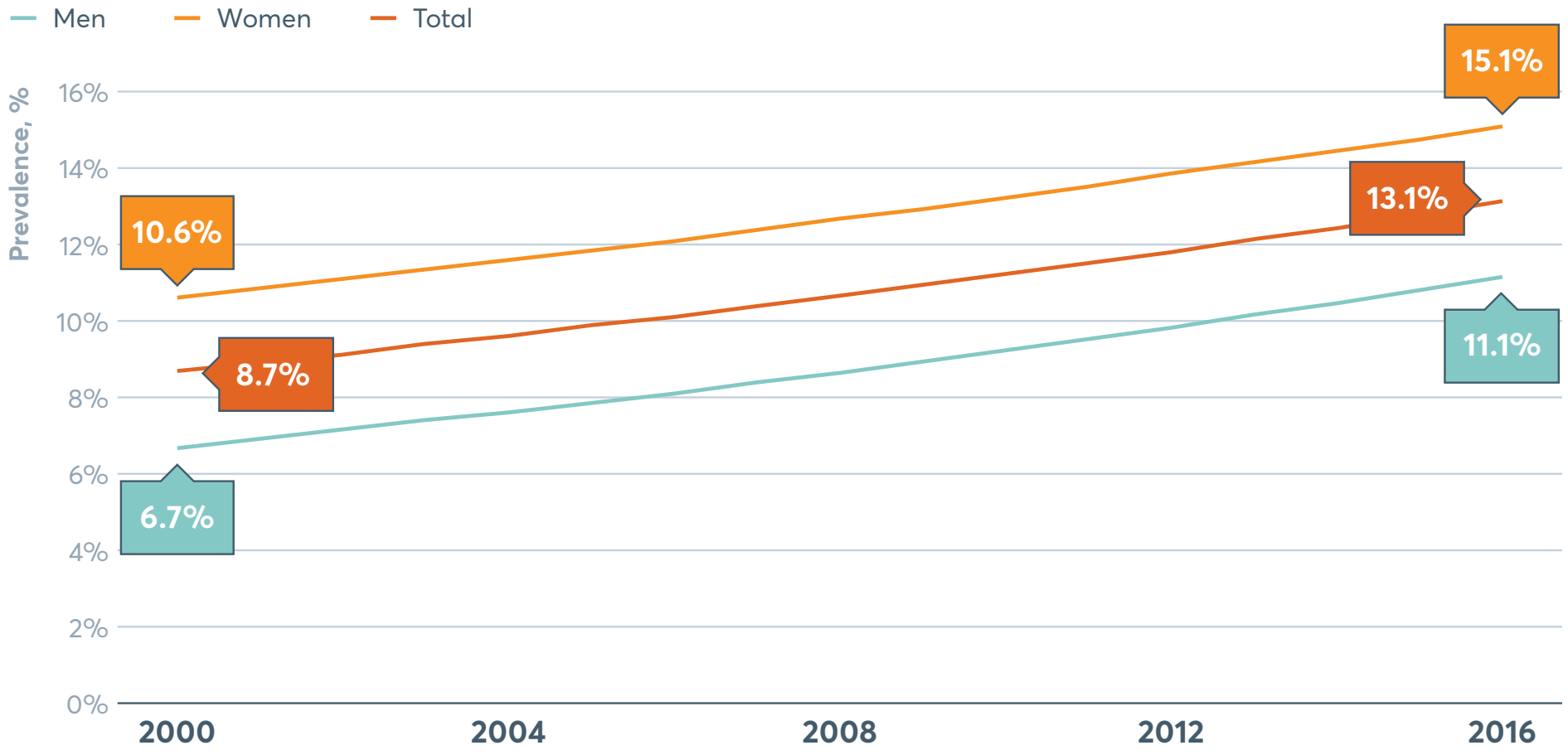
Poor Diets are the Leading Risk Factor of the Global Burden of Disease



Source: 2018 Global Nutrition Report

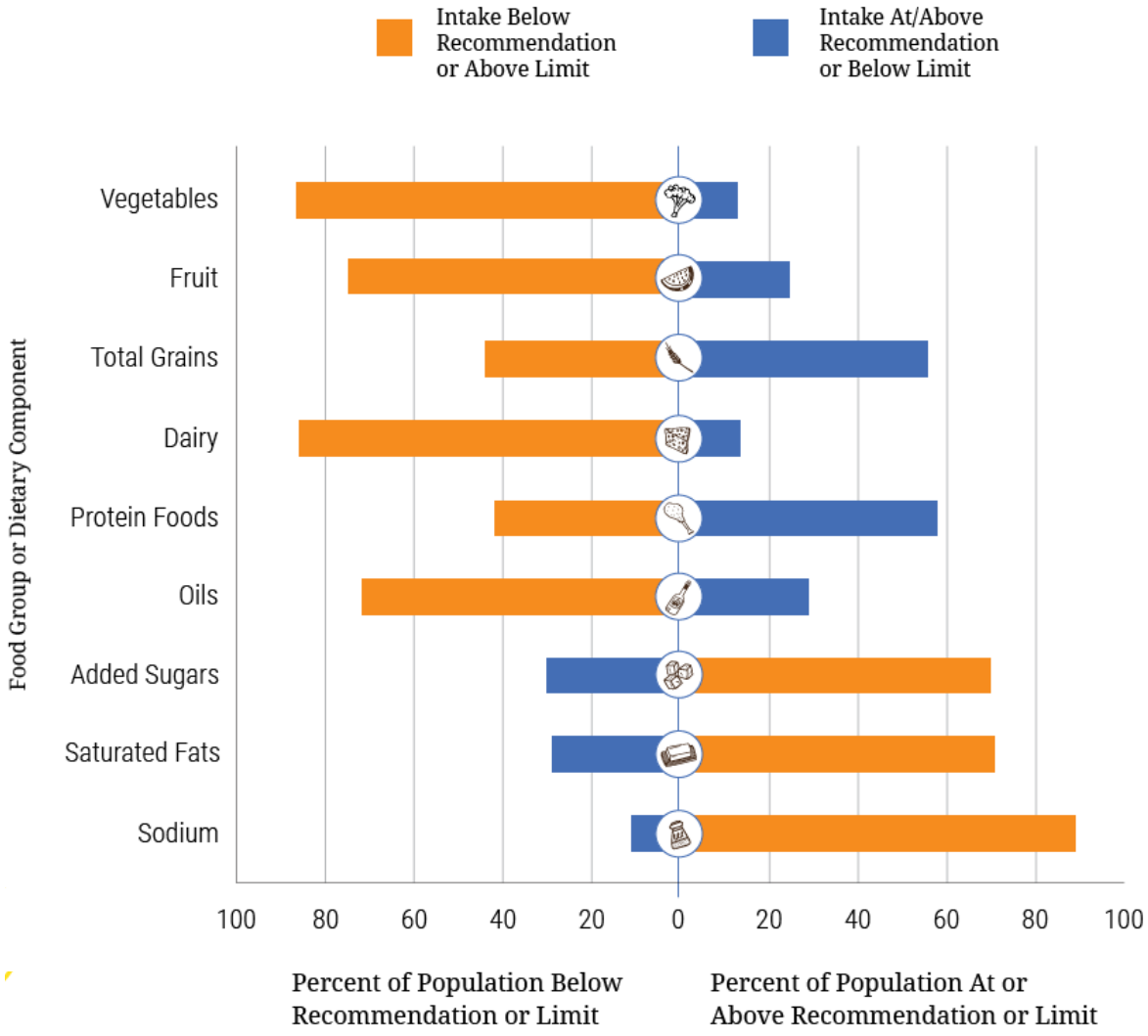
2 ZERO HUNGER

Global prevalence of obesity (BMI ≥30) among adults aged 18 years and over, 2000–2016



Source: NCD Risk Factor Collaboration.

