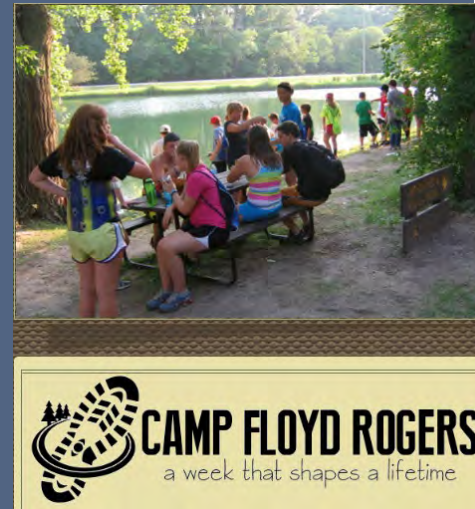


What is There to Eat? Food Insecurity (FI), Diabetes, & Chronic Disease: Addressing a Growing Challenge

Sue McLaughlin, MOL, RDN, CDCES, LMNT, CPT
Omaha, Nebraska



No Conflicts of Interest to declare

Presentation Objectives

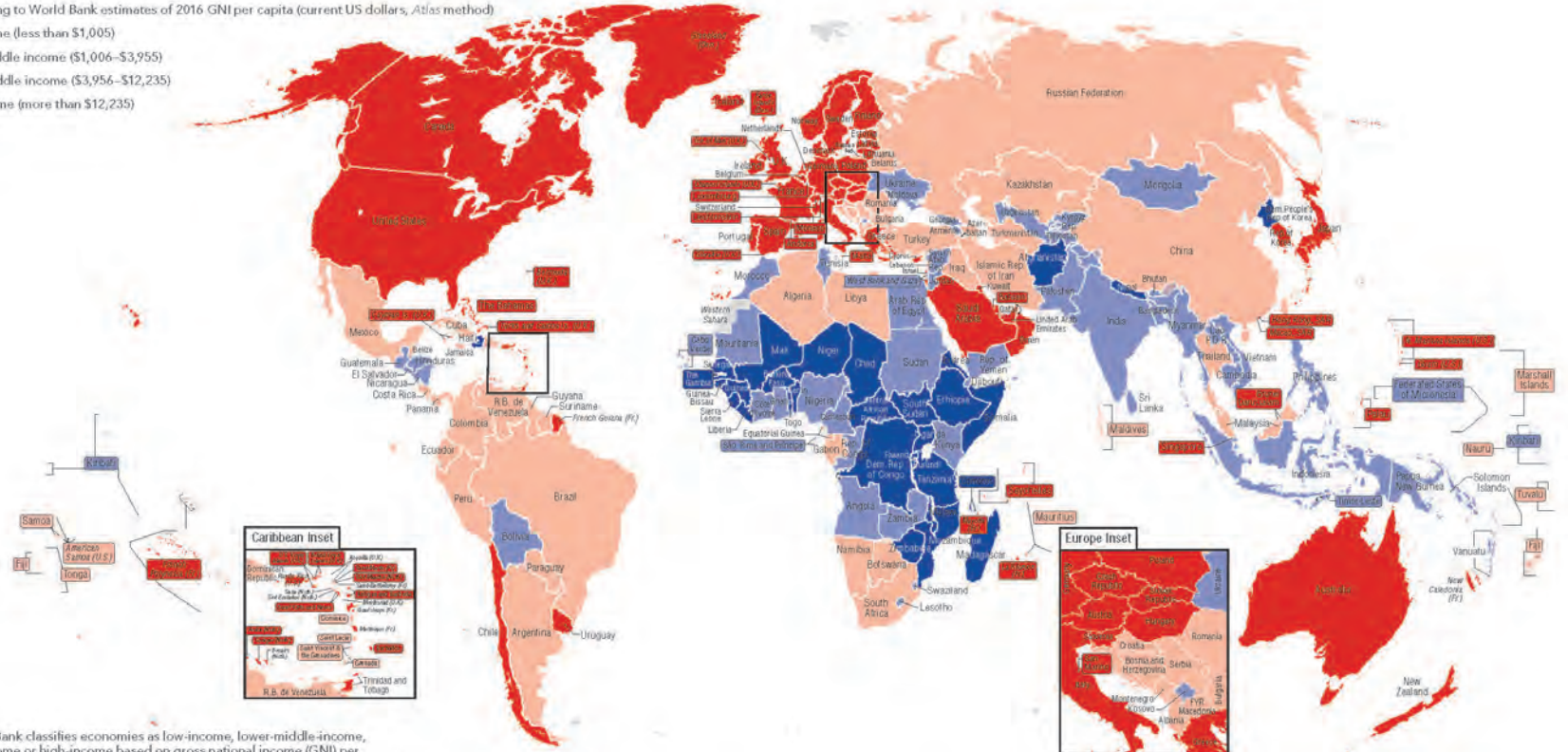
- Identify 2 contributors to food insecurity in high income countries
- Discuss psychosocial consequences of food insecurity that may impact families
- Discuss the association between food insecurity and the development of diabetes and other chronic diseases in vulnerable populations
- Describe a tool or approach that you plan to implement in your workplace or community to address food insecurity

World Bank Income Classifications

based on 2016 Gross National Income per capita (USD)

The world by income
Classified according to World Bank estimates of 2016 GNI per capita (current US dollars, Atlas method)

- Low income (less than \$1,005)
- Lower middle income (\$1,006–\$3,955)
- Upper middle income (\$3,956–\$12,235)
- High income (more than \$12,235)
- No data



Note: The World Bank classifies economies as low-income, lower-middle-income, upper-middle-income or high-income based on gross national income (GNI) per capita. For more information see <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>.

East Asia and Pacific

American Samoa	Upper middle income
Australia	High income
Brunei Darussalam	High income
Cambodia	Lower middle income
China	Upper middle income
Fiji	Upper middle income
French Polynesia	High income
Guam	High income
Hong Kong SAR, China	High income
Indonesia	Lower middle income
Japan	High income
Kiribati	Lower middle income
Korea, Dem.	Low income
People's Rep. Korea, Rep.	High income
Lao PDR	Lower middle income
Macao SAR, China	High income
Malaysia	Upper middle income
Marshall Islands	Upper middle income

Micronesia, Fed. Sts.

Mongolia	Lower middle income
Myanmar	Lower middle income
Nauru	Upper middle income
New Caledonia	High income
New Zealand	High income
Northern Mariana Islands	High income
Papua New Guinea	Lower middle income
Philippines	Upper middle income
Samoa	Upper middle income
Singapore	High income
Solomon Islands	Lower middle income
Thailand	Upper middle income
Timor-Leste	Lower middle income
Tonga	Upper middle income
Tuvalu	Upper middle income
Vanuatu	Lower middle income
Vietnam	Lower middle income

Europe and Central Asia

Albania	Upper middle income
Andorra	High income
Armenia	Lower middle income
Austria	High income
Azerbaijan	Upper middle income
Belarus	Upper middle income
Belgium	High income
Bosnia and Herzegovina	Upper middle income
Bulgaria	Upper middle income
Channel Islands	High income
Croatia	Upper middle income
Cyprus	High income
Czech Republic	High income
Denmark	High income
Estonia	High income
Faroe Islands	High income
Finland	High income
France	High income

Georgia	Lower middle income
Germany	High income
Gibraltar	High income
Greece	High income
Greenland	High income
Hungary	High income
Iceland	High income
Ireland	High income
Isle of Man	High income
Italy	High income
Kazakhstan	Upper middle income
Kosovo	Lower middle income
Kyrgyz Republic	Lower middle income
Latvia	High income
Liechtenstein	High income
Lithuania	High income
Luxembourg	High income
Macedonia, FYR	Upper middle income
Moldova	Lower middle income
Monaco	High income

Montenegro	Upper middle income
Netherlands	High income
Norway	High income
Poland	High income
Portugal	High income
Romania	Upper middle income
Russian Federation	Upper middle income
San Marino	High income
Serbia	Upper middle income
Slovak Republic	High income
Slovenia	High income
Spain	High income
Sweden	High income
Switzerland	High income
Tajikistan	Lower middle income
Turkey	Upper middle income
Turkmenistan	Upper middle income
Ukraine	Lower middle income
United Kingdom	High income
Uzbekistan	Lower middle income

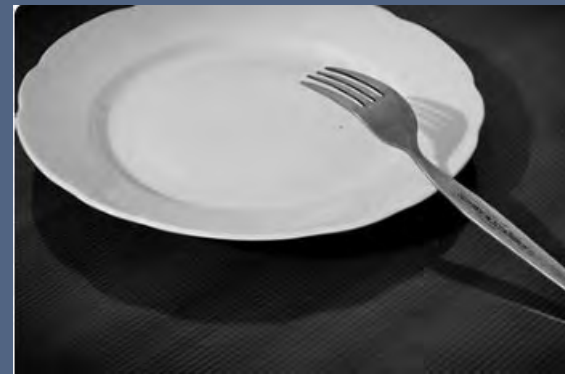
Latin America and the Caribbean

Antigua and Barbuda	High income
Argentina	Upper middle income
Aruba	High income
Bahamas, The	High income
Barbados	High income
Belize	Upper middle income
Bolivia	Lower middle income
Brazil	Upper middle income
British Virgin Islands	High income
Cayman Islands	High income
Chile	High income
Colombia	Upper middle income
Costa Rica	Upper middle income
Cuba	Upper middle income
Curaçao	High income
Dominica	Upper middle income
Dominican Republic	Upper middle income
Ecuador	Upper middle income
El Salvador	Lower middle income

Definition of Food Insecurity (FI)

“Food insecurity occurs when a person is consistently unable to get enough food on a day-to-day basis.”

- <https://borgenproject.com>



Global Issues Linked to Food Insecurity

Food availability (i.e. physical access to a food supply on a consistent basis)

Food accessibility (i.e. the person has the resources available (money, transportation, etc) to obtain a sufficient amount of food)

Food utilization (i.e. how a person consumes food and whether or not he/she is able to use the food to maintain a nutritious diet). Proper sanitation and hygiene practices also contribute to food utilization.

<https://borgenproject.com>

Are Nutrient Dense Foods and Beverages Available, Accessible, and Utilized Properly?

“Nutrient-dense foods and beverages provide vitamins, minerals, and other health-promoting components and have little added sugars, saturated fat, and sodium. Vegetables, fruits, whole grains, seafood, eggs, beans, peas, and lentils, unsalted nuts and seeds, fat-free and low-fat dairy products, and lean meats and poultry—when prepared with no or little added sugars, saturated fat, and sodium— are nutrient-dense foods.”

Source: U.S. Department of Agriculture and U.S. Department of Health and Human Services. *Dietary Guidelines for Americans, 2020-2025*. 9th Edition. December 2020. Available at [DietaryGuidelines.gov](https://www.dietaryguidelines.gov).

