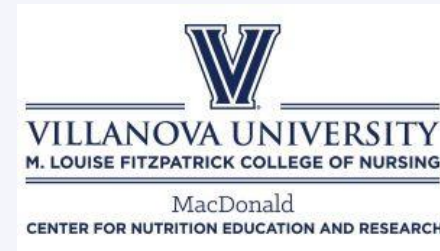
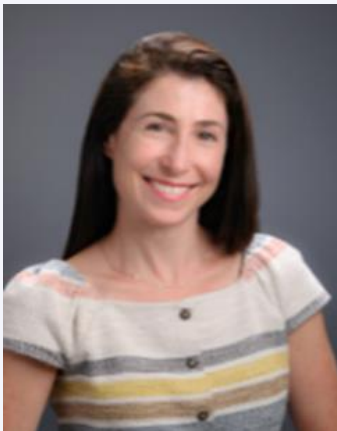


MCNER Webinar Series for Health Professionals



Understanding the Connection Between Food Insecurity and Diabetes: Implications for Practice November 15, 2023




Moderator:
Rebecca Shenkman
Director
MacDonald Center for Nutrition Education and
Research
Villanova University M. Louise Fitzpatrick College of
Nursing

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Understanding the Connection Between Food Insecurity and Diabetes: Implications for Practice



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Director of Research & Evaluation
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Connection Between Food Insecurity and Diabetes: Implications for Practice

Ronli Levi, MPH, RD
University of California, San Francisco
Center for Vulnerable Populations
Food Policy Health and Hunger Research Program

11/12/2023



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Special thanks to my co-authors

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- Hilary Seligman, MD, MAS, University of California, San Francisco

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These findings are solely those of the authors and do not reflect the views of the Department of Health and Human Services or the CDC.

Objectives

- Understand the link between food insecurity and diabetes and its implications for diabetes treatment and management
- Describe the rationale behind screening for food insecurity in the clinical setting
- Describe the range of interventions and policies that exist for addressing food insecurity and diabetes

Background

What is food security?

Food insecurity

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

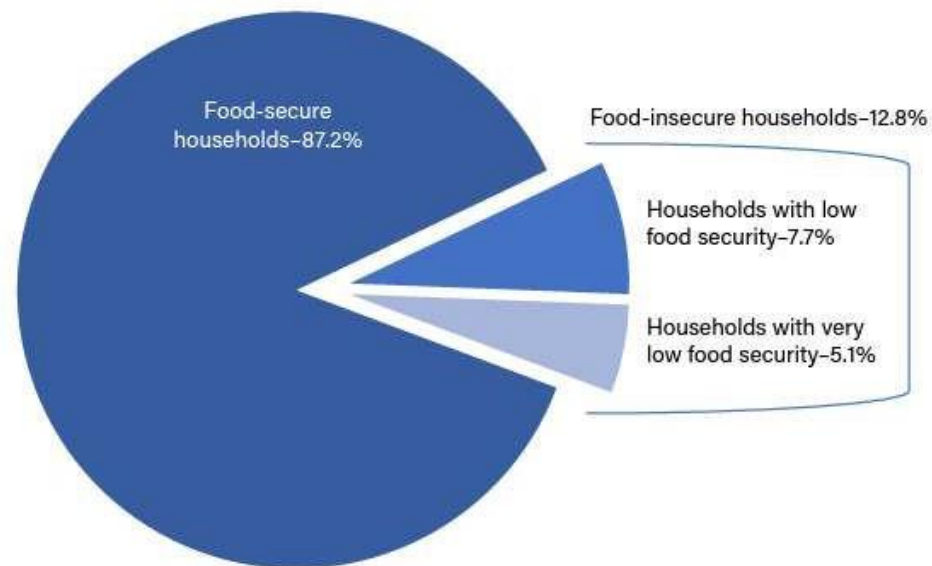
Food security

- Access by all people at all times to enough food for an active, healthy life

Food security in the US

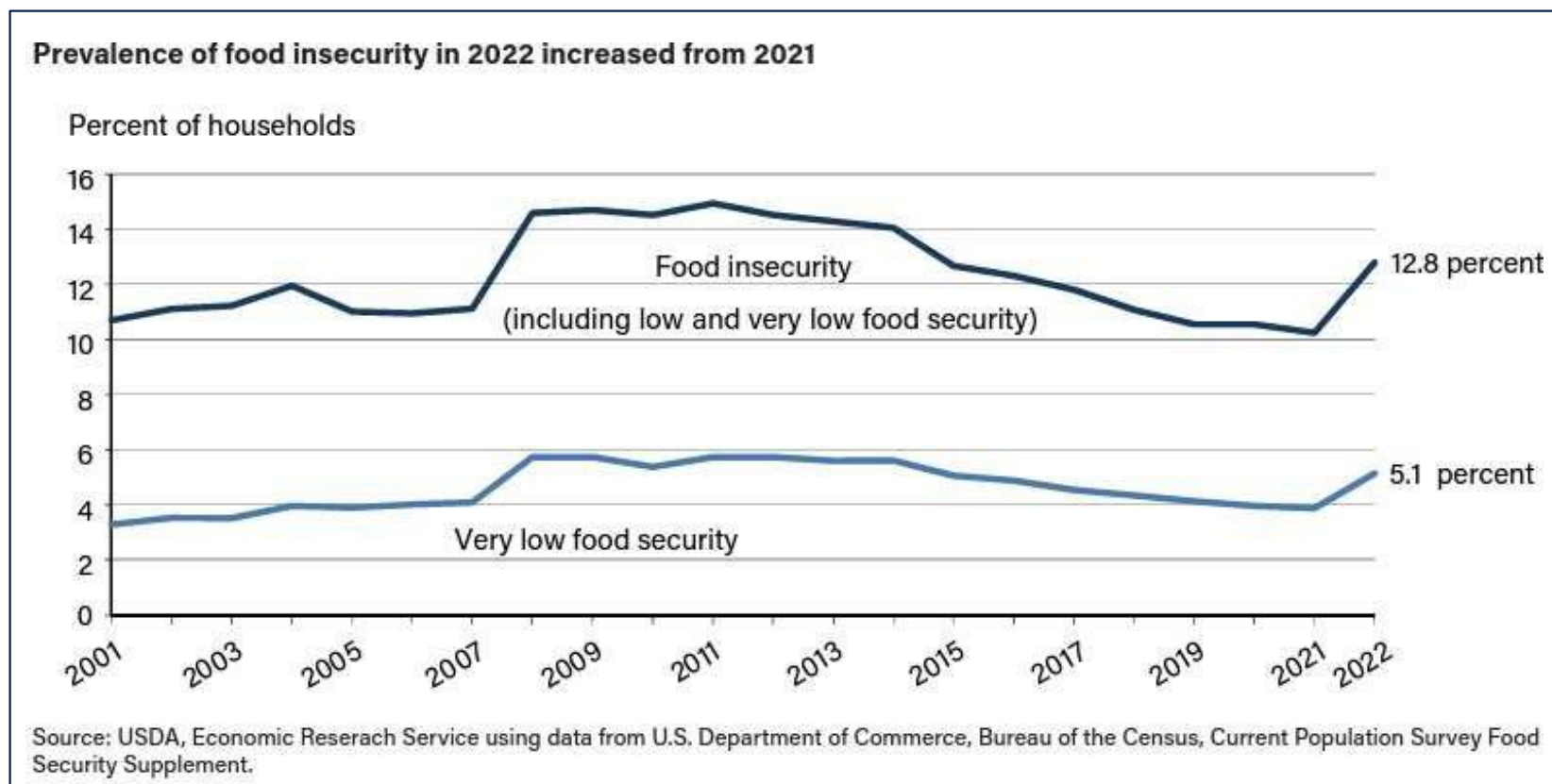
44.2 million people lived in a food insecure household in 2022