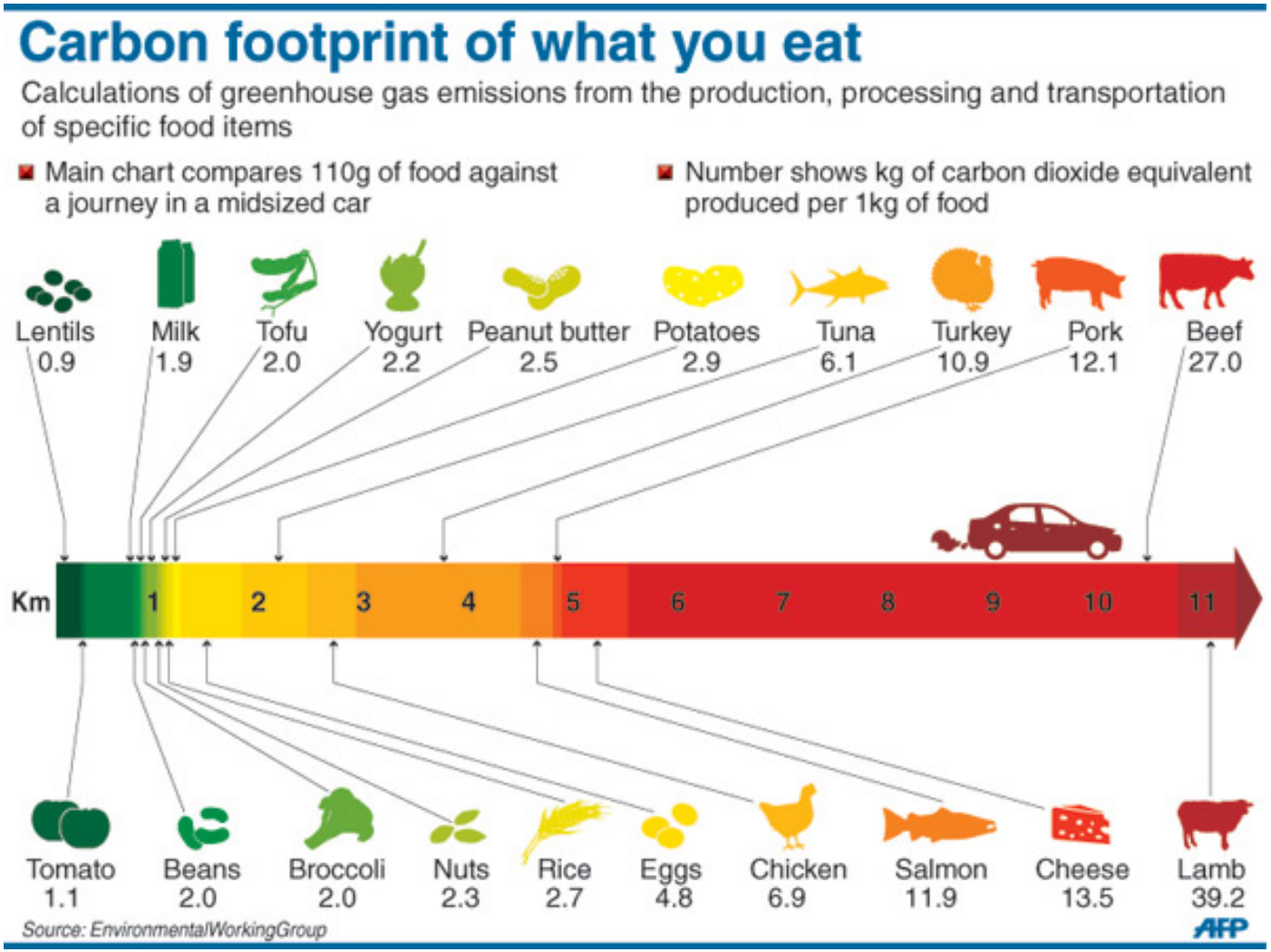
Dietary Intake of Americans Doesn't Meet Recommendations



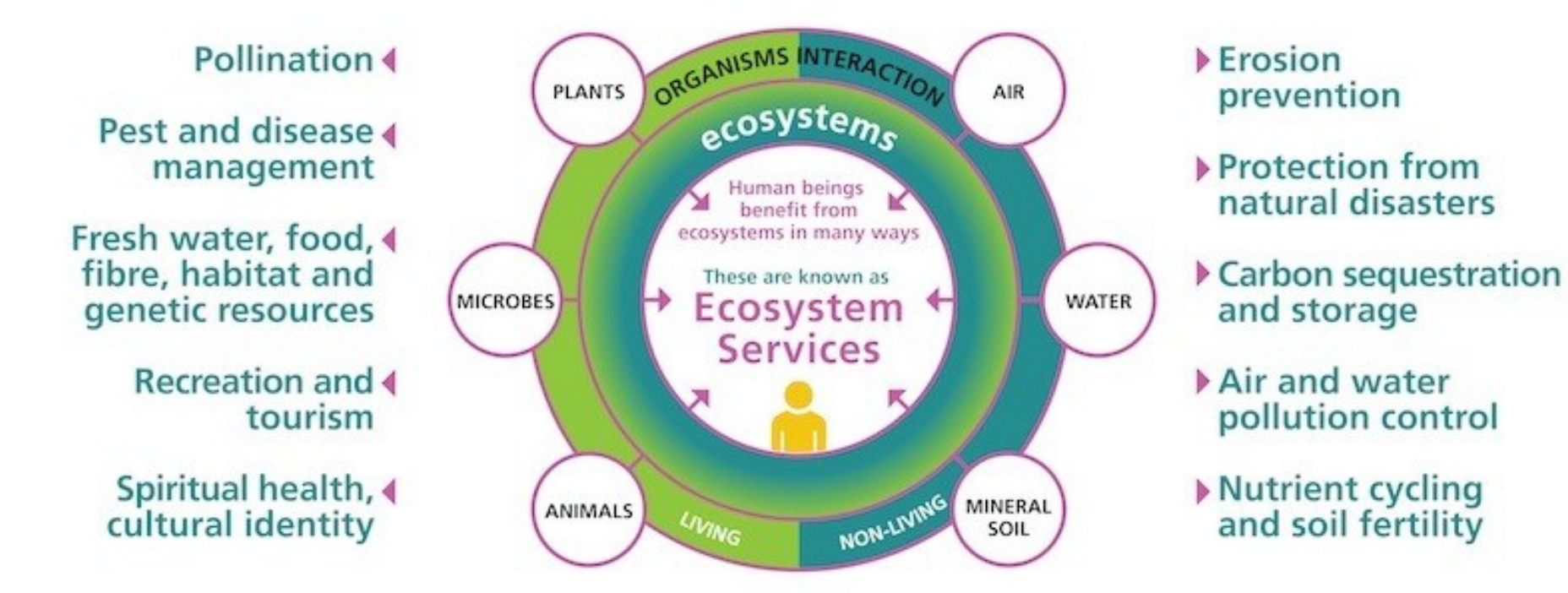
Source: National Health and Nutrition Examination Survey

3 GOOD HEALTH AND WELL-BEING

Food Production Places Greater Stress on Ecosystems than any Other Human Activity



Food Production is Critically Dependent on Multiple Ecosystem Services



12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Source: https://wle.cgiar.org

Diversified Agricultural Systems can Support Environmental and Human Health

Total Catechin Content (TCC)

218 mg TCC / g tea > 86 mg TCC / g tea

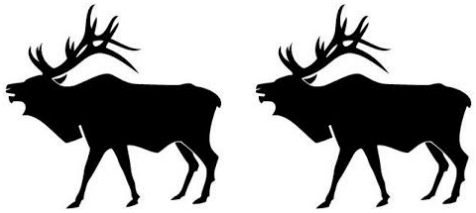
$p < 0.0001$

Ahmed et al. *Conservation Letters* 6, 28-36 (2013)