Food Insecurity Experience Scale Survey (FIES-SM)



**During the last 12 months, was there a time when,
because of lack of money or other resources:**

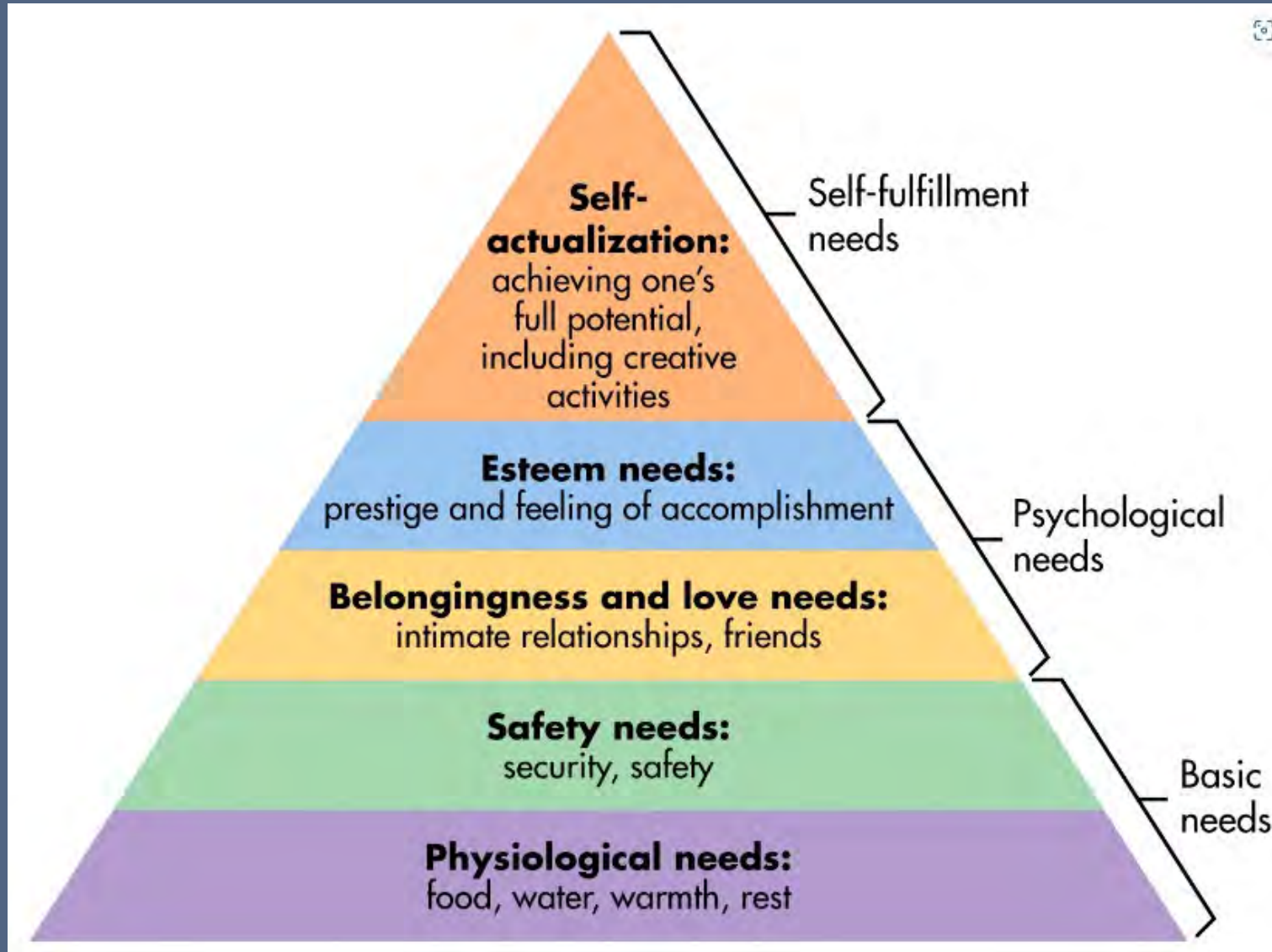
1. You were worried you would not have enough food to eat?
2. You were unable to eat healthy and nutritious food?
3. You ate only a few kinds of foods?
4. You had to skip a meal?
5. You ate less than you thought you should?
6. Your household ran out of food?
7. You were hungry but did not eat?
8. You went without eating for a whole day?

Food Insecurity Experience Scale (FIES)



<https://www.fao.org/in-action/voices-of-the-hungry/fies/en>

Maslow's Hierarchy of Needs

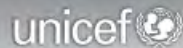




Food and Agriculture
Organization of the
United Nations



International Fund for
Agricultural Development



World Food
Programme



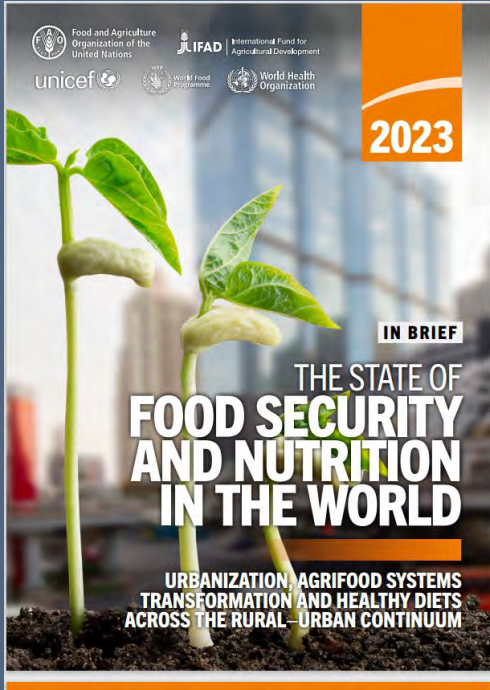
World Health
Organization

2023

IN BRIEF

THE STATE OF FOOD SECURITY AND NUTRITION IN THE WORLD

URBANIZATION, AGRIFOOD SYSTEMS
TRANSFORMATION AND HEALTHY DIETS
ACROSS THE RURAL-URBAN CONTINUUM

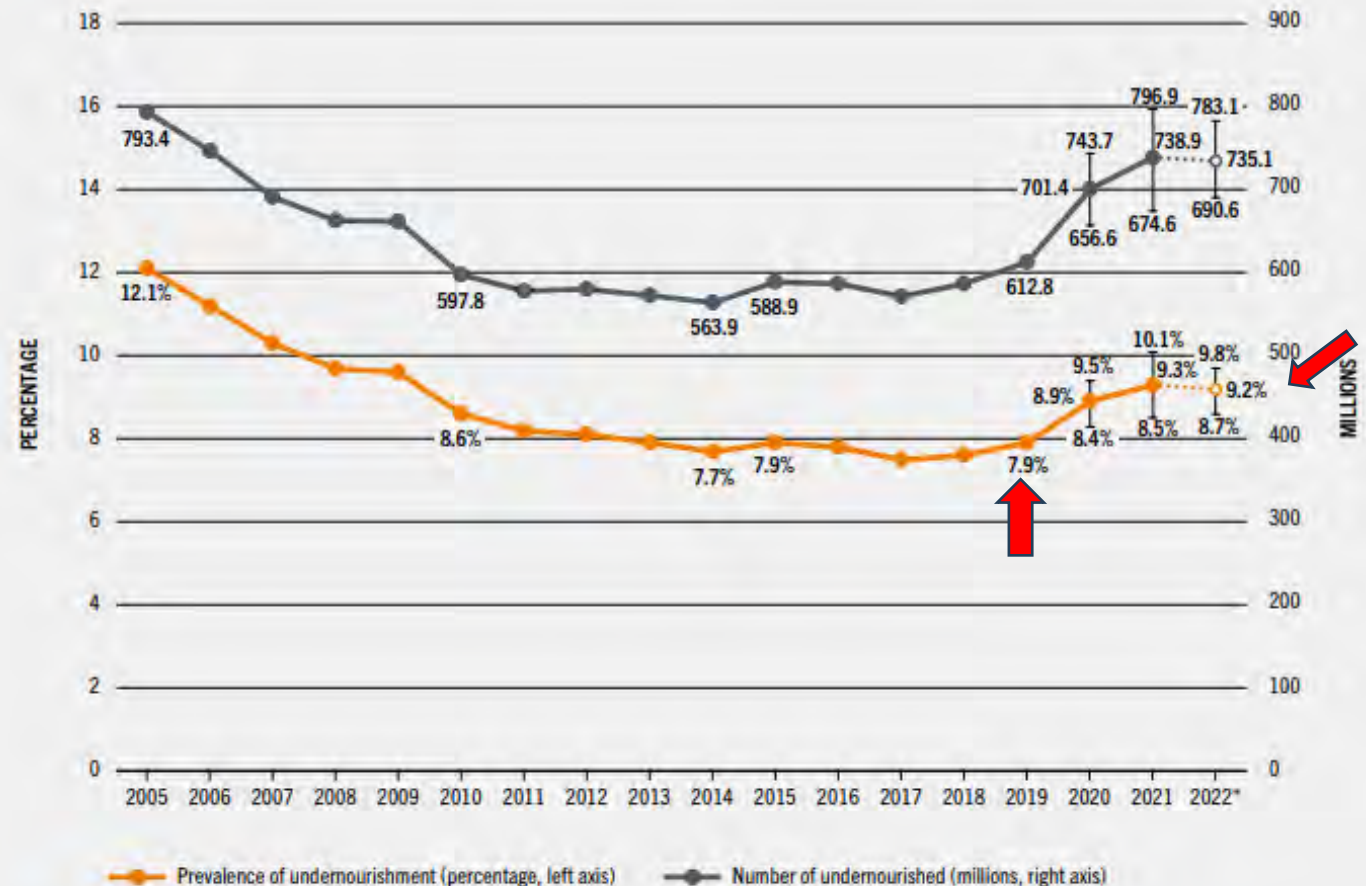


Key Findings:

- Global hunger on the rise
- Inconsistent access to nutritious, safe, and sufficient supply of food to support normal growth, development, and tissue repair
- Child malnutrition remains alarmingly high
- Movement from rural to urban communities leads to:
 - ↑ consumption of calorie-rich, nutrient-sparse foods
 - ↑ rates of overweight and obesity, across all areas
- Rural dependence on global markets (especially in Asia and Africa)
- **Future Outlook:** 70% of global population will reside in cities, necessitating a reorientation of food delivery systems to address food insecurity and malnutrition

2023 report:
Global hunger in
2022 (9.2%)
remained far
above pre-COVID-
19 levels (7.9%)

FIGURE 1 GLOBAL HUNGER REMAINED VIRTUALLY UNCHANGED FROM 2021 TO 2022 BUT IS STILL FAR ABOVE PRE-COVID-19-PANDEMIC LEVELS



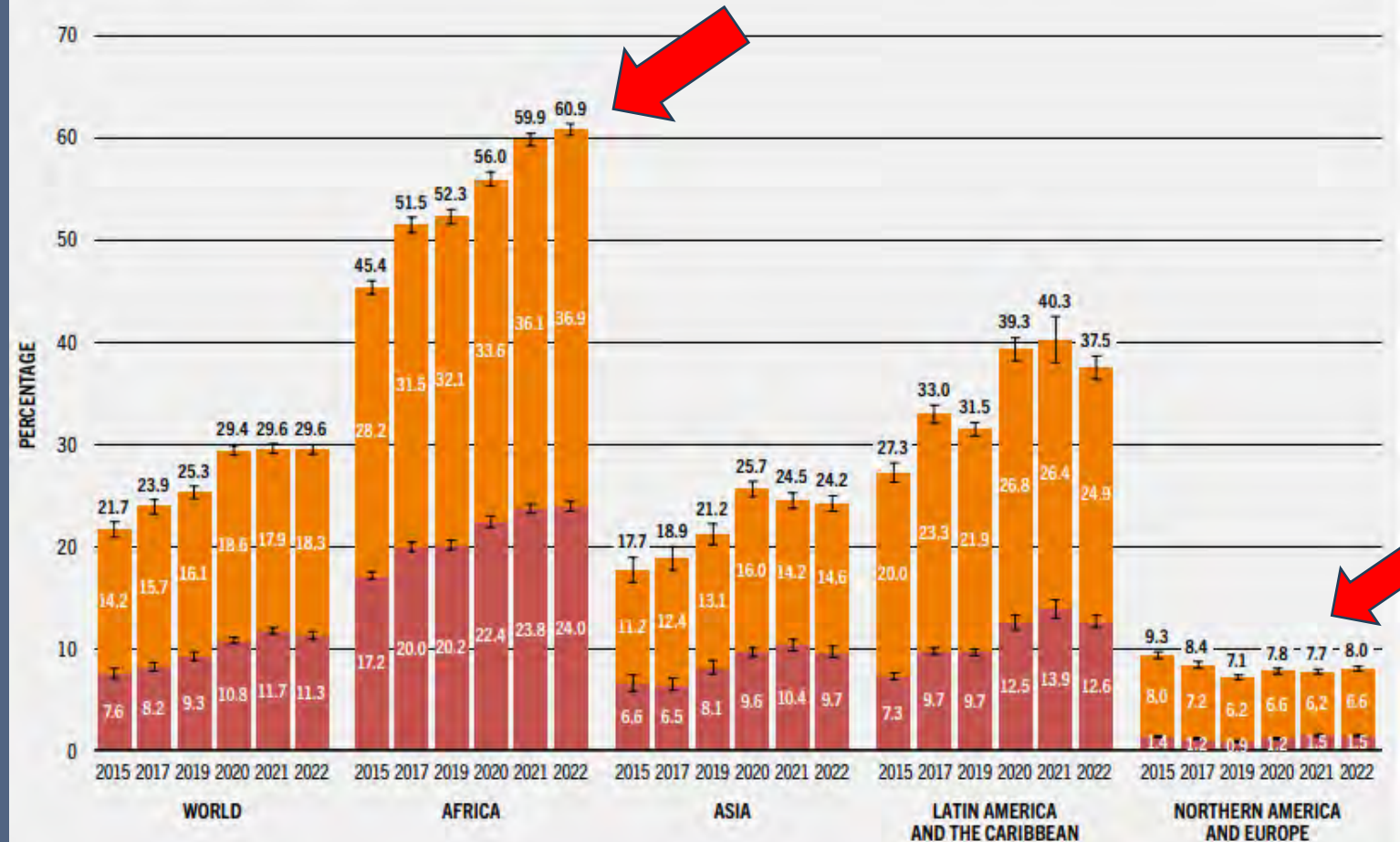
NOTES: * Projections based on nowcasts for 2022 are illustrated by dotted lines. Bars show lower and upper bounds of the estimated range.