Figure 1
U.S. households by food security status, 2022



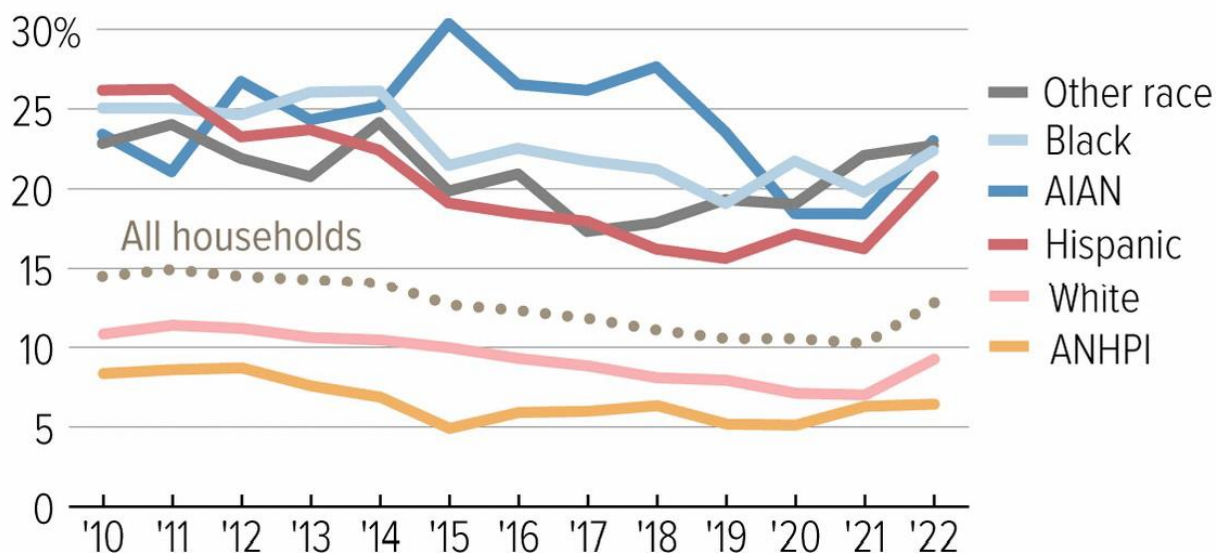
Source: USDA, Economic Research Service using data from U.S. Department of Commerce, Bureau of the Census, 2022 Current Population Survey Food Security Supplement.

Food insecurity rates increased across all groups



Food Insecurity by Race and Ethnicity Reveals Stark Disparities

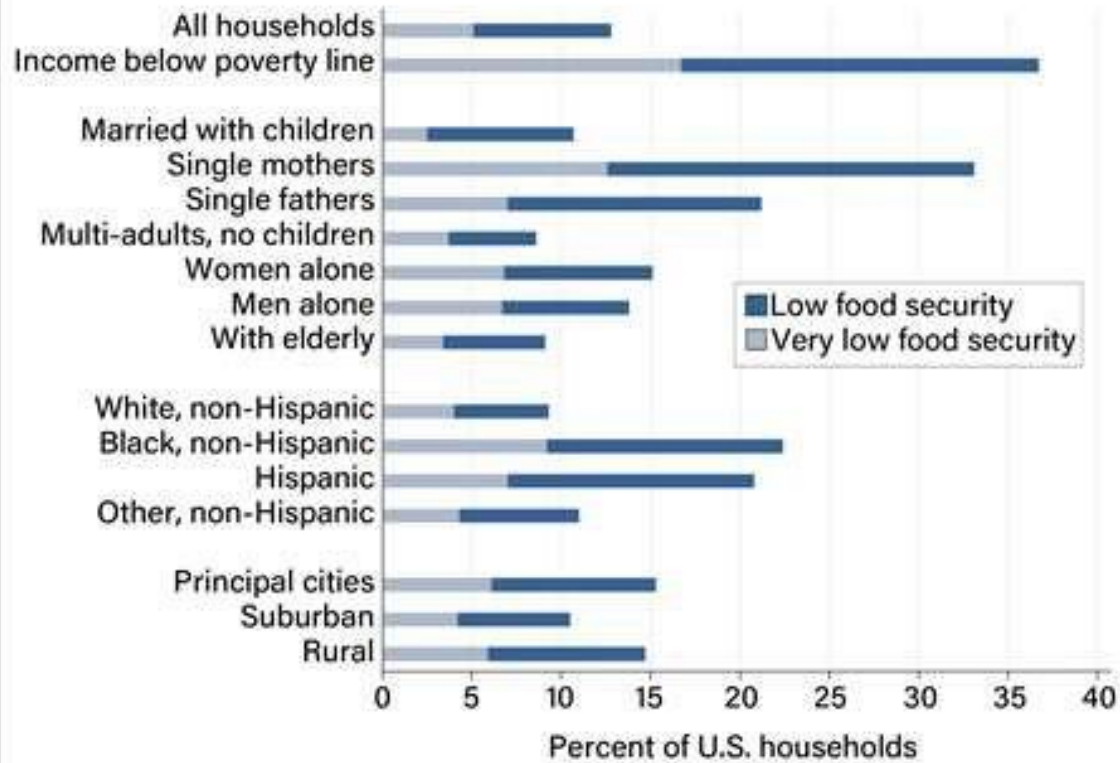
Households that lacked access to adequate food at some point in the year



Note: Other race = people who are more than one race. AIAN = people who are American Indian or Alaska Native. ANHPI = people who are Asian, Native Hawaiian, or Pacific Islander. Hispanic households may be of any race. Race and ethnicity for the household are based on that of the household reference person (in whose name the housing unit is owned or rented).

Source: U.S. Department of Agriculture, Current Population Survey Food Security Supplement 2010-2022

Prevalence of food insecurity by selected household characteristics, 2022



Note: Food-insecure households include those with low food security and very low food security.
 Source: USDA, Economic Research Service using data from U.S. Department of Commerce, Bureau of the Census, 2022 Current Population Survey Food Security Supplement.

Coping Strategies

- Eating low-cost, energy dense foods
- Skipping or cutting size of meals
- Reduced variety of foods
- Binge eating when food is available
- Eating expired or spoiled food

Nutrition Security

WHAT IS NUTRITION SECURITY?

Consistent and equitable access to healthy, safe, and affordable foods that promote optimal health and well-being.