Much of What is Produced is Wasted

SFBS 499 and NUTR 351
Student Project on Food Waste

Three Days of Student Food Waste =



Weight of 2 Adult Bull Elk

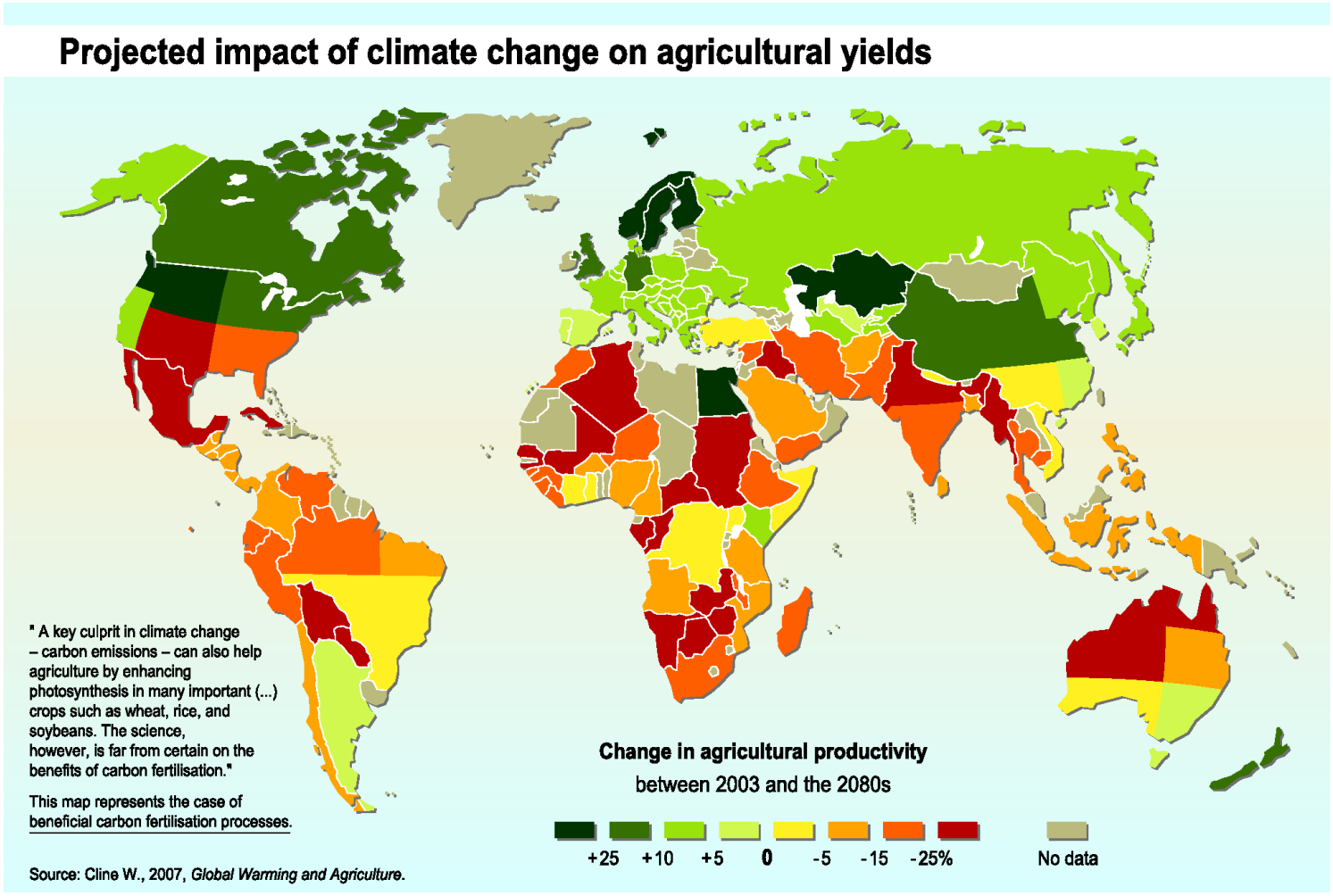
Help Reduce Food Waste

TAKE WHAT YOU CAN EAT -

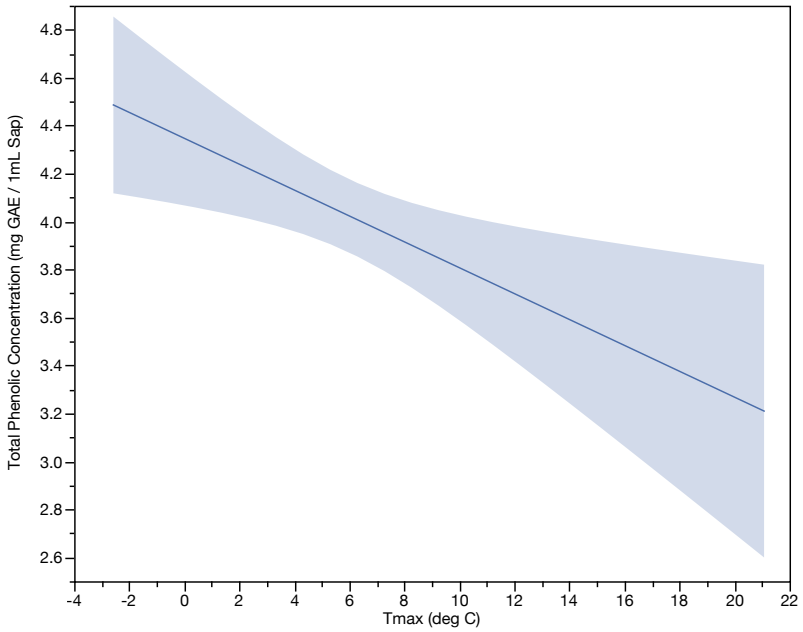
GET SECONDS IF YOU WISH!

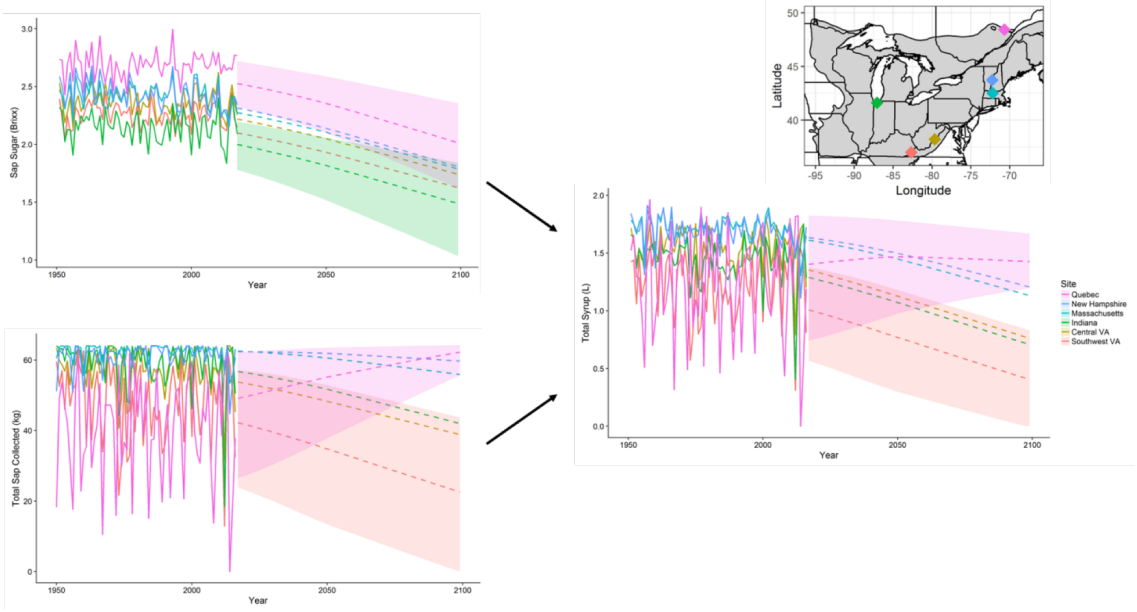
12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Global Change Exacerbates Food System Challenges



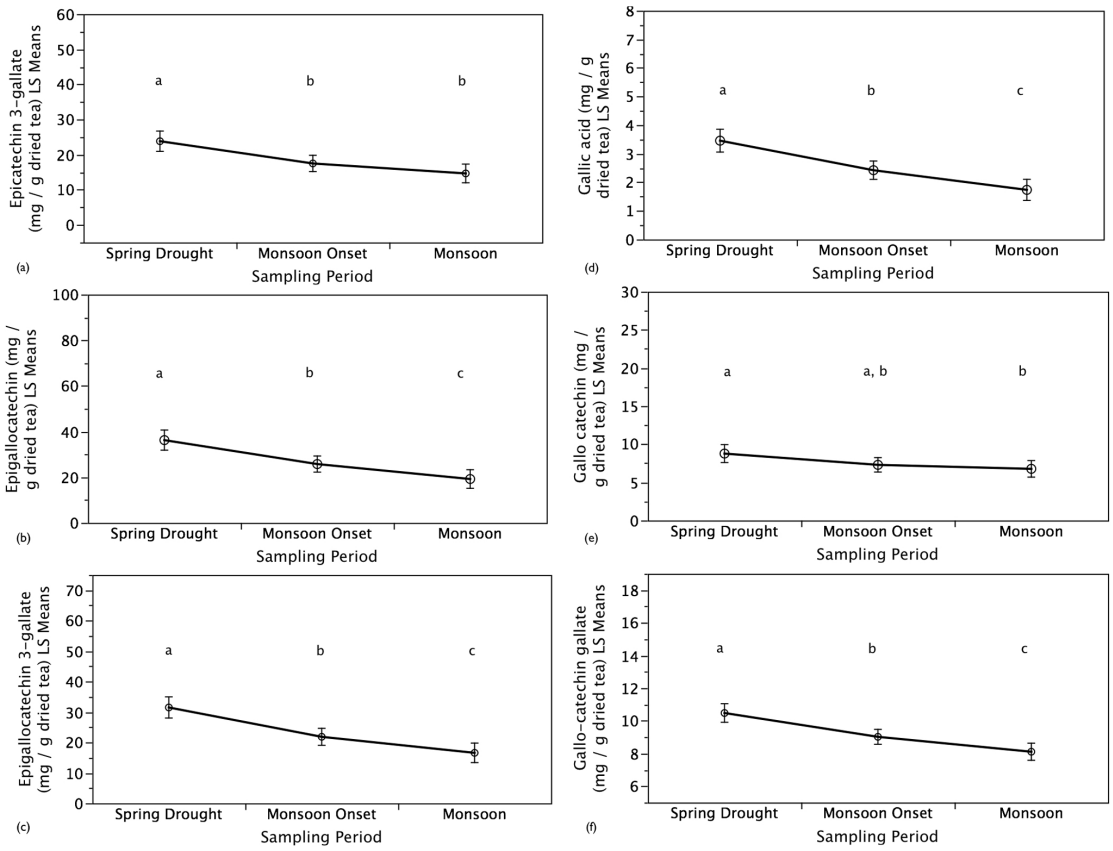
Crop Quality is Predicted to Shift with Climate Change