SOURCE: FAO. 2023. FAOSTAT: Suite of Food Security Indicators. In: FAO. [Cited 12 July 2023]. www.fao.org/faostat/en/#data/FS

2023 report:

Changes in
Moderate or
Severe Food
Insecurity from
2021- 2022 (post
COVID-19 period)

FIGURE 6 MODERATE OR SEVERE FOOD INSECURITY REMAINED UNCHANGED AT THE GLOBAL LEVEL FROM 2021 TO 2022, WITH WORSENING FOOD INSECURITY LEVELS IN AFRICA AND IN NORTHERN AMERICA AND EUROPE, AND IMPROVEMENTS IN ASIA AND IN LATIN AMERICA AND THE CARIBBEAN



NOTE: Differences in totals are due to rounding of figures to the nearest decimal point.

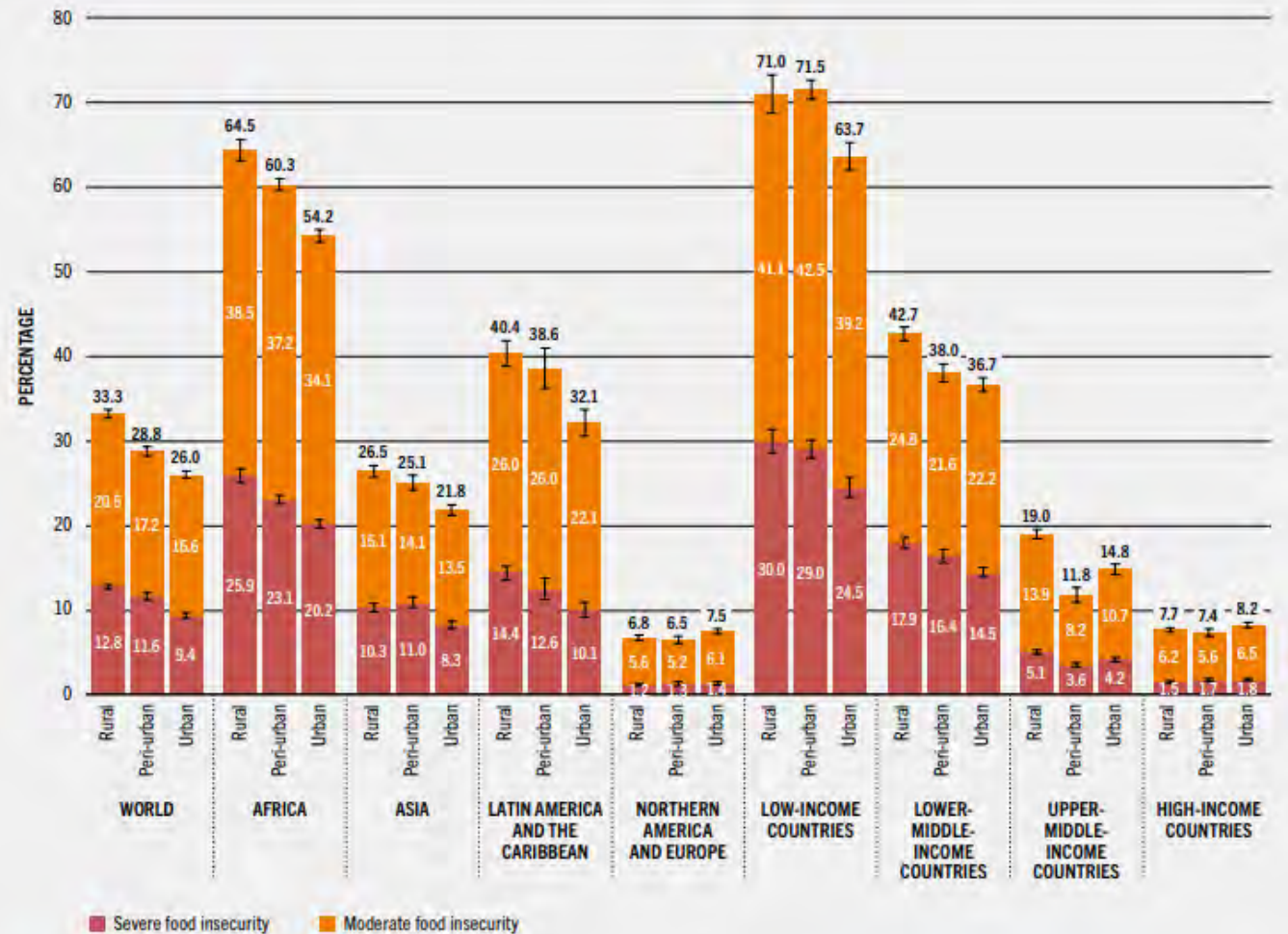
SOURCE: FAO, 2023. FAOSTAT: Suite of Food Security Indicators. In: FAO, [Cited 12 July 2023]. www.fao.org/faostat/en/#data/FS

2023 report:

Moderate and Severe Food Insecurity higher in Rural vs Urban Areas (except North America and Europe – high income countries)

Women affected disproportionately

FIGURE 8 FOOD INSECURITY, AT BOTH LEVELS OF SEVERITY, IS HIGHER IN RURAL AREAS THAN IN URBAN AREAS IN ALL REGIONS EXCEPT NORTHERN AMERICA AND EUROPE



SOURCE: FAO. 2023. FAOSTAT: Suite of Food Security Indicators. In: FAO. [Cited 12 July 2023]. www.fao.org/faostat/en/#data/FS

Contributing Factors to Worldwide Food Insecurity

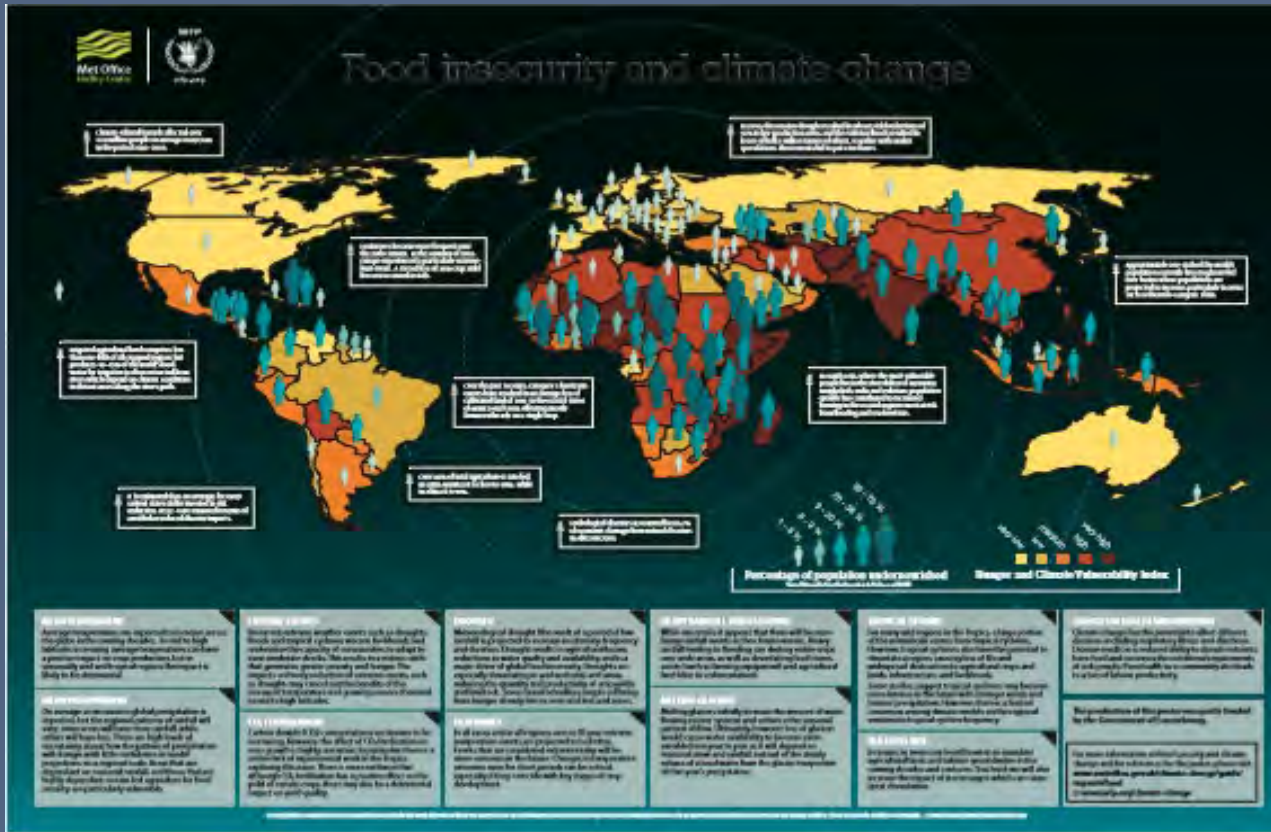
- Increase in human population; food supply can't keep up
- Global water crisis; widespread over-pumping and irrigation
- Climate extremes and natural disasters impact communities; issues with transportation, agriculture/crops, loss of forests, and potable water supplies contribute to higher food prices

<https://borgenproject.com>

- Geopolitical conflicts: war in Ukraine, Gaza, other areas in the world

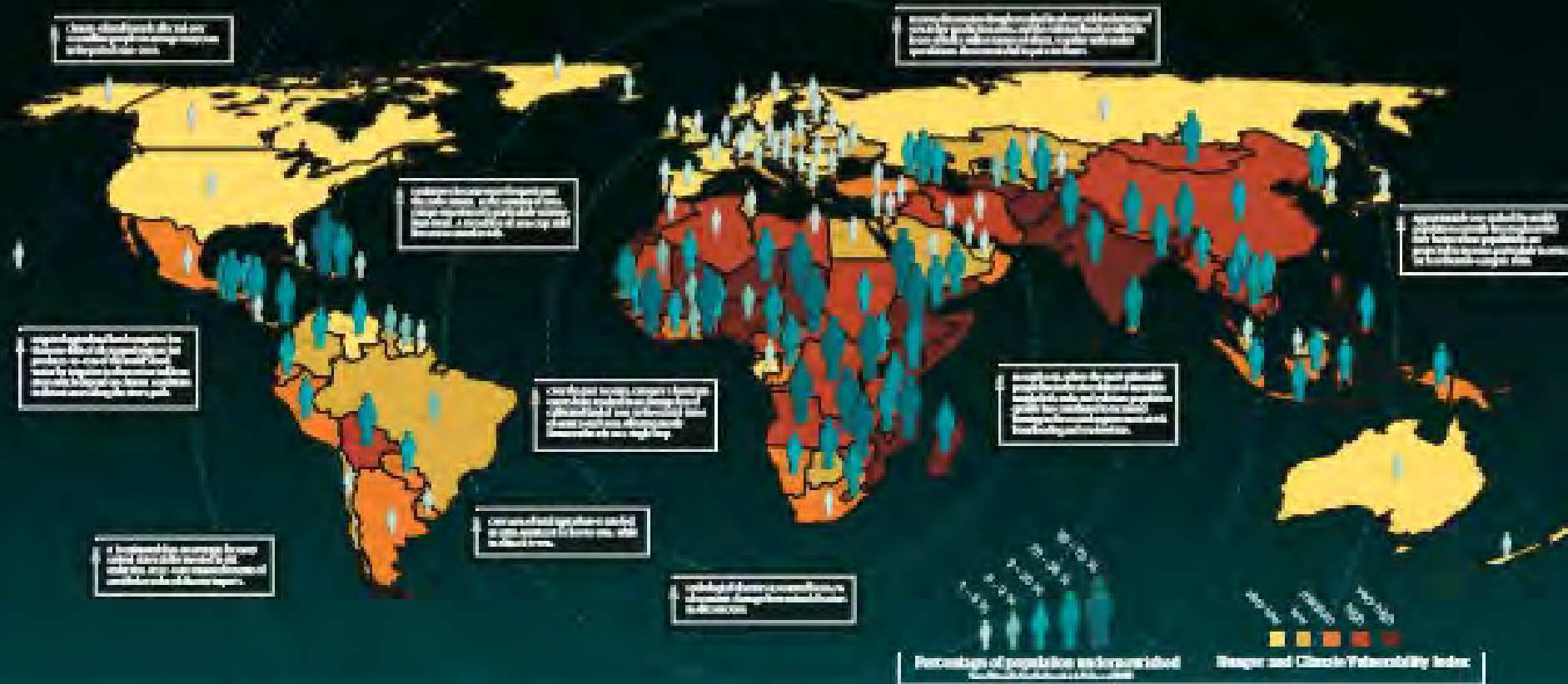
Food Insecurity and Climate Change

- Mean temperature
- Mean precipitation
- Extreme events
- Drought
- CO2 fertilization
- Heatwaves
- Heavy rainfall and flooding
- Melting glaciers
- Tropical Storms
- Sea level rise
- **Changes in health and nutrition**