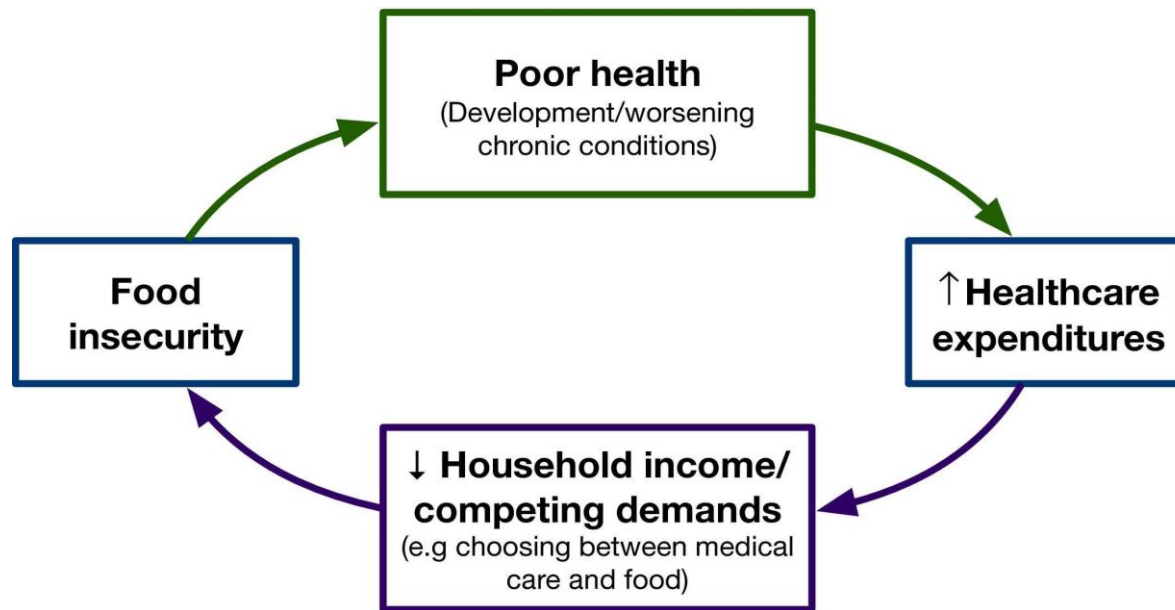


HOW DOES NUTRITION SECURITY INTERSECT WITH HEALTH EQUITY?

Structural racism increases food insecurity and the risk of diet-related chronic diseases for historically underserved populations. Efforts to improve nutrition security also promote health equity.

Food insecurity and diabetes

Bidirectional relationship between food insecurity and poor health



Trends in food insecurity among pre-diabetic & diabetic populations

Walker RJ, Grusnick J, Garacci E, Mendez C, Egede LE. Trends in Food Insecurity in the USA for Individuals with Prediabetes, Undiagnosed Diabetes, and Diagnosed Diabetes. *J Gen Intern Med.* 2019;34(1):33-35. doi:10.1007/s11606-018-4651-z

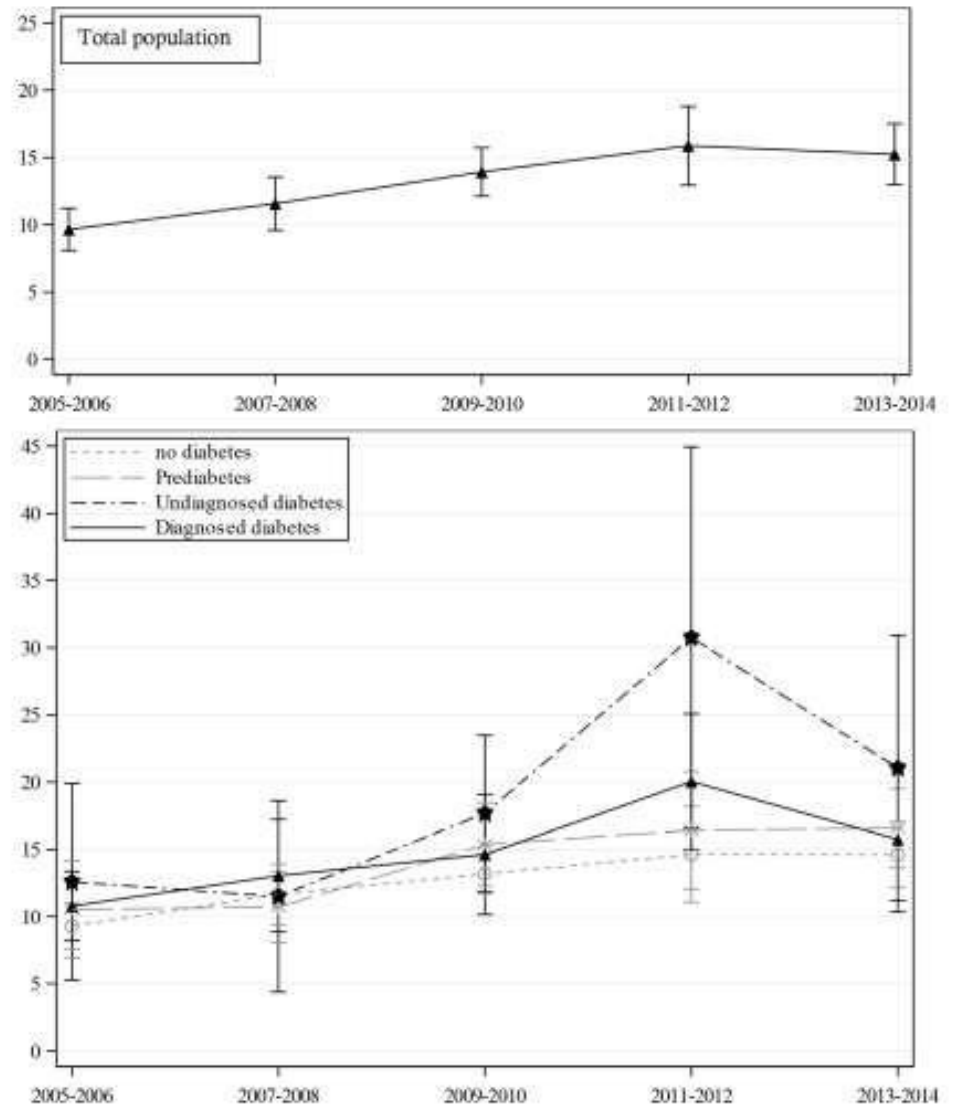


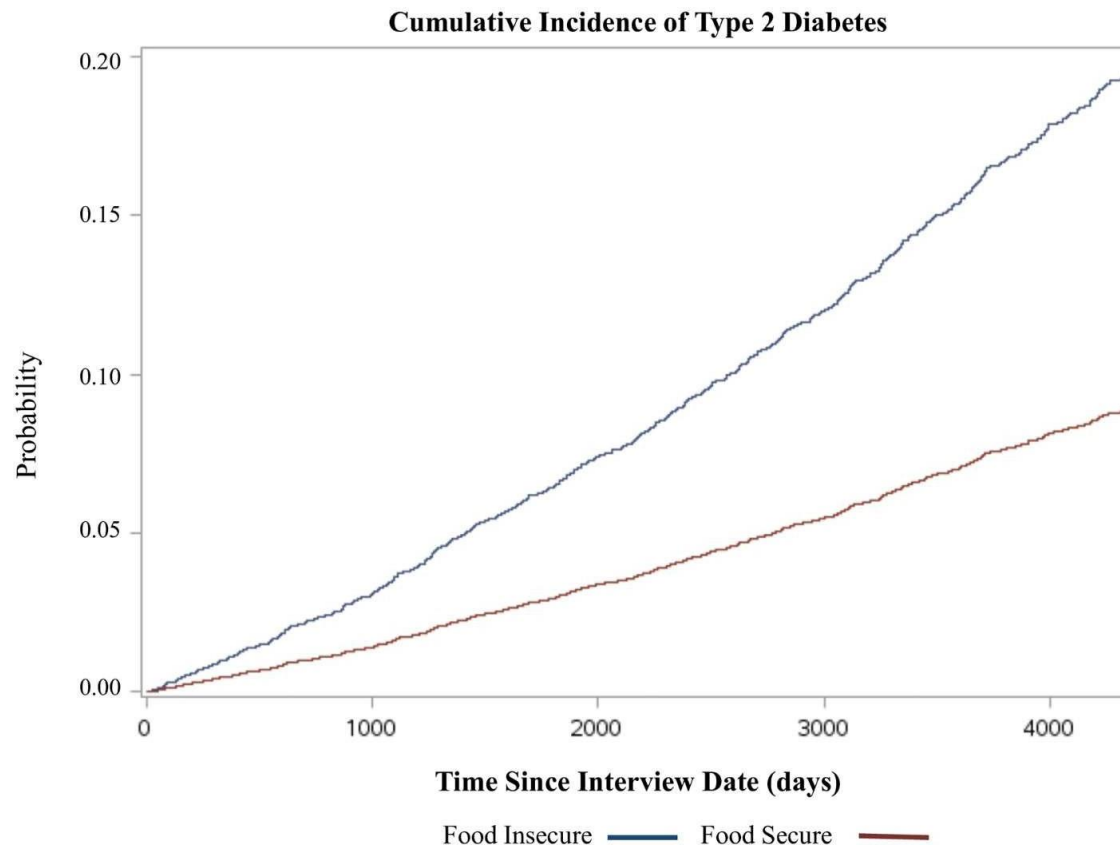
Figure 1 Trends in food insecurity 2005–2014, % reporting food insecurity overall and by diabetes status.