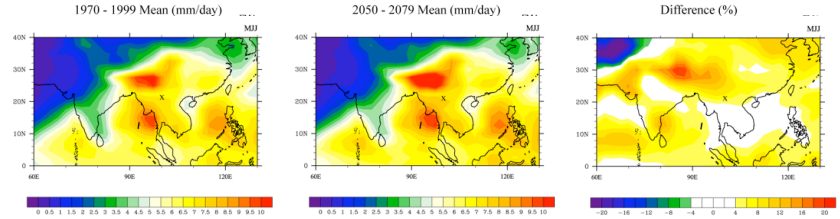


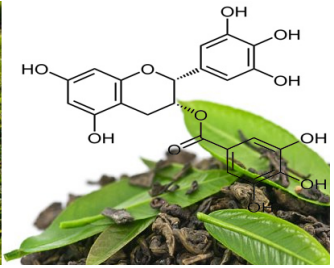


Ahmed et al. FEMC Annual Conference 2017

Crop Quality is Already Significantly Impacted by Climate Variability







Ahmed et al. *PLoS One* 9 (2014)

Sustainable Diversified Agriculture Can Mitigate Climate Change Effects on Crop Quality

Change in secondary metabolite concentrations between Spring and Monsoon harvests

-24.9 mg TCC / g tea > -32.2 mg TCC / g tea

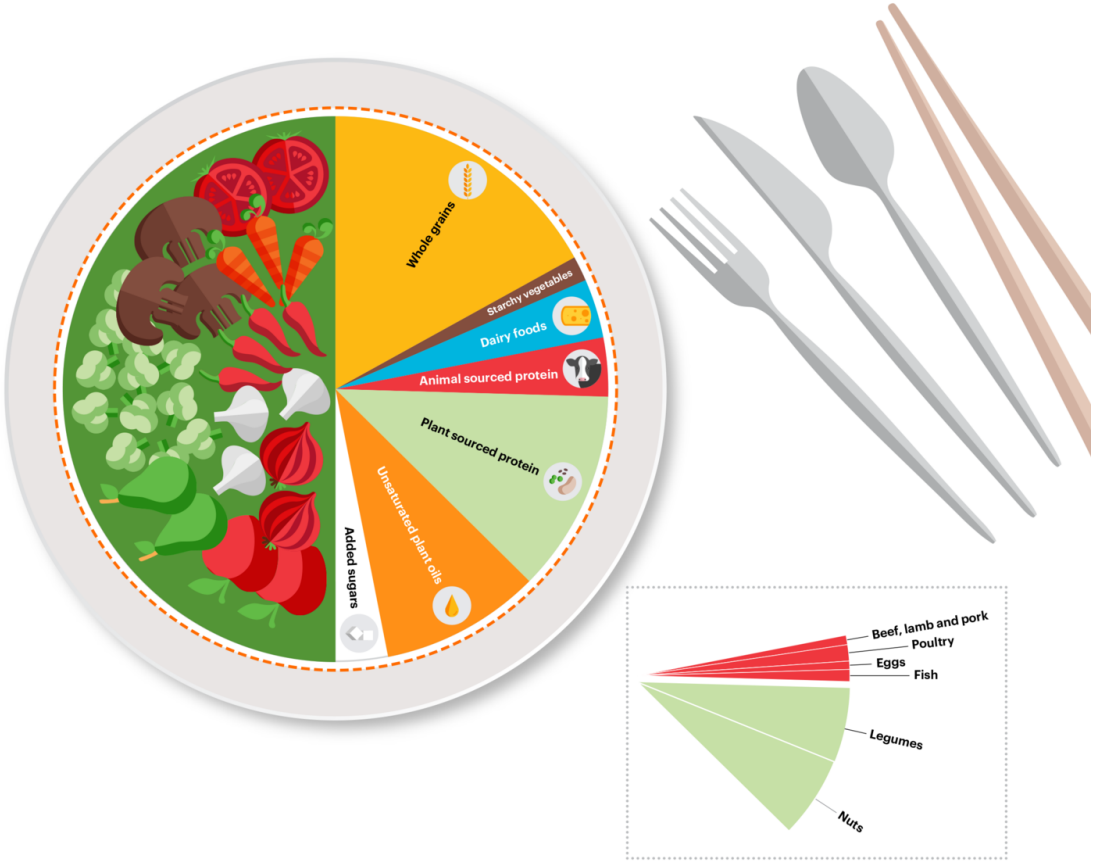
$p < 0.0001$

Sustainable Food Systems

Source: https://www.esdw.eu

Sustainable Diets

Sustainable diets are healthy diets from sustainable food systems that advance the human condition and conserve ecological resources in socially acceptable ways.