<https://www.wfp.org/publications/maps-food-insecurity-and-climate-change>

Food insecurity and climate change



Food Insecurity and Climate Change

<p>As we've learned so far:</p> <p>Food insecurity and malnutrition are a global problem. It's not just about the food we eat, but also about the people who grow it. Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p> <p>As we've learned so far:</p> <p>Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p>	<p>Climate change:</p> <p>Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p> <p>Food security:</p> <p>Food security is about having enough food to eat, and it's also about having the resources to grow it. Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p> <p>As we've learned so far:</p> <p>Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p>	<p>Food security:</p> <p>Food security is about having enough food to eat, and it's also about having the resources to grow it. Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p> <p>As we've learned so far:</p> <p>Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p>	<p>Food security:</p> <p>Food security is about having enough food to eat, and it's also about having the resources to grow it. Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p> <p>As we've learned so far:</p> <p>Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p>	<p>Food security:</p> <p>Food security is about having enough food to eat, and it's also about having the resources to grow it. Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p> <p>As we've learned so far:</p> <p>Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p>	<p>Food security:</p> <p>Food security is about having enough food to eat, and it's also about having the resources to grow it. Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p> <p>As we've learned so far:</p> <p>Climate change is making it harder to grow food, and it's also making it harder to get it to the people who need it. This is a global problem that we need to solve.</p>
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Defining Food Security in the United States

30 years ago: “access to enough food for an active, healthy life”

- Ready availability of nutritionally and safe foods
- Assured ability to acquire acceptable foods in socially acceptable ways

National Research Council. Panel to review US Department of Agriculture's Measurement of Food Insecurity and Hunger. The National Academies Press; 2006



Ranges of Food Security

Food Security:

- High food security – no reported indications of food-access problems or limitations
- Marginal food security – one or two reported indications; anxiety over food sufficiency or shortage of food in the house; little or no indication of changes in diets or food intake

Food Insecurity:

- Low food security – reports of reduced quality, variety or desirability of diet; little or no indication of reduced food intake
- Very low food security – reports of multiple indications of disrupted eating patterns and reduced food intake

Food Insecurity and Hunger – What is the Difference?

Food Insecurity

- A household-level economic and social condition of limited or uncertain access to adequate food

Hunger

- An individual-level physiological condition that may result from food insecurity

Percentage of U.S. households reporting indicators of adult food insecurity, by food security status, 2022



Source: USDA, Economic Research Service using data from U.S. Department of Commerce, Bureau of the Census, 2022 Current Population Survey Food Security Supplement.

The Faces of Food Insecurity in the United States



2017: 11.8% of US households had food insecurity during previous 12 months

Who were most vulnerable?

- Those with children
- With children under age 6
- With children headed by a single woman
- Women living alone
- Men living alone
- College students
- Black non-Hispanic heads of households
- Hispanic heads of households
- Incomes below 185% of the federal poverty line
- With children headed by a single man

11.8% of US households in 2017 had food insecurity during previous 12 months

Most vulnerable:

- Incomes below 185% of the federal poverty line (30.8%)
- With children and headed by a single woman (30.3%)
- Black non-Hispanic heads of households (21.8%)
- With children and headed by a single man (19.7%)
- Hispanic heads of households (18.0%)
- With children under age 6 (16.4%)
- With children (15.7%)
- Women living alone (13.9%)
- Men living alone (13.4%)
- College students

Coleman-Jensen A et al. *Household Food Security in the United States in 2017*. USDA, Economic Research Service; 2018.

Federal Poverty Level Guidelines in the US

- The U.S. **federal poverty** level is a measure of income used by the U.S. government to determine who is eligible for subsidies, programs, and benefits.
- The Department of Health and Human Services updates the **poverty guidelines** each January, with consideration for inflation.

US Federal Poverty Guidelines

Most vulnerable in 2017 were those with incomes below 185% of federal poverty line

Table 1. 2017 Federal Poverty Guidelines (FPG) and FPG Income Ratios by Persons in Family/Household

Number of Persons in Family/Household	Poverty Guideline	200% of Poverty Guideline	400% of Poverty Guideline
2	\$16,240	\$32,480	\$64,960
3	\$20,420	\$40,840	\$81,680
4	\$24,600	\$49,200	\$98,400
5	\$28,780	\$57,560	\$115,120
6	\$32,960	\$65,920	\$131,840
7	\$37,140	\$74,280	\$148,560
8	\$41,320	\$82,640	\$165,280

2023 US Federal Poverty Guidelines

48 Continuous States and the District of Columbia

Family Size	Gross Annual Income	Gross Monthly Income	Approximate Hourly Wage
1	\$14,580	\$ 1,215	\$ 7.01
2	\$19,720	\$ 1,643	\$ 9.48
3	\$24,860	\$ 2,072	\$ 11.95
4	\$30,000	\$ 2,500	\$ 14.42
5	\$35,140	\$2,928	\$ 16.89
6	\$40,280	\$ 3,357	\$ 19.36
7	\$45,420	\$ 3,785	\$ 21.84
8	\$50,560	\$4,213	\$ 34.31
If over 8 family members, add per person:	+ \$4,720/person	+ \$ 393/person	+ <u>\$ 2.27</u> /person

Chart adapted from: Federal Register, January 2023.



MAP THE MEAL GAP 2023

A Report on County and Congressional District Food Insecurity and County Food Cost in the United States in 2021

Monica Hake

Emily Engelhard

Adam Dewey



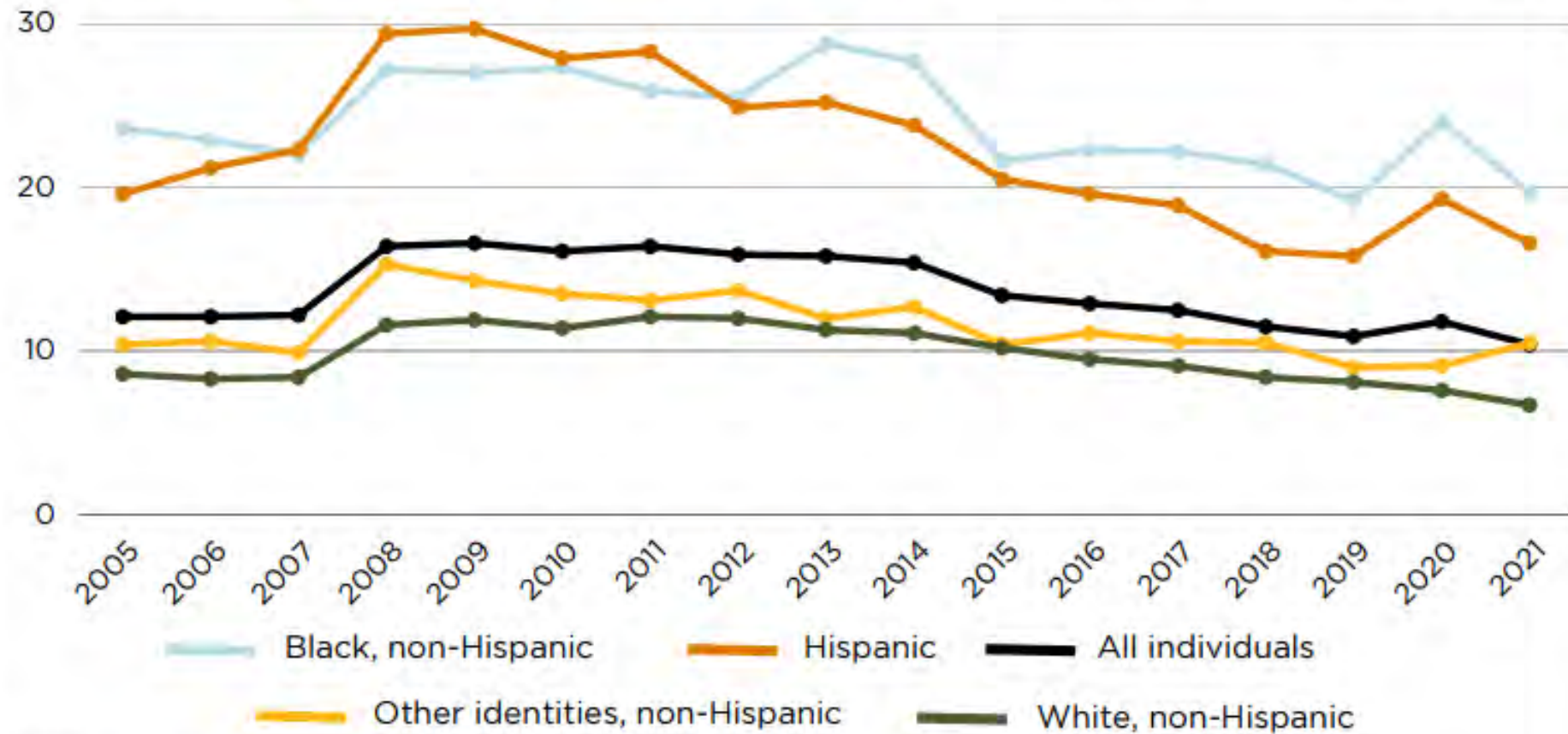
>10% of US population is food insecure

Key Findings: Map the Meal Gap 2023 Report

- 100% of US counties and congressional districts are home to those facing hunger
- FI among Blacks or Latinos higher than for Whites in ≥ 9 of 10 counties
- County FI varies by $\geq 58\%$ points for some racial/ethnic groups
- Child FI rates $\geq 40\%$ in some counties
- One in 3 persons facing hunger are unlikely to qualify for SNAP
- Persons facing hunger report needing more than \$20 more per week to need their food needs
- Eight of 10 high FI counties are in the South
- Nine of 10 high FI counties are rural
- Average cost/meal was \$3.59 (nationally)
- County meal costs/meal range from \$2.73 to \$7.89