Food insecurity & diabetes

Food insecure individuals are greater risk for:

- Developing pre-diabetes and diabetes
- Worse glycemic control and more diabetes complications
 - Higher HbA1c (0.6 percentage points)
 - Risk of hypoglycemia
- Other cardiometabolic conditions: overweight/obesity (especially for women), HTN, CKD, CHF, stroke, and CHD
- Food insecurity rates highest among those with more severe diabetes (on insulin, eye or kidney complications)

Food insecurity is associated with increased risk of developing diabetes



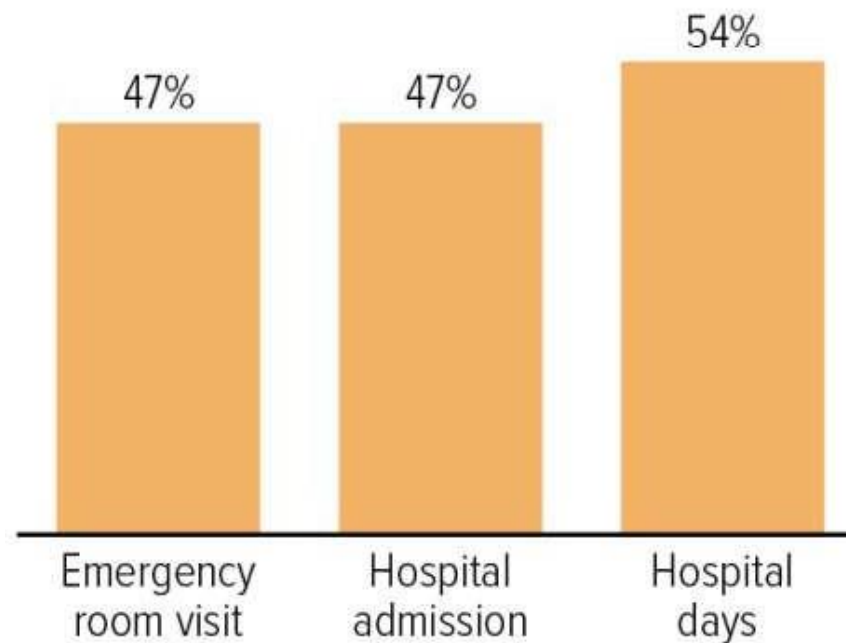
Tait, C. A., et al. (2018). "The association between food insecurity and incident type 2 diabetes in Canada: A population-based cohort study." *PloS one* 13(5): e0195962.

Food insecure adults with diabetes have higher average blood sugars

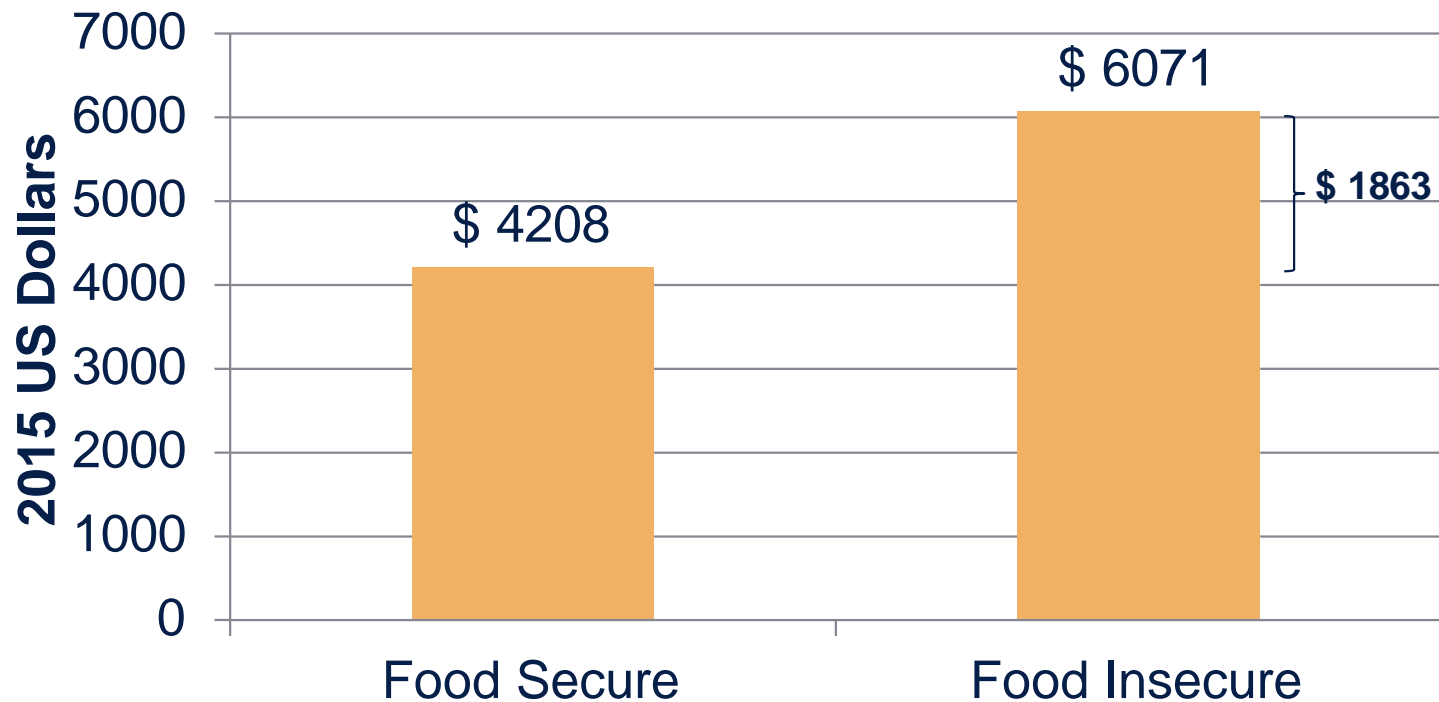
| | Food Secure | Food Insecure | |
|--|-------------|---------------|---------------------------------|
| HbA1c >7% (NHANES, known diabetics <200% FPL) | 49% | 70% | Adjusted RR 1.35 (1.05-1.74) |
| Mean HbA1c (ICHHC, n=711) | 8.1% | 8.5% | p=0.007 |
| Mean HbA1c (MFFH, n=621) | 8.0% | 8.4% | p=0.01 |