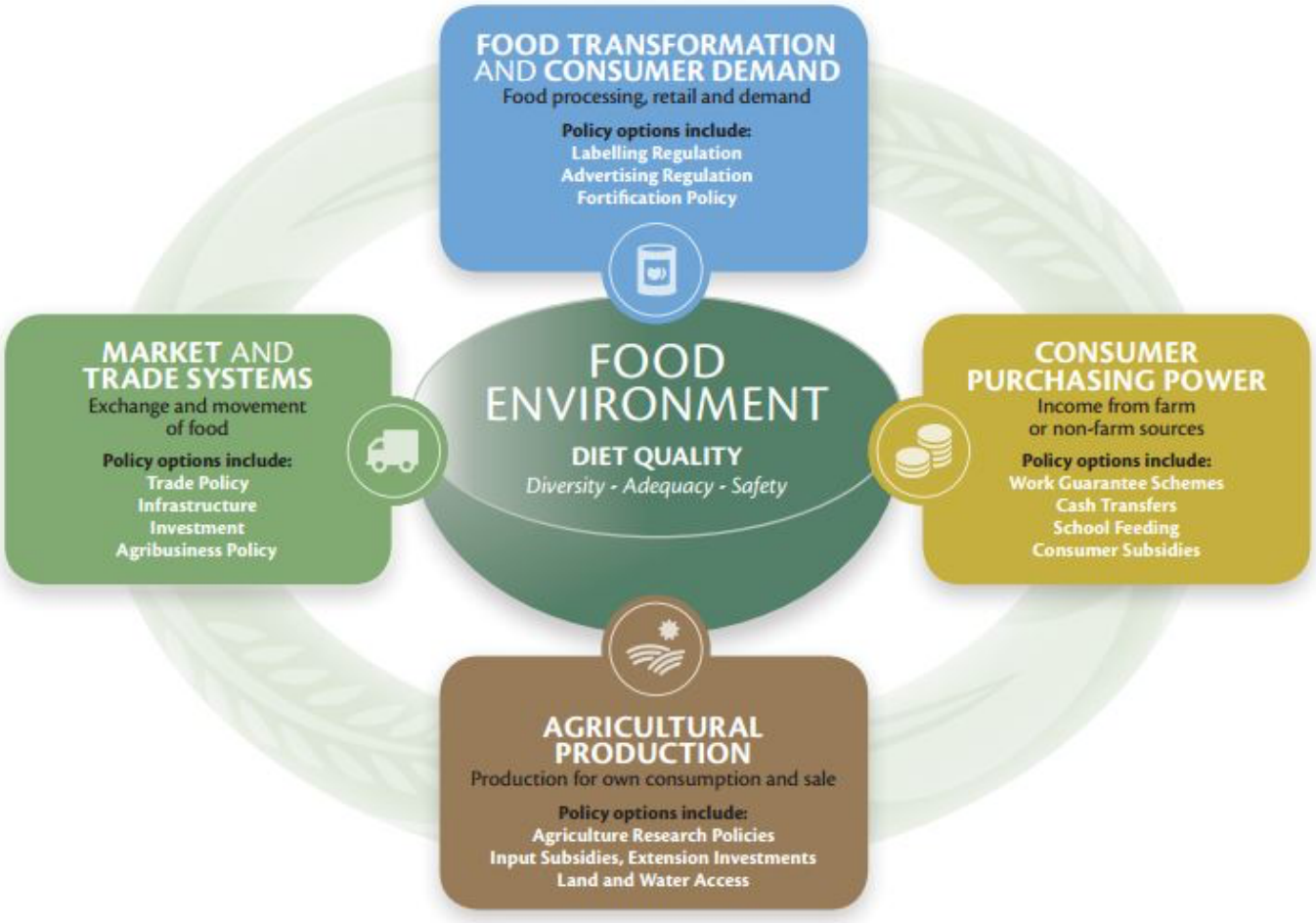


Source: The EAT-Lancet Commission on Food, Planet, Health

The Food Environment is the Consumer Interface with the Food System

Sustainable diets are the results of a consumer's food choices within the food environment.

The food environment influences the availability, affordability, convenience, and desirability of food.

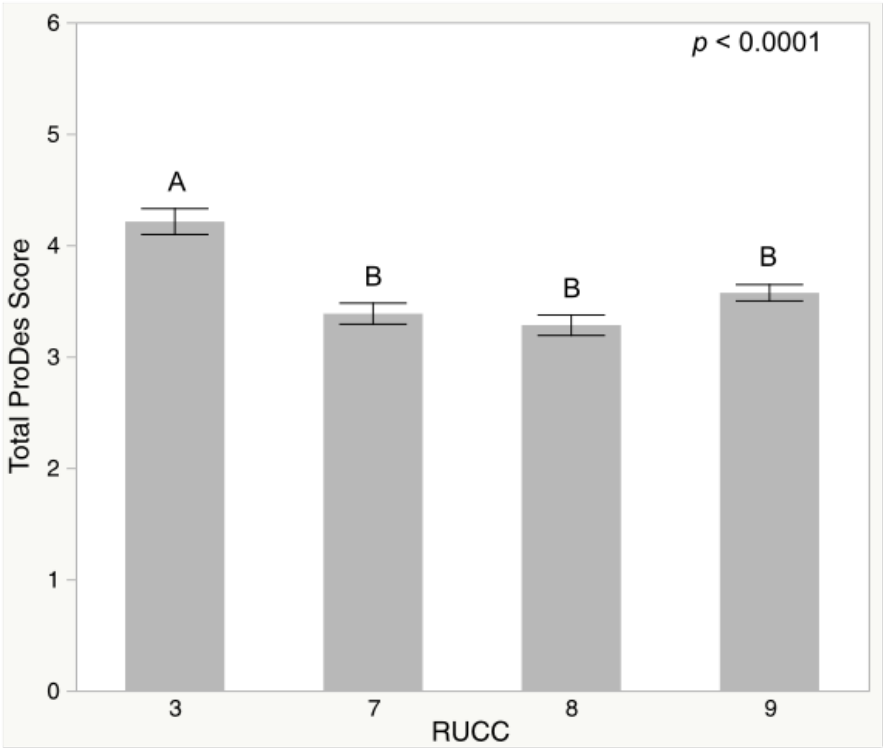


Source: https://www.glopan.org/nutrition

Not all Food Environments Support Sustainability

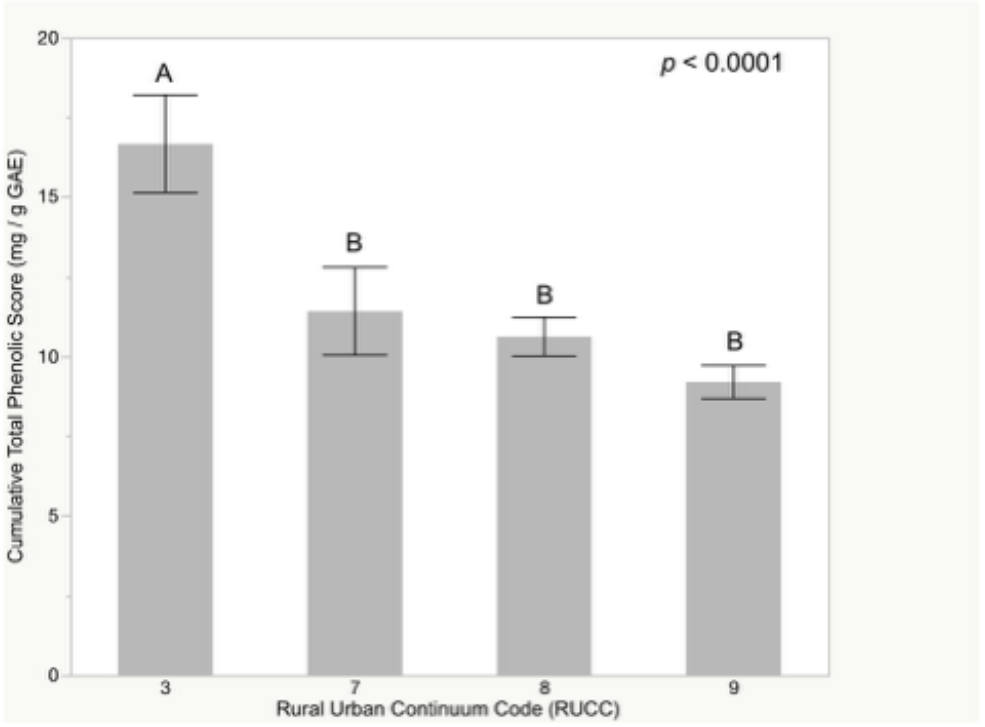
Individuals interact in the food environment to make food choices based on personal / cultural factors (preferences, income, knowledge, values, time etc.)

Food Environment Disparities based on Rurality



Fruit and vegetable desirability is lower in more rural built food environments of Montana, USA using the Produce Desirability (ProDes) Tool

Selena Ahmed[1] · Carmen Byker Shanks[1] · Teresa Smith[2] · Justin Shanks[3]

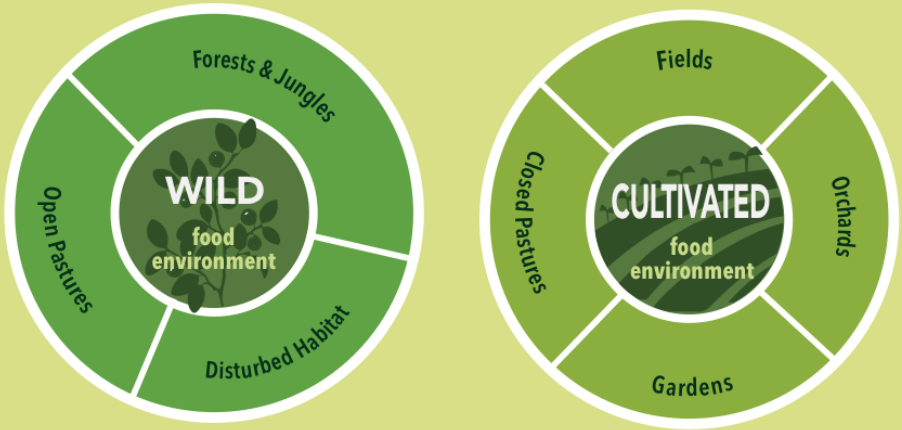


Quality of Vegetables Based on Total Phenolic Concentration Is Lower in More Rural Consumer Food Environments in a Rural American State