Map the Meal Gap 2023

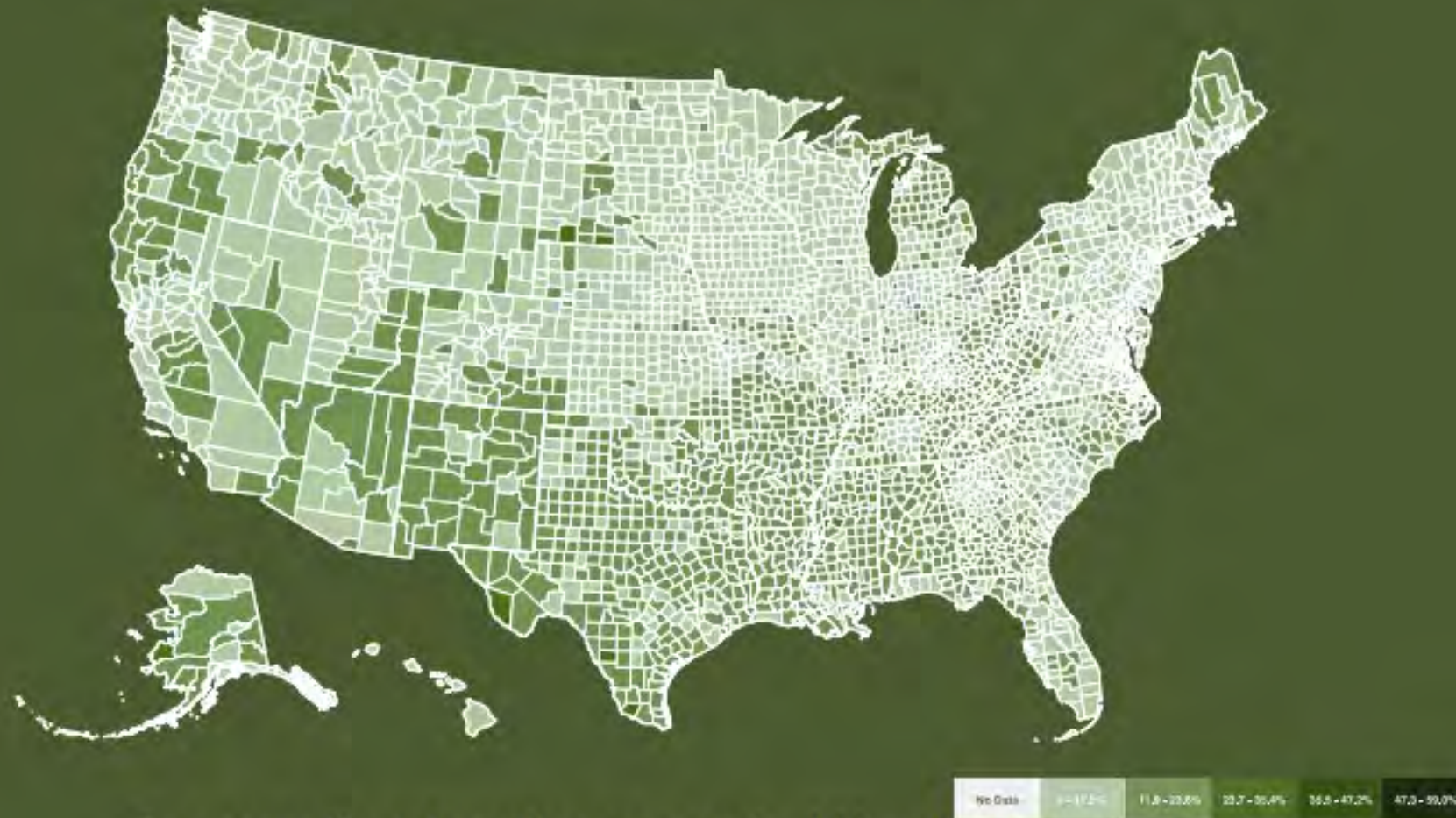
Figure 1. Food Insecurity Among Individuals by Race/Ethnicity, 2005-2021



Source: USDA Economic Research Service

Note: the category of "Other identities, non-Hispanic" includes individuals who identify as Native American, Asian, Pacific Islander, or multiple races (non-Hispanic).

Figure 2. Map of county-level food insecurity among the overall population in 2021



To access the interactive map and additional information about data availability and suppression, visit map.feedingamerica.org.



WHAT DOES
HUNGER
LOOK LIKE
IN YOUR BACKYARD?



map.feedingamerica.org





Kansas



2021 OVERALL FOOD INSECURITY & FOOD COST IN THE US

STATE FOOD INSECURITY RATE

FOOD INSECURE PEOPLE: 291,430



OF STATE
POPULATION

10.4 NATIONAL FOOD INSECURITY RATE

ESTIMATED PROGRAM ELIGIBILITY AMONG FOOD INSECURE PEOPLE



66% Above SNAP threshold of 130% poverty
34% Below SNAP threshold of 130% poverty

Average Meal Cost

State
\$3.45

National
\$3.59

Sedgwick County, Kansas

COUNTY FOOD INSECURITY RATE

FOOD INSECURE PEOPLE: 56,920



OF COUNTY
POPULATION

ESTIMATED PROGRAM ELIGIBILITY AMONG FOOD INSECURE PEOPLE



- 53% Above SNAP threshold of 130% poverty
- 47% Below SNAP threshold of 130% poverty

Average Meal Cost

County	National
\$3.65	\$3.59

Consequences of Food Insecurity: Impact on Families Across the Lifespan

- Compromised dietary intake and nutritional state (under- and over-nutrition with inadequacies in key nutrient intake)
- Delays in physical development and mental health/coping strategies
- Physical Hunger
- Distress/worry/anxiety/depression
- Increased risk of suicide in adolescents
- Adverse family and social interactions
- Decreased physical activity
- Lessened ability to manage chronic diseases, such as HIV, diabetes, others

Frongillo E. *J Acad Nutr Diet* 2019; 119 (10):1621-1622.

Psychosocial Consequences of Food Insecurity: Impact on Families Across the Lifespan

Adult and seniors' concerns:

- Uncertainty about accessing food (i.e. how to get to store to shop)
- Adequacy of food supply to meet needs to sustain life (i.e. calories)
- Ability to obtain the right foods to match with health conditions and prevention of illness
- Resorting to use of socially unacceptable ways to access food
- Feeling deprived

National Research Council. Panel to review US Department of Agriculture's Measurement of Food Insecurity and Hunger. The National Academies Press; 2006.

Maxwell S. Food security: A post-modern perspective. *Food Policy*. 1996; 21: 155-170.

Psychosocial Consequences of Food Insecurity: Impact on Families Across the Lifespan

Children are affected by food insecurity on multiple levels:

- Cognitive and behavioral effects (delays in academic and social development, coping strategies, acting out at home or school)
- Emotional toll (worry about food procurement, preparation and amount available)
- Physical awareness (hunger)

National Research Council. Panel to review US Department of Agriculture's Measurement of Food Insecurity and Hunger. The National Academies Press; 2006.

Maxwell S. Food security: A post-modern perspective. *Food Policy*. 1996; 21: 155-170.

Psychosocial Consequences of Food Insecurity: Impact on Families Across the Lifespan

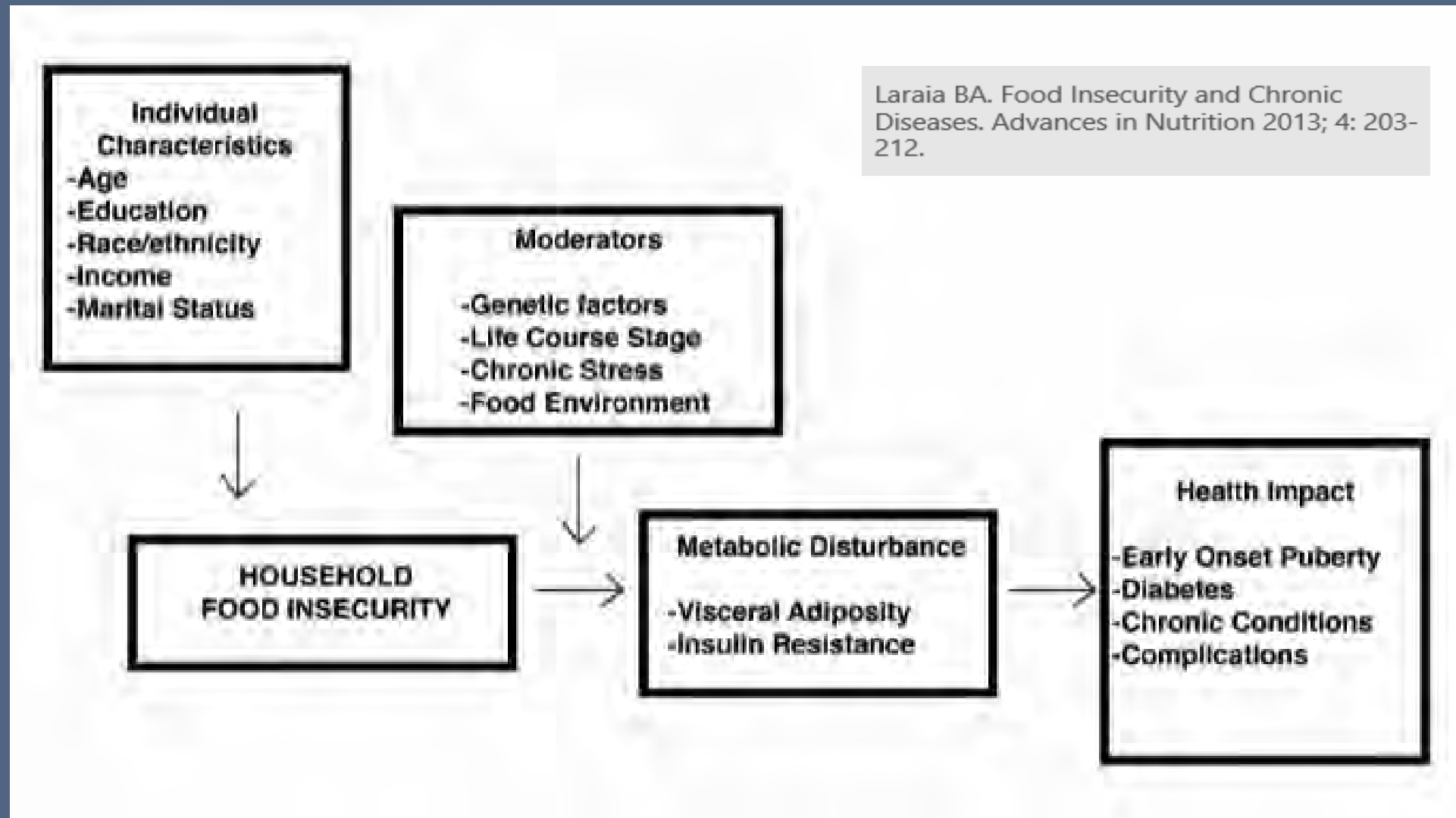
Responses of children to food insecurity:

- Participation in adult strategies to remedy the situation
- Initiation of their own strategies to remedy the situation
- Generating resources for food

Fram MS et al. *J Hunger Environ Nutr* 2013; 8:128-145.

Fram MS et al. *J Nutr* 2011; 141(6):1114-1119.

Conceptual framework: Influence of household food insecurity on chronic diseases and health outcomes



Food Insecurity and Metabolic Control Among US Adults with Diabetes

- Study Objective: to determine whether food insecurity is associated with poorer glycemic, cholesterol, and blood pressure control in adults with diabetes
- Methods: Data from 1999 – 2008 NHANES for 2,557 adults with diabetes. Outcomes of interest were those with A1c > 9%, LDL > 100 mg/dL, and BP > 140/90 mmHg.
- Results: Food insecurity significantly associated with poor glycemic control, LDL control, but not associated with BP control

Berkowitz SA et al. *Diabetes Care* 2013 Oct; 36(10): 3093-99.

Influence of Household Food Insecurity on Weight Status and Pregnancy Complications

Household Food Insecurity Associated with Severe Obesity

- **Women with BMI ≥ 35** at 3 times greater risk of food insecurity

Household Food Insecurity Associated with:

- Greater gestational weight gain – 1.87 kg
- 25% higher weight gain ratio
- Gestational diabetes mellitus – 2.76 times greater odds

Laraia BA et al; *J Am Diet Assoc* 2010; 110:692-701.

Food Insecurity (FI) Pregnant Adolescents and Infant Birth Outcomes

- Participants: 881 pregnant adolescents; ages 14 – 21
- Study results:
 - More than half of pregnant adolescents experience alarming rates of FI
 - 26% experience FI \geq 1X during pregnancy
 - 27% chronic food insecurity during the pregnancy
 - Those who were food insecure had:
 - More depressive symptoms
 - Lower birth weight of fetuses
 - Fetuses born at early gestational age
 - Implications for *inter-generational* effects

Grilo SA et al; *J Applied Research on Children* 2015; 6 (2): Article 4.