Adults in Food-Insecure Households Have More Emergency Room Visits and Hospital Admissions

Percent more likely relative to food-secure households



Food Insecurity Associated with 44% Increase in Annual Health Care Expenditures

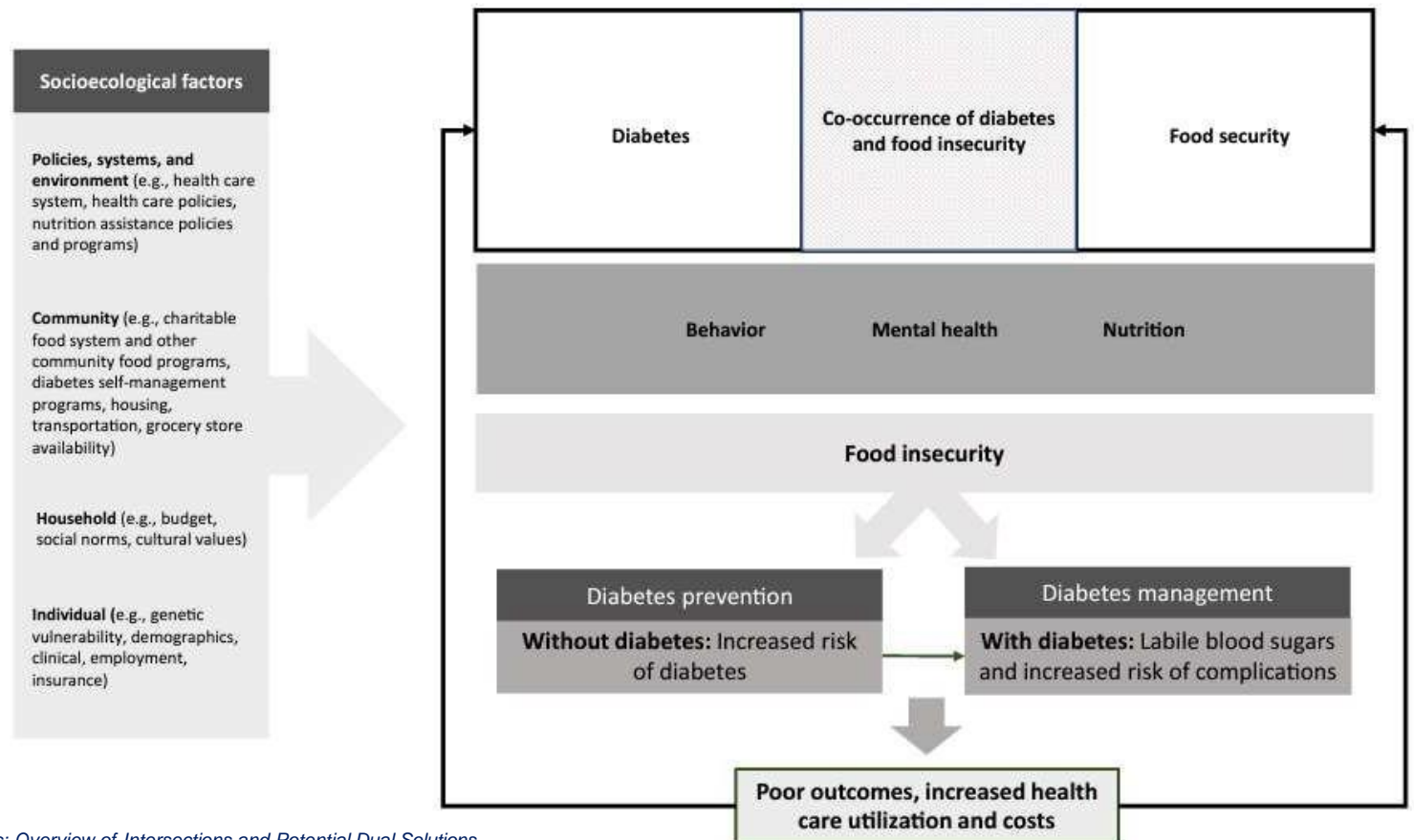


NHIS-MEPS data adjusted for: age, age squared, gender, race/ethnicity, education, income, rural residence, and insurance.

Berkowitz, Basu, and Seligman. Health Services Research: 2017.

Mechanisms linking food insecurity to diabetes

- Nutritional
- Mental health
- Behavioral



Mechanisms linking food insecurity to diabetes



Nutritional

Lower diet quality
Consumer fewer fruits
and vegetables
More low quality, energy
dense foods



Mental Health

Anxiety/stress
Depression
Substance abuse



Behavioral

Treatment non-
adherence
Postponing care
Missed clinic visits

Relation Between the Energy Density of Selected Foods and Energy Costs (\$/MJ)

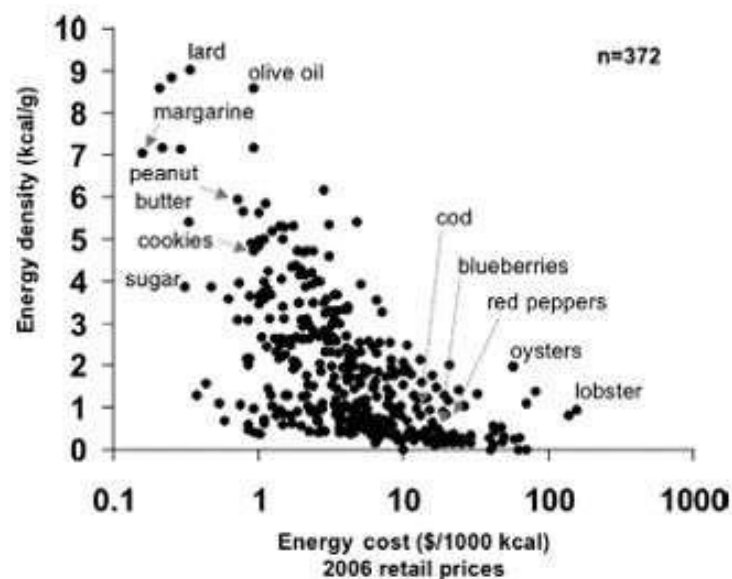
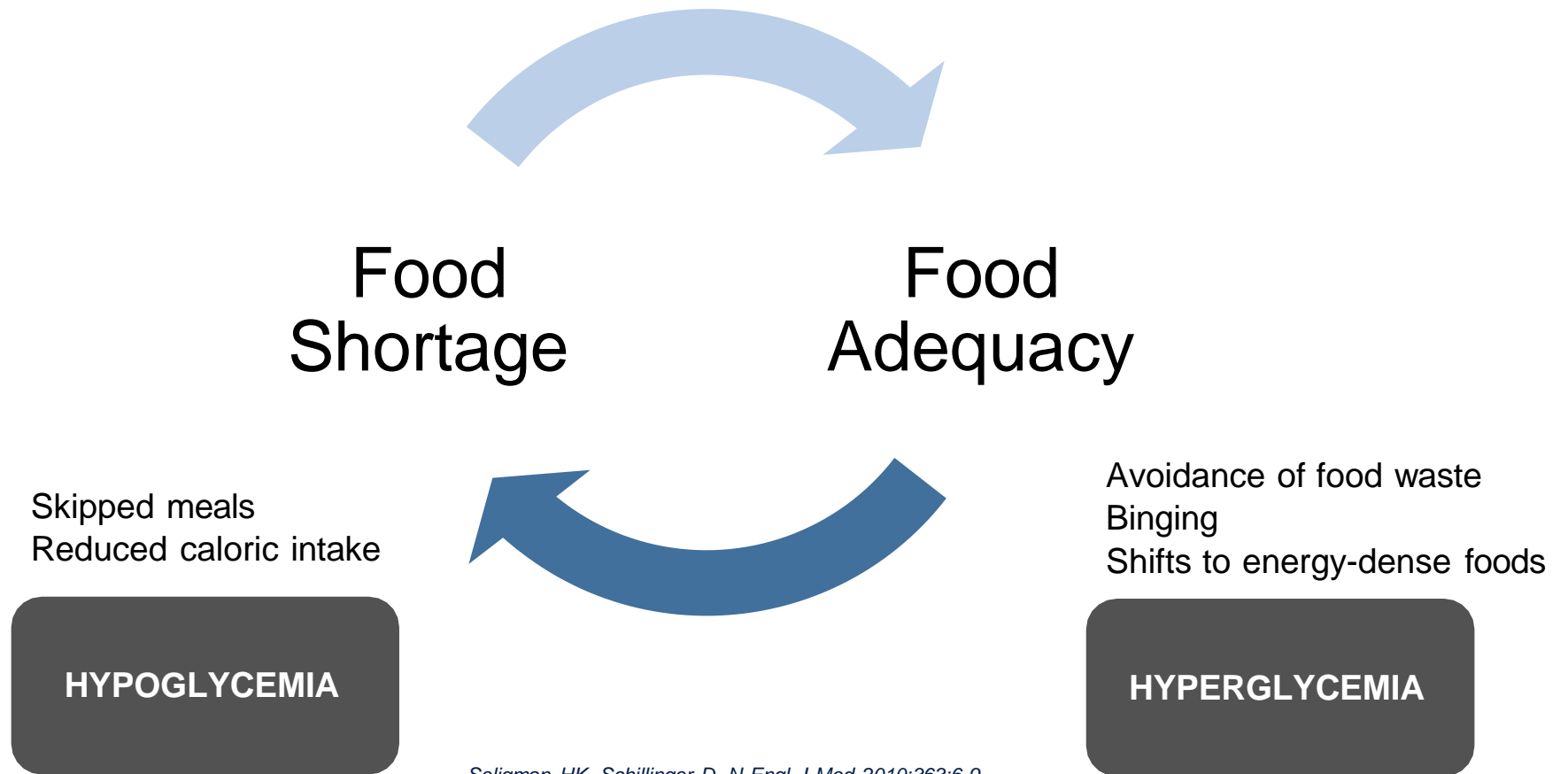