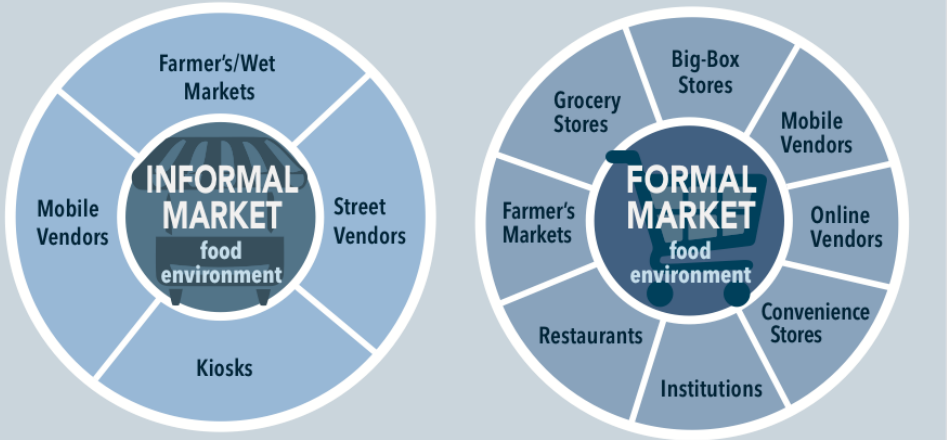
Selena Ahmed * and Carmen Byker Shanks

FOOD ENVIRONMENT TYPOLOGIES

NATURAL FOOD ENVIRONMENTS



BUILT FOOD ENVIRONMENTS



Indigenous Yunnan food environments







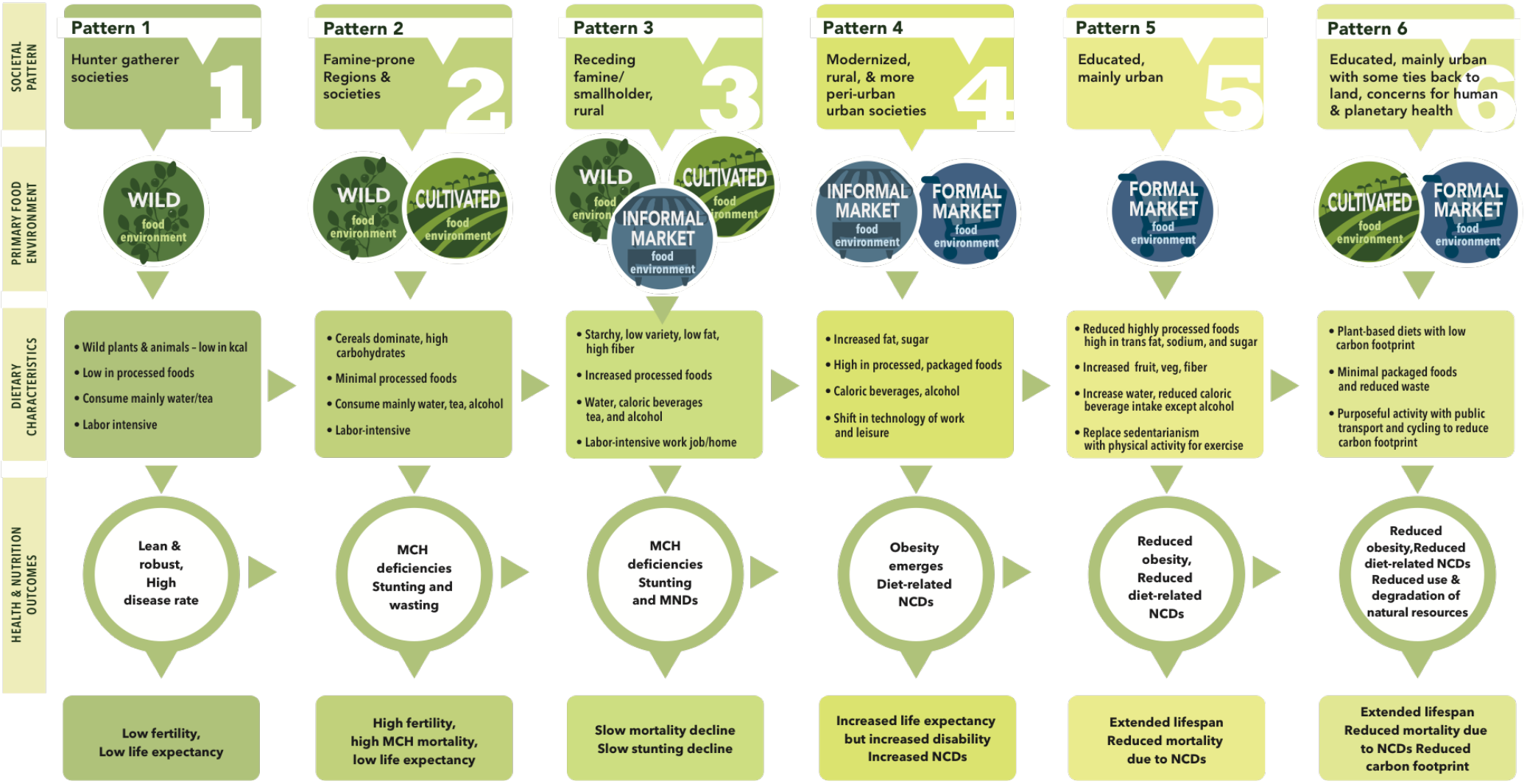




Biodiversity of the Natural Food Environment is Linked to Dietary Diversity

Food Environments are Changing

THE FOOD ENVIRONMENT AND NUTRITION TRANSITION TOWARDS SUSTAINABLE DIETS



Changes in Food Availability

Table 1. TOP TEN SPECIES IN TERMS OF THEIR INCREASE IN ABUNDANCE IN NATIONAL FOOD SUPPLIES, 1961 TO 2009

Crop*	Increase in relative abundance and contribution to calories (rank)	Change in spread (rank)	Risk category
Soybean	1	2	Harmful**
Palm oil	2	5	Harmful
Sunflower	3	3	Neutral
Wheat	4	35	Neutral
Rape and mustard	5	6	Neutral
Rice	6	15	Neutral
Sweeteners	7	4	Harmful
Vegetables	8	-	Protective
Cacao beans	9	17	Neutral
Treenuts	10	26	Protective

Notes:

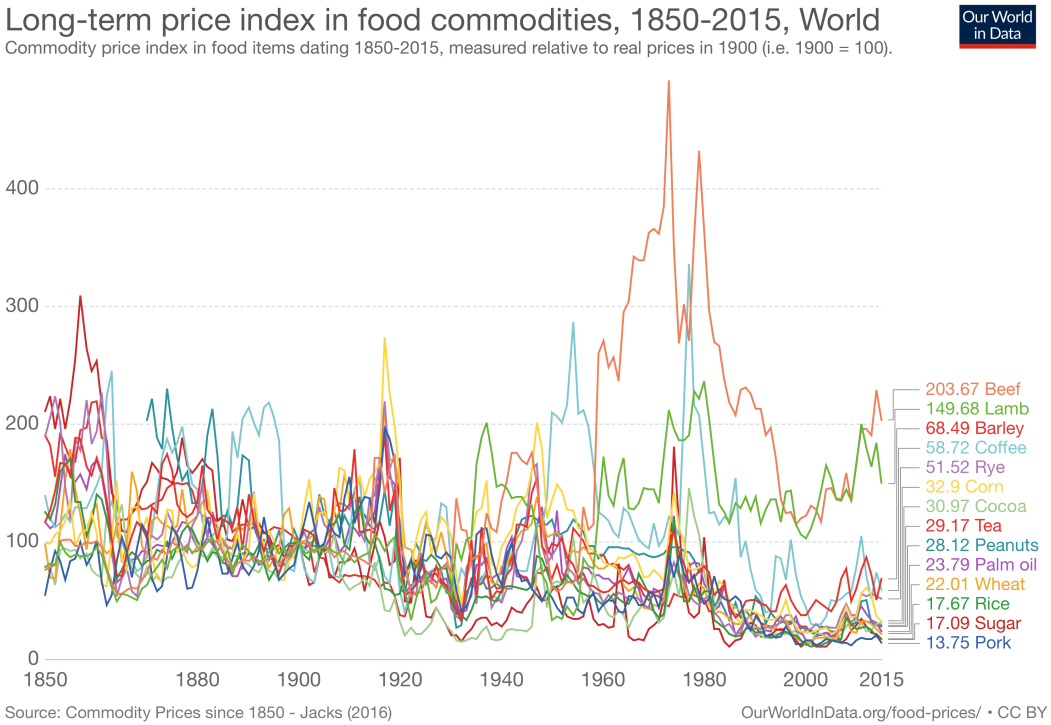
* These top ten species are ranked in terms of increase of spread (Khoury et al. 2014), and dietary risk (Murray 2014). Khoury et al. (2014) did not analyze animal-source foods. The geographic spread is defined as the change over time in a country's food supply in each year; a higher number indicates less change in geographic spread relative to other crops.