Food/Nutrition Insecurity (F/NI), Diabetes, and Chronic Disease in Indian Country

- At least 60 American Indian reservations feel the impact of F/NI
- American Indians (AIs) experience the lowest health, economic, and social status of any ethnic or racial group in the US; 35% of AI children live in poverty
- American Indian communities have highest rates of F/NI in the US; homes with children experience twice the rate of F/NI as non-AI homes
- Diet and activity patterns have changed dramatically over the past 100 yrs
- Traditional foods have been replaced by less healthy, processed convenience foods
- Highest rates of type 2 diabetes in the US; mortality rate is twice as high as counterparts
- 42% of AI struggle with obesity

Mullany B et al. PHN 2012; 16(4): 752-760.

Northern Plains Reservation Aid; Sioux Nation Relief Fund, April 2017, Partnership with Native Americans.



Why Food Insecure People Are Vulnerable to Overweight and Diabetes

- High levels of stress
- Mothers often restrict their own food to protect their children from hunger
- Cycles of food deprivation and overeating
- Greater availability of fast food restaurants
- Greater exposure to marketing of obesity-promoting products
- Fewer physical activity resources
- Lack of full service grocery stores
- When available, healthy food is more expensive

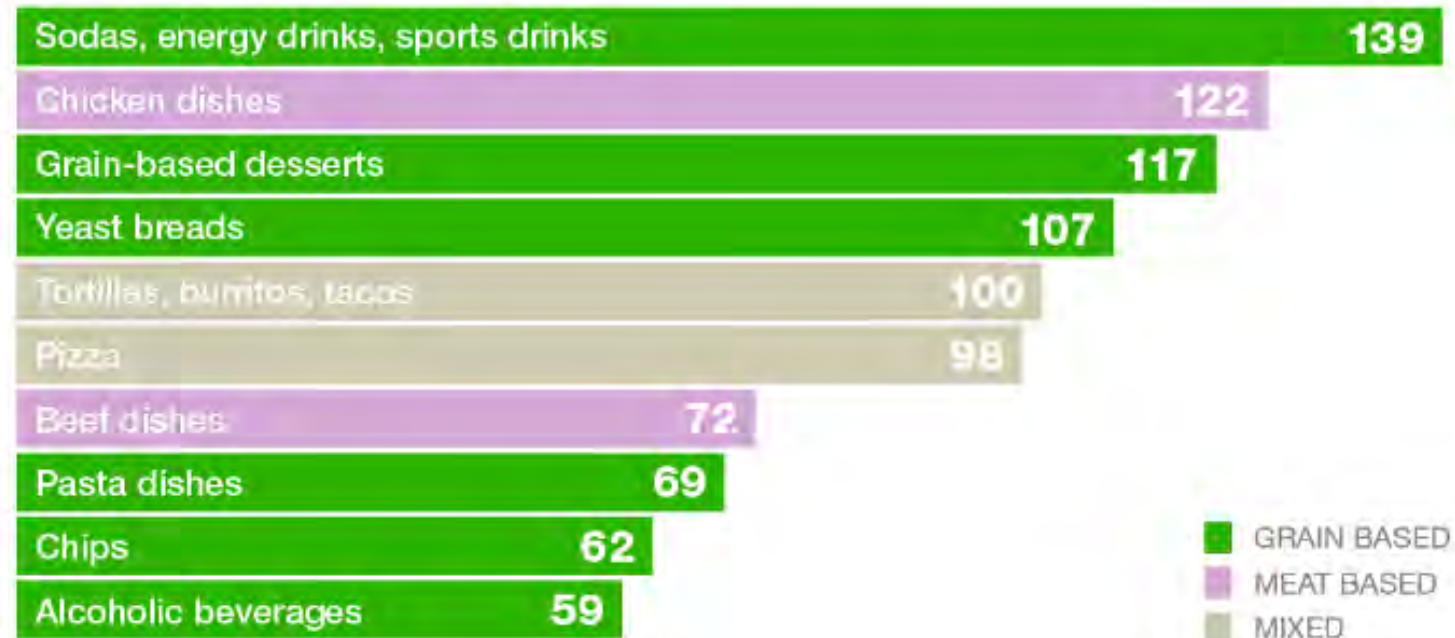
Seligman H et al. *N Engl J Med* 2010; July 1; 363:6-9.
Institute of Medicine. *Hunger and Obesity* 2011.
Drewnowski A. *Am J Clin Nutr* 2010; 92:1181-8.

How Subsidized Crops Affect Diet

Subsidized corn is used for biofuel, corn syrup, and, mixed with soybeans, chicken feed. Subsidies reduce crop prices but also support the abundance of processed foods, which are more affordable but less nutritious. Across income brackets, processed foods make up a large part of the American diet.

Top ten sources of calories for low-income individuals

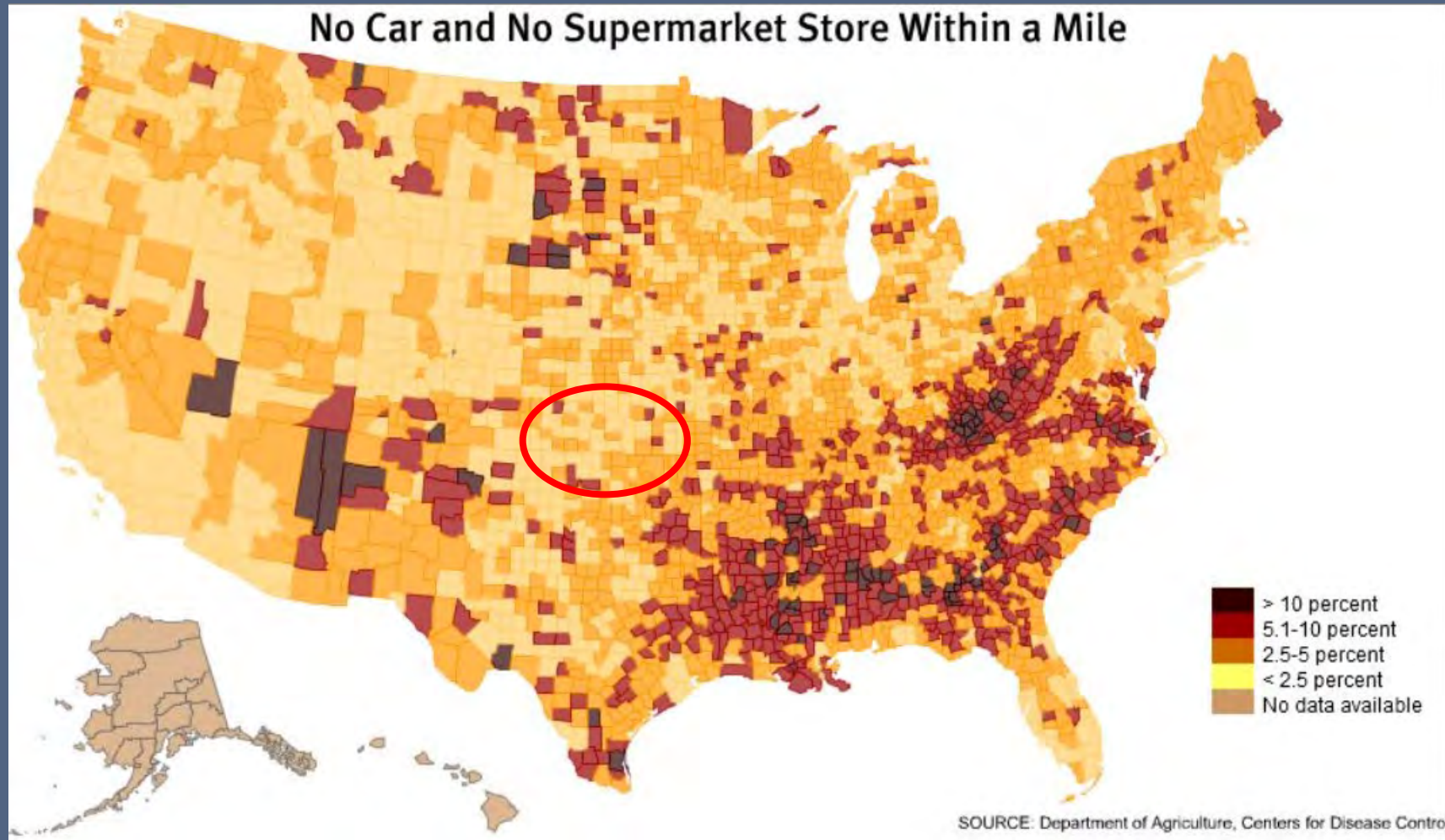
Age two and older, per person per day



Food Deserts

Areas that lack access to affordable fruits, vegetables, whole grains, low-fat milk, and other foods that make up the full range of a healthy diet

US Food Deserts





BMJ Open Do healthier foods and diet patterns cost more than less healthy options? A systematic review and meta-analysis

Mayuree Rao,^{1,2} Ashkan Afshin,² Gitanjali Singh,³ Dariush Mozaffarian^{2,3,4}

To cite: Rao M, Afshin A, Singh G, *et al*. Do healthier foods and diet patterns cost more than less healthy options? A systematic review and meta-analysis. *BMJ Open* 2013;3:e004277. doi:10.1136/bmjopen-2013-004277

► Prepublication history and additional material for this paper is available online. To view these files please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2013-004277>).

Received 17 October 2013
Accepted 24 October 2013

ABSTRACT

Objective: To conduct a systematic review and meta-analysis of prices of healthier versus less healthy foods/diet patterns while accounting for key sources of heterogeneity.

Data sources: MEDLINE (2000–2011), supplemented with expert consultations and hand reviews of reference lists and related citations.

Design: Studies reviewed independently and in duplicate were included if reporting mean retail price of foods or diet patterns stratified by healthfulness. We extracted, in duplicate, mean prices and their uncertainties of healthier and less healthy foods/diet patterns and rated the intensity of health differences for each comparison (range 1–10). Prices were adjusted for inflation and the World Bank purchasing power parity, and standardised to the international dollar (defined as US\$1) in 2011. Using random effects models, we quantified price differences of healthier versus less healthy options for specific food types, diet

Strengths and limitations of this study

- This systematic review and meta-analysis represents, to our knowledge, the most comprehensive examination of the evidence on prices of more versus less healthy foods and diet patterns. The strengths include the systematic search; adjustment for inflation and purchasing power parity; separate analyses of food groups, diet patterns and units of price; and evaluation of heterogeneity by food type, intensity of contrast and unit of comparison.
- The study was limited by less available data on restaurant prices and prices from low-income and middle-income countries. High statistical heterogeneity was evident, although the actual observed range of price differences was more modest.

INTRODUCTION

Do healthier foods and diet patterns cost more than less healthy options? A systematic review and meta-analysis

Study results:

- 27 studies from 10 countries met the inclusion criteria
- Meats/protein had largest price differences: healthy choices were \$0.29 more/serving (95% CI \$0.19 to \$0.40) than less healthy options
- Grains, dairy, snacks/sweets, fats/oils had smaller price differences between healthier vs less healthy foods per serving
- **Comparing extremes for food-based diet patterns, healthier diets cost \$1.48/day more than less healthy diets, per person**

Rao M et al. *BMJ Open* 2013; 3:e004277.

Health Care Professionals - Call to Action

- Develop processes/procedures to integrate food insecurity screening questions into your clinical practice, including EHR templates
- Build partnerships with others in your community: churches, volunteer organizations
- Maintain updated lists and contacts for community resources & services
- Offer cooking classes and demos on how to eat healthy on a budget
- Offer grocery store and Dollar Store tours with guidance on healthy choices
- Develop an on-site food pantry with non-perishable foods for those with emergency needs
- Promote community gardens to teach gardening skills, how to harvest and use produce in food preparation
- Advocate for SNAP and other federal and local programs to address SDOH
-

Addressing the problem – Awareness & Assessment

Food Insecurity Assessment Tool – IHS DDTP

Food Insecurity Assessment Tool and Resource List

© 2000 Blackwell Science Ltd *Journal of Internal Medicine* 247: 399–405

The information used for this report was provided by the U.S. Forest Service, Department of Agriculture.