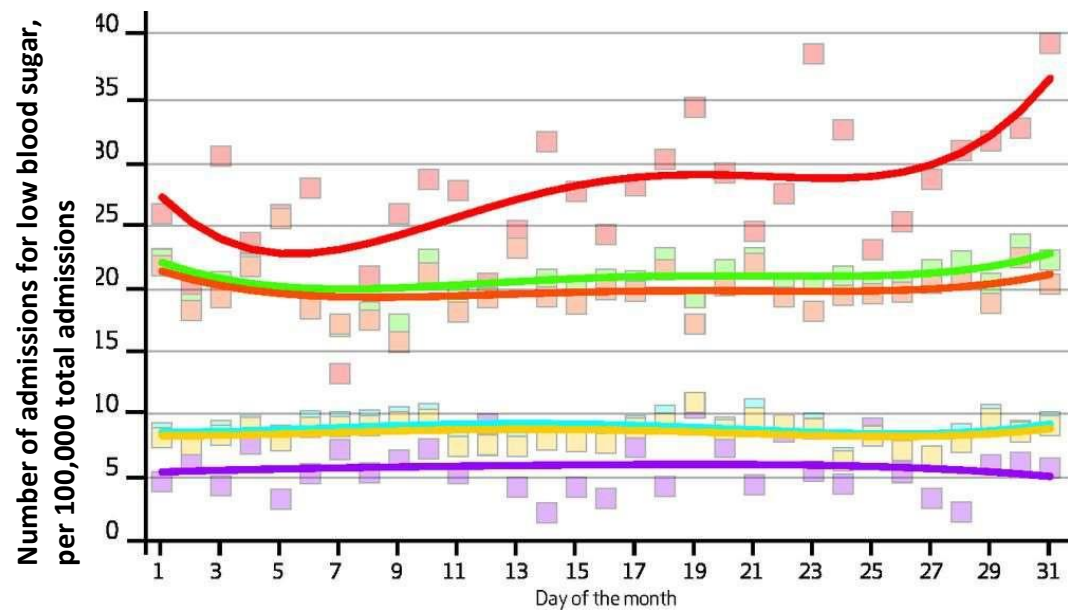
Figure 2. Relationship between monetary cost of dietary energy (\$/1,000 kcal) and energy density (kcal/g) of 372 foods from Seattle-area supermarkets for which nutrient and energy data were available. Energy cost was inversely associated with energy density. The data were fit by a linear regression: $r^2=0.38$. Retail prices for 372 foods and beverages were for 2006.

Compensatory Strategies



Seligman HK, Schillinger D. N Engl J Med 2010;363:6-9.

Admissions for Hypoglycemia Increase by 27% in Last Week of the Month for Low-Income Population



Cost of A Health Care Visit for Low Blood Sugar vs. Food



American Journal of Managed Care, 2011.