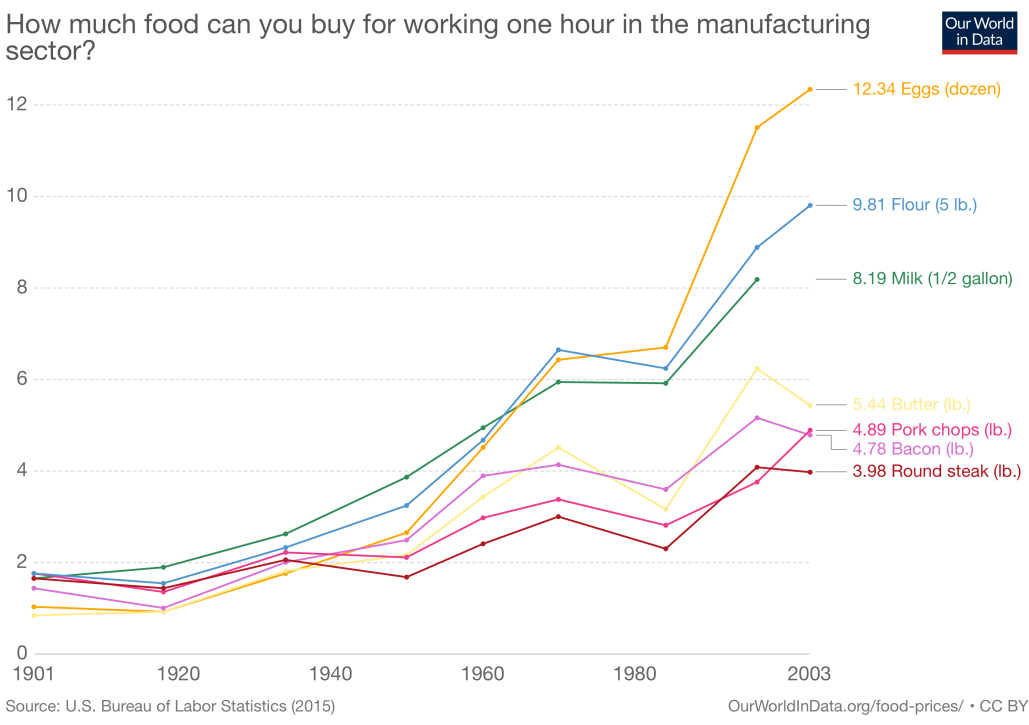
**Soybeans themselves would be in the "protective" risk category, but the increase in their production is mostly for livestock feed to produce red meat destined for middle- and high-income countries, which is classified as "harmful" with relation to the global burden of disease.

Sources: Derived from Figures 1A and 1B in Khoury et al. (2014) and Murray (2014).

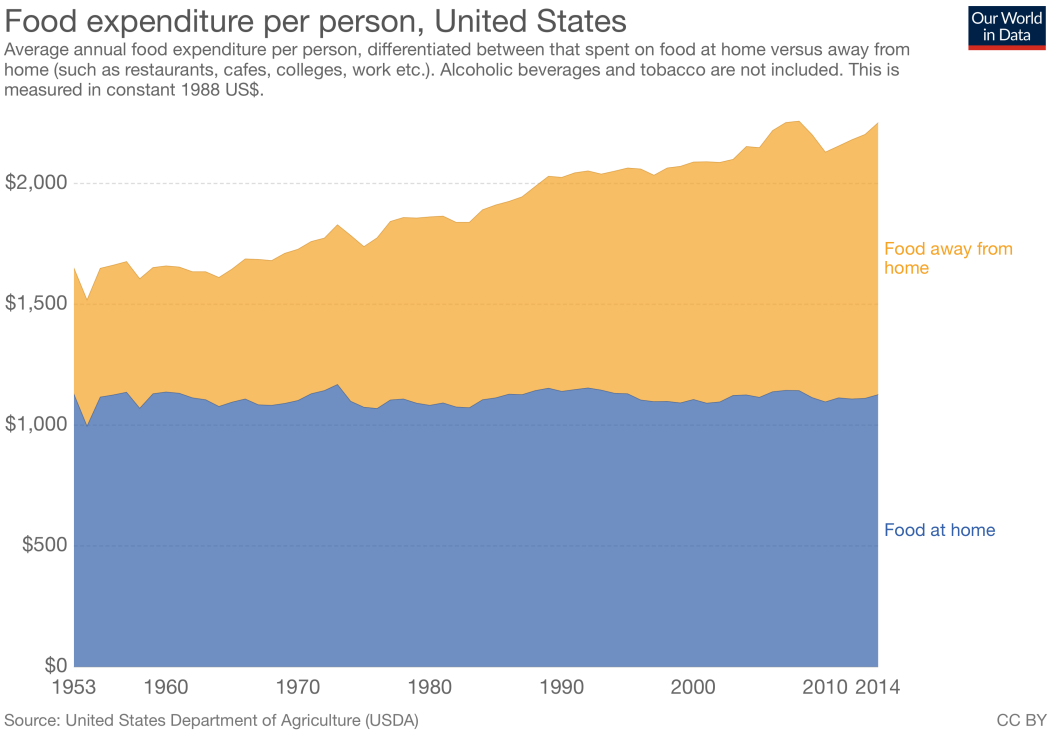
Source: Herforth et al. 2017 (UNSCN)