- It is essential to bring potentially different
- The two potential ways communication happens
- Even the same person might have different meanings for, using different or
- context, to the same words
- Language collection built up from common interactions, by which we learn
- the rules & try to follow to the best of our ability
- Learning process not following a sequential order
- And we need to be aware of the process

To help you get started, we have some ideas for you to try:

- 1) What are the primary goals of the research? (e.g., understanding the relationship between variables, testing a hypothesis, etc.)
- 2) What are the research questions or hypotheses? (e.g., "There is a positive relationship between X and Y," "The effect of X on Y is moderated by Z," etc.)
- 3) What are the independent and dependent variables? (e.g., "The independent variable is X, and the dependent variable is Y," "The independent variable is X, and the dependent variable is Y, and the moderating variable is Z," etc.)
- 4) What are the research methods? (e.g., "The research method is a quantitative approach using a survey," "The research method is a qualitative approach using interviews," "The research method is a mixed-method approach using both surveys and interviews," etc.)
- 5) What are the research findings? (e.g., "The research findings show a positive relationship between X and Y," "The research findings show a negative relationship between X and Y," "The research findings show no relationship between X and Y," etc.)
- 6) What are the research conclusions? (e.g., "The research conclusions suggest that X has a positive effect on Y," "The research conclusions suggest that X has a negative effect on Y," "The research conclusions suggest that X has no effect on Y," etc.)

Read each statement and ask your client if the statement is often true, sometimes true, rarely true, or never true.

- 1) "Within the past 12 months we worried whether our food would run out before we got money to buy more," and
- 2) "Within the past 12 months the food we bought just didn't last and we didn't have money to get more."

- A response of “often true” or “sometimes true” to either statement carries 97% sensitivity and 83% specificity for food insecurity.

Hager ER, et al. Pediatrics 2010;126:e26–e32

To help your patients/clients lessen food insecurity, take these three steps:

1. Read each statement* and ask your client if the statement is often true, sometimes true, rarely true, or never true.
 - Within the past 12 months, we worried whether our food would run out before we got money to buy more. ☐ Often True ☐ Sometimes True ☐ Rarely True ☐ Never True
 - Within the past 12 months, the food we bought just didn't last and we didn't have money to get more. ☐ Often True ☐ Sometimes True ☐ Rarely True ☐ Never True
2. If your client responds "often true" or "sometimes true" to either statement, they likely have food insecurity. Help them get more food by filling out the list of resources (see next page) and giving it to them.

You can also fill out the list, make copies, and leave them in waiting rooms and other areas for community members to pick up.
3. Advocate for nourishing foods in your community. Take steps to increase the availability of nutritious, affordable food.

* Hager ER, Quigg AM, Black MM, Coleman SM, Heeren T, Rose-Jacobs R, et al. Development and validity of a 2-item screen to identify families at risk for food insecurity. *Pediatrics*. 2010 Jul 1; 126(1):26-32.



Produced by the IHS Division of Diabetes Treatment and Prevention, 2015. To print this, go to www.ihs.gov/diabetes and search **Food Insecurity** using 'exact match' on the Education Materials and Resources (Online Catalog) webpage.

Addressing the problem: Connect Resources to People Where They Live, Work, and Learn



<https://www.feedingamerica.org>

Peek inside the backpack feeding millions of kids this weekend

October 18, 2019
by Paul Morello

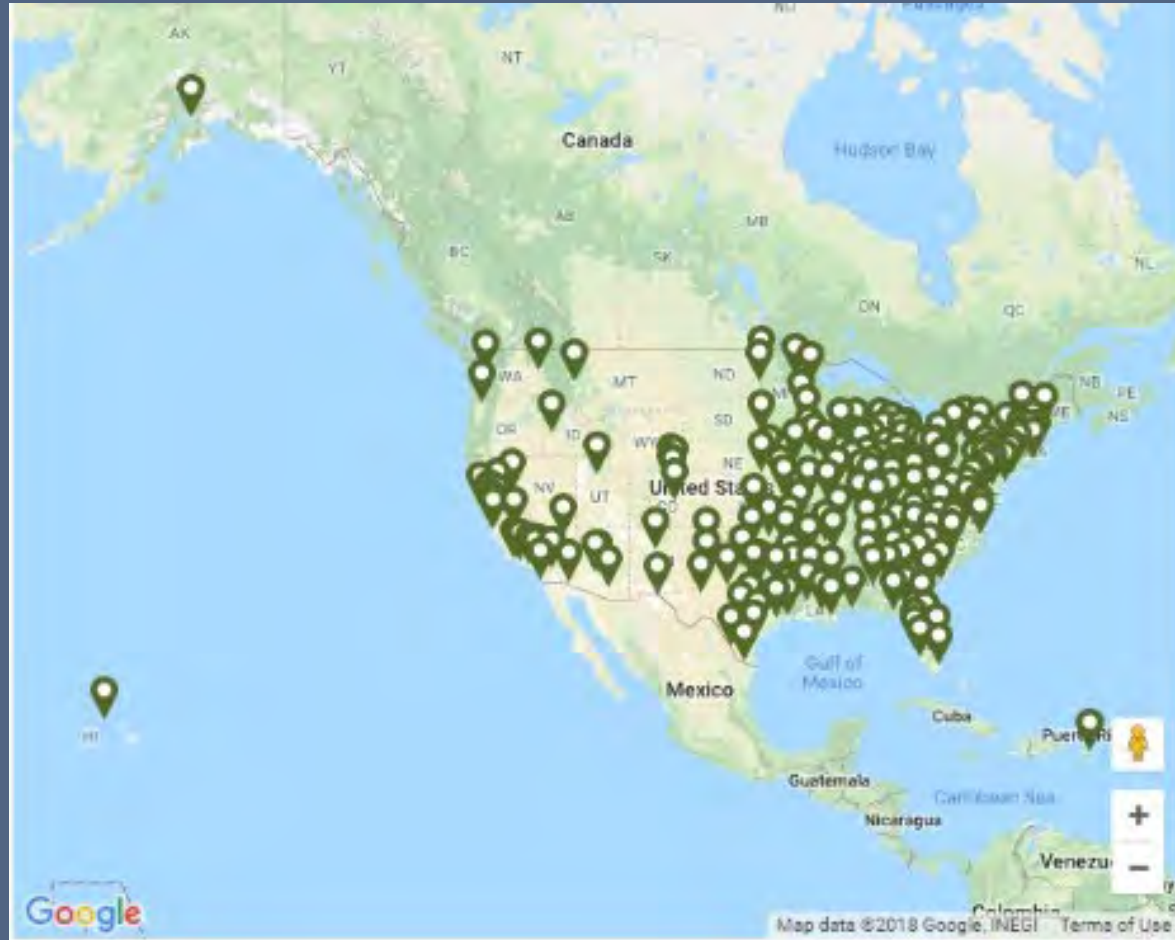
It's Friday and all your classmates are itching to get the weekend started. Just waiting for that last bell to ring. They're already making plans – some are going to the movies, some are planning get-togethers. Some are headed to that big game. Everyone is doing something different, but they're all thrilled about getting away from school.

But you're not.

You know when the weekend starts, you won't be eating free breakfast and lunch at school. And since your parents can't always afford food, you're worried about what you'll eat on Saturday and Sunday. Because it might be nothing.



200 Feeding America Food Banks Serve the US



<https://www.feedingamerica.org>

➤ [Health Aff \(Millwood\)](#). 2015 Nov;34(11):1956-63. doi: 10.1377/hlthaff.2015.0641.

A Pilot Food Bank Intervention Featuring Diabetes-Appropriate Food Improved Glycemic Control Among Clients In Three States

[Hilary K Seligman](#)¹, [Courtney Lyles](#)², [Michelle B Marshall](#)³, [Kimberly Prendergast](#)⁴,
[Morgan C Smith](#)⁵, [Amy Headings](#)⁶, [Georgiana Bradshaw](#)⁷, [Sophie Rosenmoss](#)⁸, [Elaine Waxman](#)⁹

Affiliations + expand

PMID: 26526255 DOI: [10.1377/hlthaff.2015.0641](#)

Study Design and Participants:

- 687 food pantry clients with diabetes in 3 states
- 6 month pilot intervention
- Participants provided with healthy food choices; BGM, DSMES, and primary care referral

Study Results:

- Improvements in glycemic control (A1c from 8.11 to 7.96%)
- Participants with elevated A1c at baseline (over 7.5%) had improvement from 9.52 to 9.04%
- Improvements in fruit and vegetable intake (increase from 2.8 to 3.1 servings/day)
- Improvements in medication adherence
- Improvements in perceived self-efficacy

Conclusions and Recommendations:

- Non-traditional settings for DSMES are promising options for vulnerable populations and may be an effective strategy because of food access and distribution capacity

Food Insecurity and Diabetes: The Role of Federally Qualified Health Centers as Pillars of Community Health

Anne Daly ¹, Amit Sapra ¹, Christine E. Albers ¹, Anastasia M. Dufner ¹, Priyanka Bhandari ¹

¹. Department of Family and Community Medicine, Southern Illinois University School of Medicine, Springfield, USA

Corresponding author: Anne Daly, adaly79@siumed.edu

Abstract

Food insecurity is a complex public health problem affecting millions of people globally. It leads to negative health outcomes in the afflicted population and the society at large. There is a self-perpetuating vicious cycle between food insecurity and chronic health conditions like diabetes. It is important for healthcare professionals to be aware of its existence, to be able to recognize it, and to work with their patients to find solutions for it. Simultaneously, the providers should advocate for their patients and make program administrators, policymakers, and legislatures aware of this crisis. During the current coronavirus disease 2019 (COVID-19) pandemic, when economies have been badly affected and many people have lost their jobs, this subject has arguably assumed much greater importance. In this article, we discuss the magnitude of the problem, its relation to diabetes mellitus, and the role that a Federally Qualified Health Center (FQHC) can play in mitigating this problem.

Daly A, Sapra A, Albers C E, et al. (March 12, 2021) Food Insecurity and Diabetes: The Role of Federally Qualified Health Centers as Pillars of Community Health. Cureus 13(3): e13841. DOI 10.7759/cureus.13841



FIGURE 2: SIU Center for Family Medicine Diabetic educators teaching the public about healthy cooking during a health fair

SIU: Southern Illinois University

Supplemental Nutrition Assistance Program Access and Racial Disparities in Food Insecurity

Laura J. Samuel, PhD, RN; Deidra C. Crews, MD, ScM; Bonnielin K. Swenor, PhD, MPH; Jiafeng Zhu, MS; Elizabeth A. Stuart, PhD; Sarah L. Szanton, PhD, RN; Boeun Kim, PhD, MPH, RN; Pallavi Dwivedi, MPH, MS; Qiwei Li, PhD; Nicholas S. Reed, AuD; Roland J. Thorpe Jr, PhD

Abstract

IMPORTANCE Racially minoritized people experience disproportionately high rates of food insecurity. The Supplemental Nutrition Assistance Program (SNAP) reduces food insecurity.

OBJECTIVE To evaluate SNAP access with regard to racial disparities in food insecurity.

DESIGN, SETTING, AND PARTICIPANTS This cross-sectional study used data from the 2018 Survey of Income and Program Participation (SIPP). On the basis of random sampling strategies, 44 870 households were eligible for the SIPP, and 26 215 (58.4%) participated. Sampling weights accounted for survey design and nonresponse. Data were analyzed from February 25 to December 12, 2022.

EXPOSURES This study examined disparities based on household racial composition (entirely Asian, entirely Black, entirely White, and multiple races or multirace based on SIPP categories).

MAIN OUTCOMES AND MEASURES Food insecurity during the prior year was measured using the validated 6-item US Department of Agriculture Food Security Survey Module. SNAP participation during the prior year was classified based on whether anyone in the household received SNAP benefits. Modified Poisson regression tested hypothesized disparities in food insecurity.

RESULTS A total of 4974 households that were eligible for SNAP (income \leq 130% of the poverty threshold) were included in this study. A total of 218 households (5%) were entirely Asian, 1014 (22%) were entirely Black, 3313 (65%) were entirely White, and 429 (8%) were multiracial or of other racial groups. Adjusting for household characteristics, households that were entirely Black (prevalence rate [PR], 1.18; 95% CI, 1.04-1.33) or multiracial (PR, 1.25; 95% CI, 1.06-1.46) were more likely to be food insecure than entirely White households, but associations differed depending on SNAP participation. Among households that did not participate in SNAP, those that were entirely Black (PR, 1.52; 97.5% CI, 1.20-1.93) or multiracial (PR, 1.42; 97.5% CI, 1.04-1.94) were more likely to be food insecure than White households; however, among SNAP participants, Black households were less likely than White households to be food insecure (PR, 0.84; 97.5% CI, 0.71-0.99).