*Thrifty Food Plan

Mechanisms linking food insecurity to diabetes



Nutritional

Lower diet quality

Consumer fewer fruits and vegetables

More low quality, energy dense foods



Mental Health

Anxiety/stress

Depression

Substance abuse



Behavioral

Treatment non-adherence

Postponing care

Missed clinic visits

Mechanisms linking food insecurity to diabetes



Nutritional

Lower diet quality

Consumer fewer fruits and
vegetables

More low quality, energy
dense foods



Mental Health

Anxiety/stress

Depression

Substance abuse



Behavioral

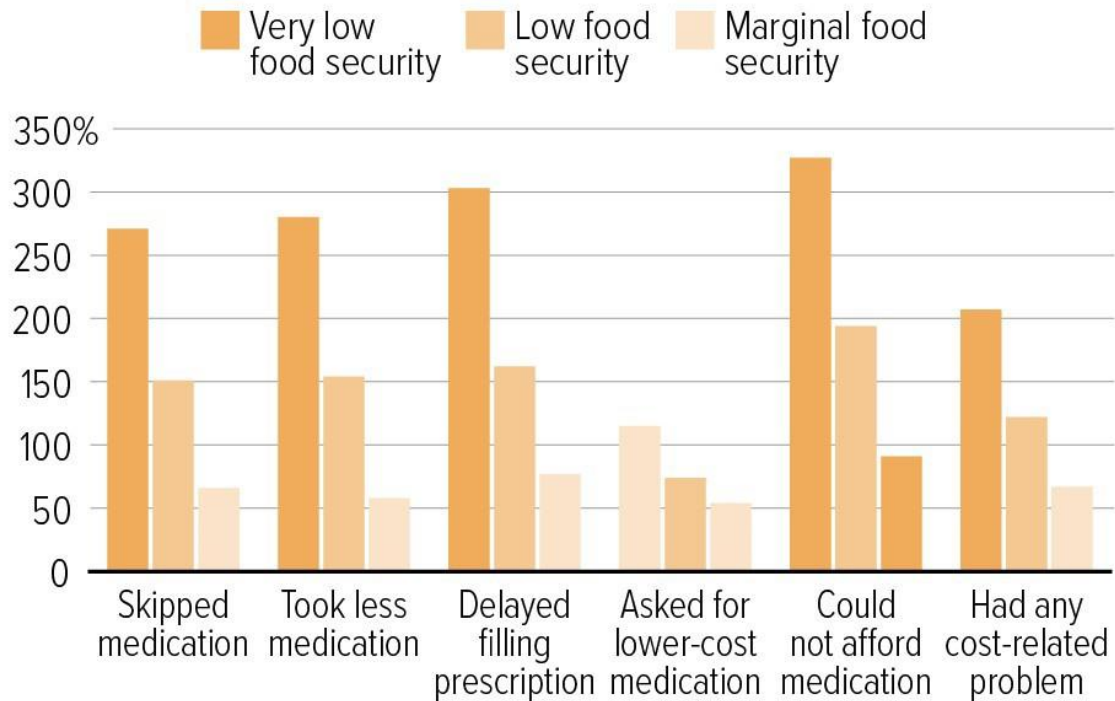
Treatment non-adherence

Postponing care

Missed clinic visits

Adults in Households With Less Food Security Are Likelier to Skip Needed Medications

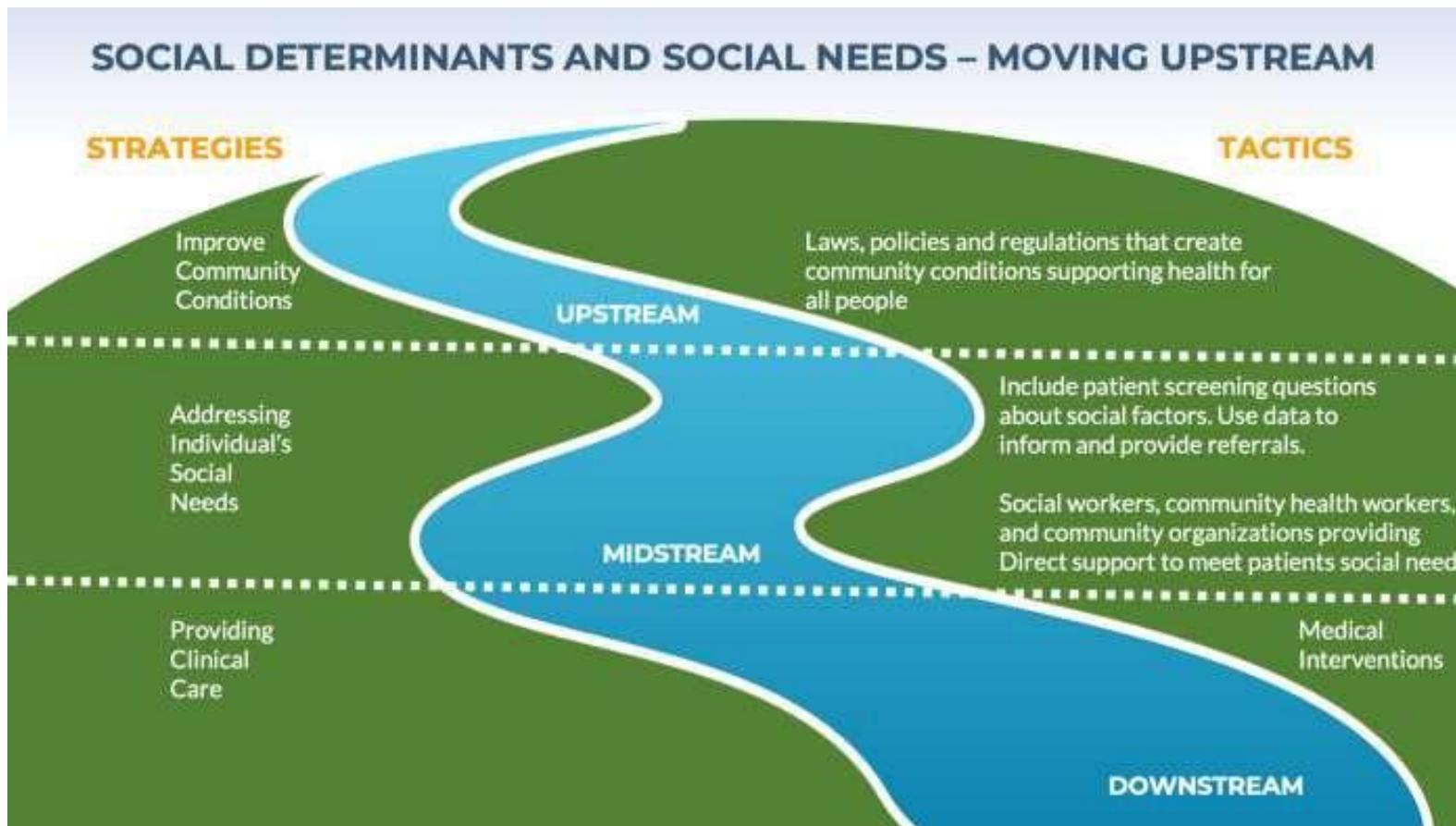
Percent more likely relative to food-secure households



Note: When food security is “marginal,” a household may experience anxiety over food adequacy, but little to no change in diets; when “low,” it reduces diet’s quality or variety sometime in year; when “very low,” food intake has been disrupted or reduced.

Source: Dena Herman et al., “Food Insecurity and Cost-Related Medication Underuse Among Nonelderly Adults in a Nationally Representative Sample.”

What Interventions Might Target Both Food Insecurity and Diabetes?