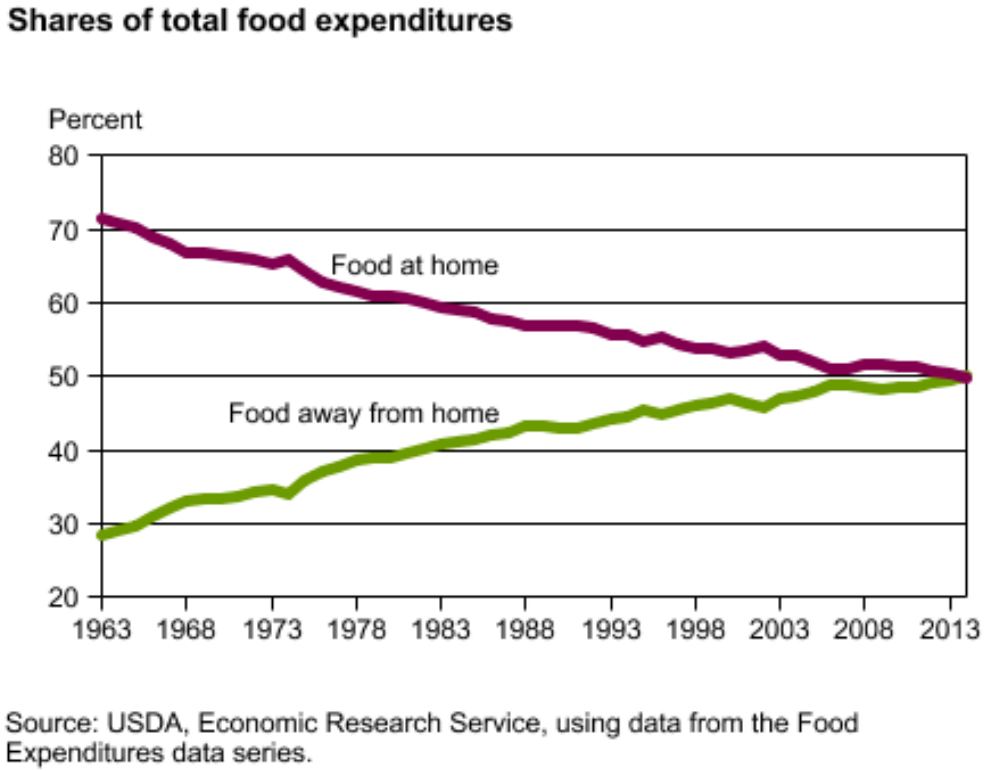
Changes in Food Affordability



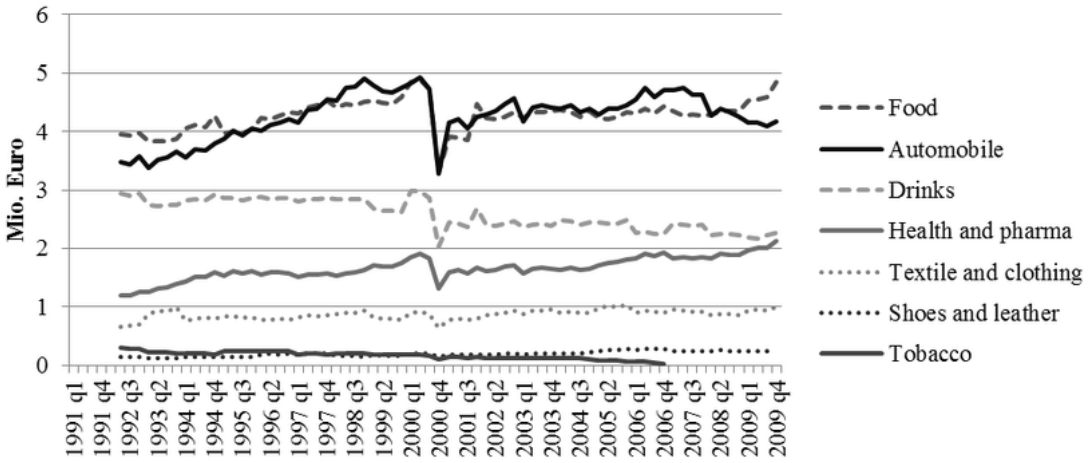


Changes in Food Convenience

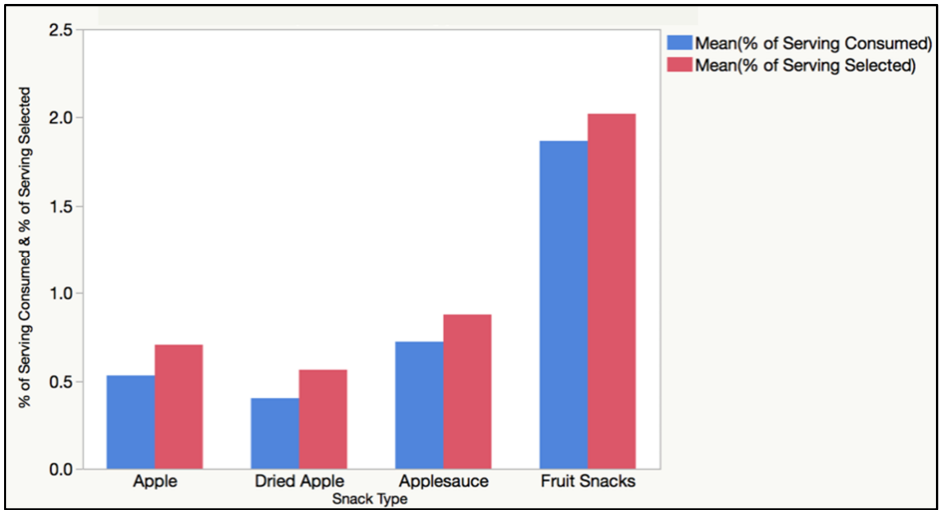




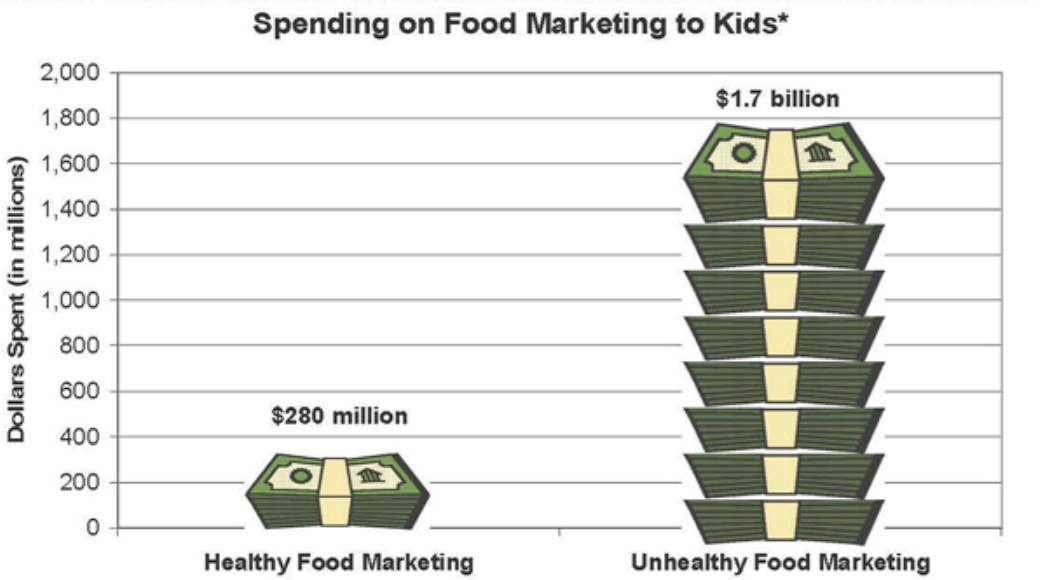
Changes in Food Desirability



Source: Lischka et al. 2014



Source: Svisco et al. 2019



*Federal Trade Commission (FTC). *Marketing Food to Children and Adolescents: A Review of Industry Expenditures, Activities, and Self-regulation*. Washington, D.C.: FTC, 2008.
Powell L, Schermbeck R, Szczypka G, Chaloupka F, Braunschweig C. "Trends in the Nutritional Content of TV Food Advertisements Seen by Children in the US: Analyses by Age, Food Categories and Companies." *Archives of Pediatric and Adolescent Medicine*, Published online August 2011. doi:10.1001/archpediatrics.2011.131.

Promoting Sustainable Diets: Nutrition and Human Health

Nutrition and health dimension of sustainable diets		
Component	**Characterization**	**Metrics**
Plant-based foods 	Consumption of plant-based foods including fruits, vegetables, legumes, nuts, and seeds versus consumption of animal-source foods (including meat and dairy) as part of a diet with adequate consumption of calories and protein.	Survey data of dietary intake; Food balance sheet data; Healthy Eating Index; Dietary Diversity Scores
Dietary diversity	Consumption of a diverse range of foods in different food groups that support healthy diets.	Survey data of dietary intake; Dietary Diversity Scores
Dietary quality	Consumption of high-quality foods including nutrient-dense foods and those rich in phytochemicals such as superfoods and seasonal foods as part of diet that has adequate consumption of calories and protein.	Healthy Eating Index; Plate Waste measurement
Limitation of energy and ultra-processed foods	Diets that have reduced portion sizes and caloric intake including low consumption of ultra-processed foods that are high in sugars, fats, and salts; reduced consumption of sugar-sweetened beverages; and decreased consumption of processed meats.	Survey data of dietary intake; Healthy Eating Index
Food safety	Diets comprised of safe foods including those without pathogens.	Pathogen colony counts; Toxicity tests

Source: Ahmed and Byker Shanks 2019

Promoting Sustainable Diets: Environmental Factors

Environmental dimension of sustainable diets

Component	Characterization	Metric
Biodiversity 	Diets that support biodiversity in the food system including through consumption of diversified foods; foods sourced from diversified farms; and foods produced in ways that do not endanger the survival of other organisms.	Shannon Weiner Index
Ecosystem services	Diets that support ecosystem services during food production including pollination, fertility, and nutrient cycling such as those from farms with low pesticide use.	Water quality; Bee counts
Soil health and agricultural management practices	Consumption of foods that support soil organic matter and healthy agriculture including organic food, free-range, and diversified farming; management practices that prevent eutrophication.	Soil Organic Matter; Life Cycle Analysis
Efficient resource use including water, energy, and land	Diets based on foods that make efficient use of natural resources including water, energy, and land; this includes reduced use of synthetic fertilizers and reduced food waste.	Life Cycle Analysis; Ecological Footprint; Total per capita land requirements; Water footprints of crops; Land use; Energy use; Food waste measurements
Low greenhouse gas emissions	Diets that include the procurement and consumption of food low in greenhouse gas emissions; have low carbon footprints, or are carbon neutral; have low food miles; are local, seasonal, and purchased through direct trade such as farmers' markets.	Life Cycle Analysis; Per capita GHGEs; Agriculture- and distribution related NH_3, CH_4, N_2O emission factors

Source: Ahmed and Byker Shanks 2019

Promoting Sustainable Diets: Socio-Economic Factors

Socio-economic dimension of sustainable diets

Component	Characterization	Metric
Food traditions 	Diets that include foods that are part of cultural, religious, community, and family traditions.	Surveys
Flavor and cultural preferences	Diets that include foods that meet personal preferences based on flavor and culture including foods that are local and seasonal and those purchased through direct trade such as farmers' markets.	Surveys; Choice experiments
Equity	Diets that support, and are supported by, equity in the food system based on gender, class, race, livelihoods, and distribution, among other factors.	Surveys; Household food expenditures
Food environment access	Diets that are supported by food environments that provide access to healthy food that is available, affordable, convenient, and desirable; this includes foods that have transparent and understandable labels.	ProDes; NEMS; Cost of Diets; Food environment observations
Food sovereignty	Diets that support and are supported by education, skills, empowerment, and safe advertising (that which does not encroach on children through unfair means).	Surveys

Source: Ahmed and Byker Shanks 2019

Thank You

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