Key Points

Question Does the Supplemental Nutrition Assistance Program (SNAP) address racial disparities in food insecurity?

Findings In this cross-sectional study of 4974 US households, Black and multiracial households had higher rates of food insecurity than White households in adjusted analyses. This disparity was not found among households that had access to SNAP benefits.

Meaning These findings suggest that SNAP likely plays a key role in addressing food insecurity, but there are racial disparities in food insecurity among those not participating in the program.

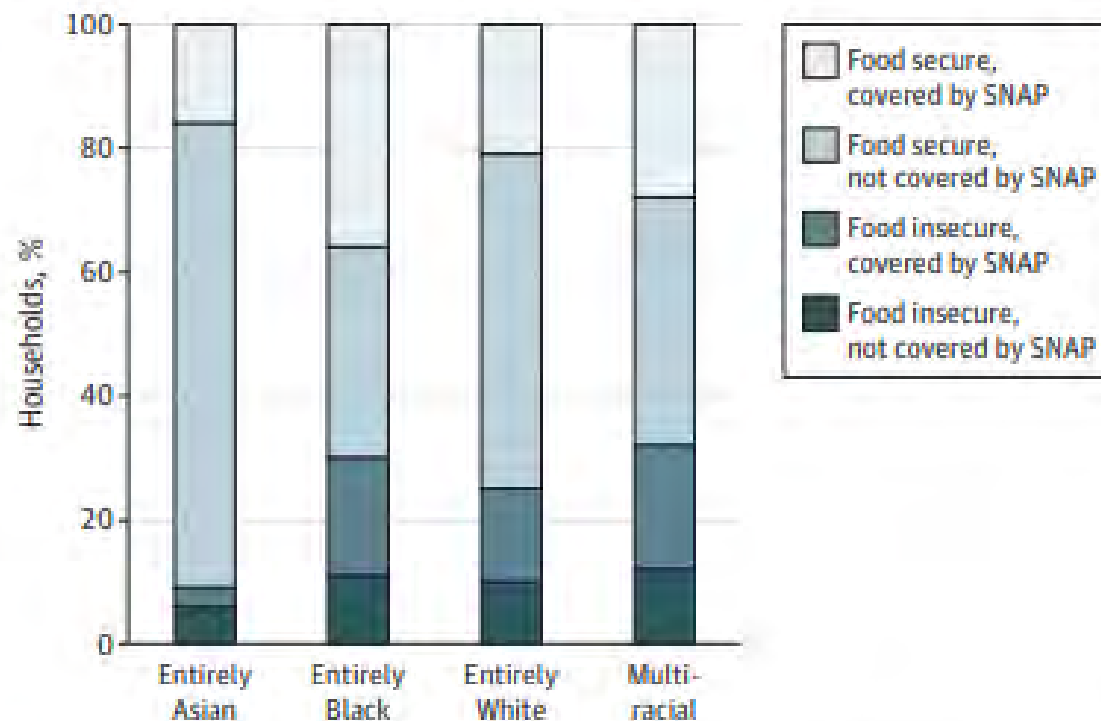
+ Supplemental content

Author affiliations and article information are listed at the end of this article.

SNAP Supplemental Nutrition Assistance Program (< Food Stamps)



Figure. Food Insecurity and Supplemental Nutrition Assistance Program (SNAP) Participation by Racial Identity



Estimated combined probability of food insecurity and SNAP participation based on the composition of racial identity among households likely eligible for SNAP (incomes $\leq 130\%$ of the poverty threshold) participating in the 2018 Survey of Income and Program Participation. The combined probabilities of SNAP participation and food insecurity differ across racial groups. Household sampling weights were applied so that inferences can be drawn to US households with incomes at 130% or less of the poverty threshold in 2018 and variance estimates account for the complex survey design.

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Study Implications

- Universal food insecurity screening is needed
- SNAP is under-utilized in households with incomes at 130% or less of the poverty threshold based on federal SNAP eligibility guidelines (i.e. less than 55% of those eligible participated)
- Under-utilization is thought to be partially due to a cumbersome SNAP enrollment process
- Greater attention needed by society to address structural barriers that prevent people from obtaining affordable food and foods assistance for prevention of food insecurity
- Ever-widening racial gaps in income and wealth must be addressed, to successfully eradicate FI

Original Investigation | Equity, Diversity, and Inclusion

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Supplemental content


Author affiliations and article information are listed at the end of this article.

JAMA Network Open. 2023;6(6):e2320196

One in 10 US adults
eats enough fruits and
veggies/day

Fruit and vegetable
incentives: coupons or
cash incentives for use
at point of purchase

Produce prescriptions:
used in HC setting or
the community

Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

Search

Nutrition

CDC > Nutrition > State and Local Strategies

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[Priority Strategy: Food Service and Nutrition Guidelines](#)


[Priority Nutrition Strategy: Fruit and Vegetable Voucher Incentives and Produce Prescriptions](#)

[Infant and Toddler Nutrition](#)

[Infant and Young Child Feeding in Emergencies \(IYCF-E\) Toolkit](#)

[Healthy Food Environments](#)


[Food Service Guidelines \(FSG\)](#)



Priority Nutrition Strategy: Fruit and Vegetable Voucher Incentives and Produce Prescriptions

Expand existing fruit and vegetable voucher incentive and produce prescription programs

[Print](#)



On This Page

[Background](#)[Potential Activities](#)[Resources](#)[What Others Are Doing](#)[Definitions](#)

SNAP EBT at Farmers' Markets

The **Supplemental Nutrition Assistance Program (SNAP)**, formerly known as the Food Stamp Program, provides assistance to low-income individuals and households to purchase food. The program issues an **Electronic Benefits Transfer (EBT)** card, which can be used to purchase eligible food items at participating retailers, including farmers' markets¹². The United States Department of Agriculture (USDA) has a list of farmers' markets that accept SNAP benefits on their website. You can use the USDA's Farmers Market Directory to find a participating farmers' market near you¹



HO·CHUNK
INCORPORATED

OUR VISION
To be a world-class tribal company driving the socio-economic development of the Winnebago people.

OUR MISSION
Ho·Chunk, Inc.'s ongoing mission is to use the Tribe's various economic and legal advantages to develop and operate successful business enterprises and provide job opportunities for Tribal members.
The long-term mission of Ho·Chunk, Inc. is to provide the Tribe with a large enough income stream from its business operations to enable the Tribe to reach economic self-sufficiency.



Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)





United States Department of Agriculture

THE SCHOOL BREAKFAST PROGRAM



<https://www.fns.usda.gov/school-meals/income-eligibility-guidelines>



United States Department of Agriculture

THE NATIONAL SCHOOL LUNCH PROGRAM



OCTOBER 2016

HUNGER ON CAMPUS

The Challenge of Food Insecurity for College Students

James Dubick

Brandon Mathews

Clare Cady

College and University
Food Bank Alliance

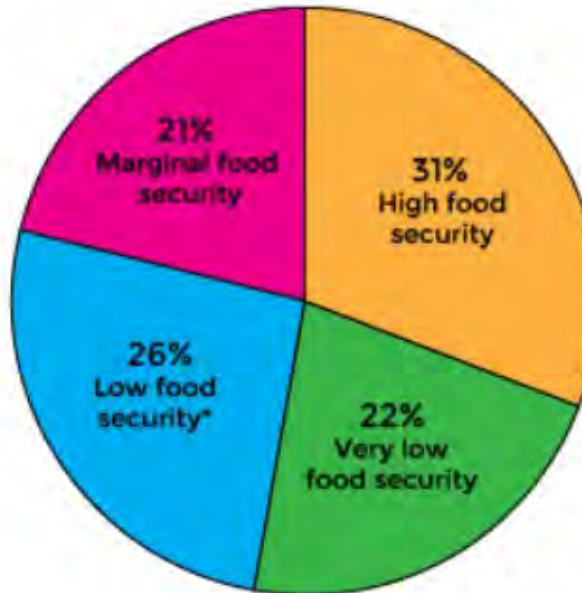
National Student
Campaign Against Hunger
and Homelessness

Student Government
Resource Center

Student Public Interest
Research Groups



Hunger on College Campuses



44 percent of students cut the size of their meals or skipped meals because there wasn't enough money for food.

15 percent of students lost weight because there wasn't enough money for food.

20 percent of students did not eat for a whole day because there wasn't enough money for food.

*Low food security: food intake is reduced and normal eating patterns are disrupted due to lack of money for food.

Source: National Student Campaign Against Hunger and Homelessness

info@studentsagainsthunger.org

RUNNING A CAMPUS FOOD PANTRY



STUDENT GOVERNMENT TOOLKIT



TOOLKIT CONTENTS

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MILWAUKEE COUNTY
Health & Human Services



Milwaukee County

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Residents

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ADULTS

CHILDREN & YOUNG
ADULTS

OLDER ADULTS

BEHAVIORAL HEALTH

HOUSING

DISABILITIES

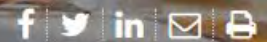
VETERANS



Senior Centers & Dining

Join Us for Meals, Exercise, Classes and More

> Department of Health & Human Services > Older Adults > Senior Centers & Dining



TAKE ACTION

LEARN MORE

FIND MEALS

CONNECT

THE CASE FOR MEALS ON WHEELS

New study confirms Meals on
Wheels as an evidence-
supported, cost-effective
solution.

[LEARN MORE](#)<https://www.mealsonwheelsamerica.org>**FIND MEALS**

Enter ZIP Code

GO

SERVICES PROVIDED:



100% provide socialization opportunities



97% train drivers to keep an eye out for senior wellbeing



88% train drivers to keep an eye out for safety issues around the clients' home



66% connect seniors to services in the community when needs are identified



55% offer home repair and modification services



44% provide pet assistance

THE IMPACT:



WE CAN SERVE A SENIOR FOR AN ENTIRE YEAR
for roughly the same cost as a day in the hospital
or 10 in a nursing home

Of home-delivered meal participants:



say the meals help
IMPROVE THEIR HEALTH



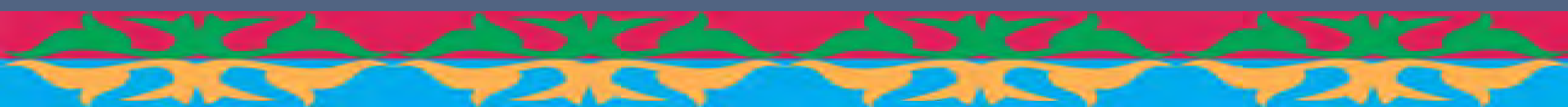
say the services help them
FEEL MORE SECURE



say the meals help them
LIVE INDEPENDENTLY



Winnebago (Ho-Chunk) Tribe Food Sovereignty Mission

- Promote tribal food sustainability and food sovereignty
 - Increase access to fresh, nutritious food
 - Revitalize traditional tribal practices in arts and agriculture
 - Encourage economic growth
 - Support healthy, connected communities
- 

Movement Toward Traditional Foods



Bago GROWS

Please Circle ONE option below (A, B, or C) to identify the type of raised garden container you'd like for your household. We'll order, based on your



Option A: Raised Planter, treated wood
40" x 20" x 30" High



Option B: Recycled Poly Raised Bed
48" x 48" x 10.5" High

Food Sovereignty Task Force Partners: HCCDC

Bago Grows

- Raised garden bed initiative
- Sponsored by Ho-Chunk Community Development Corporation (HCCDC)
 - 122 garden beds distributed in 2018
 - 80 garden beds distributed in 2019

Grant opportunities for tribal entrepreneurs

Bago GROWS

Please Circle ONE option below (A, B, or C) to identify the type of raised garden container you'd like for your household. We'll order, based on your

 Option A: Raised Planter, treated wood
40" x 20" x 30" High

 Option B: Recycled Poly Raised Bed
48" x 48" x 10.5" High

 Option C: Cedar Raised Garden Bed
2" x 8" x 10.5" High

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- *JAMA Network Open*. 2023; 6(6):e2320196

감사합니다 Natick

Grazie . Danke Ευχαριστίες Dalu
Thank You Köszönöm
Спасибо Dank Tack
Gracias

谢谢 Merci Seé
ありがとう

Obrigado