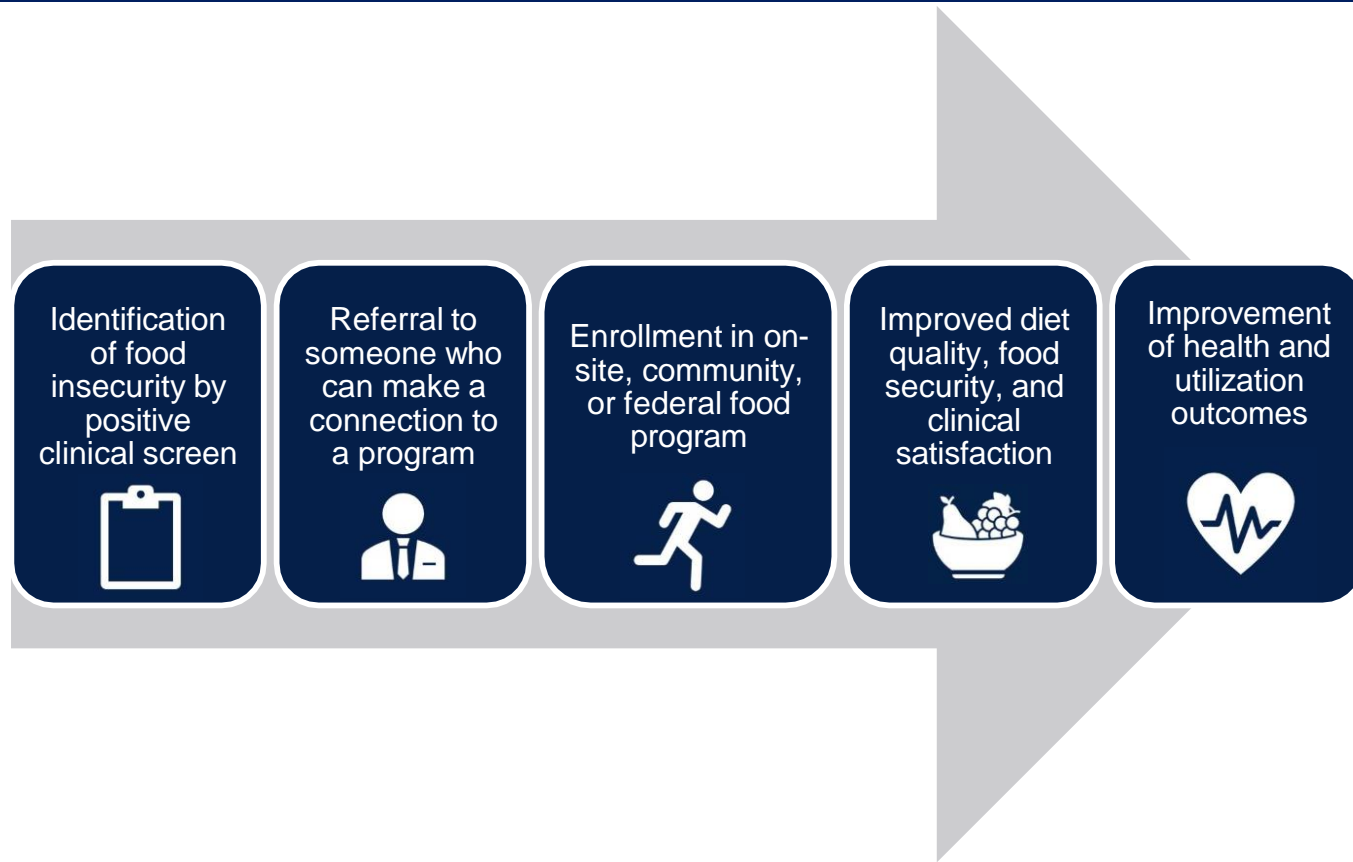


Meeting Individual Social Needs Falls Short Of Addressing Social Determinants Of Health, Health Affairs Blog, January 16, 2019. DOI: [10.1377/hblog20190115.234942](https://doi.org/10.1377/hblog20190115.234942)

Health Related Social Needs

- Living situation
- Transportation
- Utilities
- Family and social support
- Education
- Employment and income
- **Food**

Identifying food insecurity in the clinical setting



Standardized Clinical Measurement: Hunger Vital Sign

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

Often or sometimes true to EITHER question suggests food insecurity (97% sensitivity, 83% specificity)

Barriers to Implementation

- Data sharing between health system and CBO
- Staff capacity/time
- Lack of tracking infrastructure
- CBO capacity to provide food how, when, where and at the price that healthcare desires
- Fragmentation of the ecosystem outside of healthcare

TABLE 7: Obstacles That Routinely Prevent Screening or Addressing Food Insecurity at the Practice/Hospital (n = 140)

| Obstacles (multiple responses allowed) | Percent | Frequency |
|---|---------|-----------|
| Time constraints | 33% | 46 |
| Community interventions that address this issue are unknown to me | 29% | 41 |
| I am worried that talking about food insecurity will open up a range of issues that I may not be able to address | 29% | 41 |
| Limited patient cognitive function makes questions about food insecurity challenging | 25% | 35 |
| Insurance does not cover addressing food insecurity | 24% | 33 |
| Resources addressing this issue are unavailable to me | 21% | 29 |
| I don't know enough about available resources to address food insecurity | 19% | 26 |
| I'm worried that questions about food insecurity are too sensitive for my patients | 14% | 20 |
| The electronic medical record (EMR) system we use does not include food insecurity screening or adding it is cost-prohibitive | 14% | 20 |
| Lack of buy-in from other staff to address food insecurity | 13% | 18 |
| Lack of buy-in from leadership to address food insecurity | 8% | 11 |
| I don't know enough about the issue | 7% | 10 |
| I don't know how to ask questions about food insecurity | 5% | 7 |
| I don't think food insecurity exists in my patient population | 5% | 7 |
| Other (please describe)* | 4% | 5 |
| Food insecurity shouldn't be addressed in a health care setting | 1% | 2 |
| None of the above | 8% | 11 |



1. Improving Care and Promoting Health in Populations: *Standards of Care in Diabetes—2023*

Diabetes Care 2023;46(Suppl. 1):S10–S18 | <https://doi.org/10.2337/dc23-S001>

Nuha A. ElSayed, Grazia Aleppo, Vanita R. Aroda, Raveendhara R. Bannuru, Florence M. Brown, Dennis Bruemmer, Billy S. Collins, Marisa E. Hilliard, Diana Isaacs, Eric L. Johnson, Scott Kahan, Kamlesh Khunti, Jose Leon, Sarah K. Lyons, Mary Lou Perry, Priya Prahalad, Richard E. Pratley, Jane Jeffrie Seley, Robert C. Stanton, and Robert A. Gabbay, on behalf of the American Diabetes Association

TAILORING TREATMENT FOR SOCIAL CONTEXT

Recommendations

- 1.5** Assess food insecurity, housing insecurity/homelessness, financial barriers, and social capital/social community support to inform treatment decisions, with referral to appropriate local community resources. **A**
- 1.6** Provide patients with additional self-management support from lay health coaches, navigators, or community health workers when available. **A**
- 1.7** Consider the involvement of community health workers to support the management of diabetes and cardiovascular risk factors, especially in underserved communities and health care systems. **B**

Best practices in HVS administration

THREE STEPS FOR SUCCESS

PREPARE

- ▶ **Educate and train** staff on food insecurity, federal nutrition programs, and local food and income resources
- ▶ **Follow AAP's recommendation** of universal screening at scheduled check-ups or sooner, if indicated
- ▶ **Incorporate efforts** to address food insecurity into the institutional workflow
- ▶ **Practice** having empathetic and sensitive conversations when addressing food insecurity

SCREEN

Use the AAP-recommended Hunger Vital Sign™:

1. "Within the past 12 months, we worried whether our food would run out before we got money to buy more."

OFTEN TRUE SOMETIMES TRUE NEVER TRUE DON'T KNOW/REFUSED

2. "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 NEVER TRUE DON'T KNOW/REFUSED

Patients screen positive for food insecurity if the response is "often true" or "sometimes true" for either or both statements.

Document and code the administration and results of screening in medical records.

INTERVENE

- ▶ **Administer** appropriate medical interventions per your protocols
- ▶ **Connect patients** and their families to the federal nutrition programs and other food resources
- ▶ **Document and track** interventions in medical records
- ▶ **Advocate and educate** to address food insecurity and its root causes, e.g., poverty, inadequate wages, housing insecurity, and structural racism



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American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®



Range of interventions available to address food insecurity

- Charitable food system
 - Food pantries, food shelves
 - Congregate meal sites or soup kitchens
- “Food is medicine” programs
- Federal nutrition programs
 - WIC (Special Supplemental Nutrition Program for Women, Infants and Children)
 - SNAP (Supplemental Nutrition Assistance Program)

Food is Medicine

- Integration of specific food and nutrition interventions in, or in close collaboration with, the health care system
 - Medically-Tailored Meals
 - Medically-Tailored Groceries
 - Produce Prescriptions
 - On-site interventions
- Target population: individuals with or at high risk for serious health conditions
 - Often prioritizes people with or at high risk of food insecurity

What is Food is Medicine (FIM)?

Food is Medicine is a spectrum of programs, services, and other interventions that recognize and respond to the critical link between nutrition and health, particularly within healthcare systems.²²


Spectrum of FIM Programs

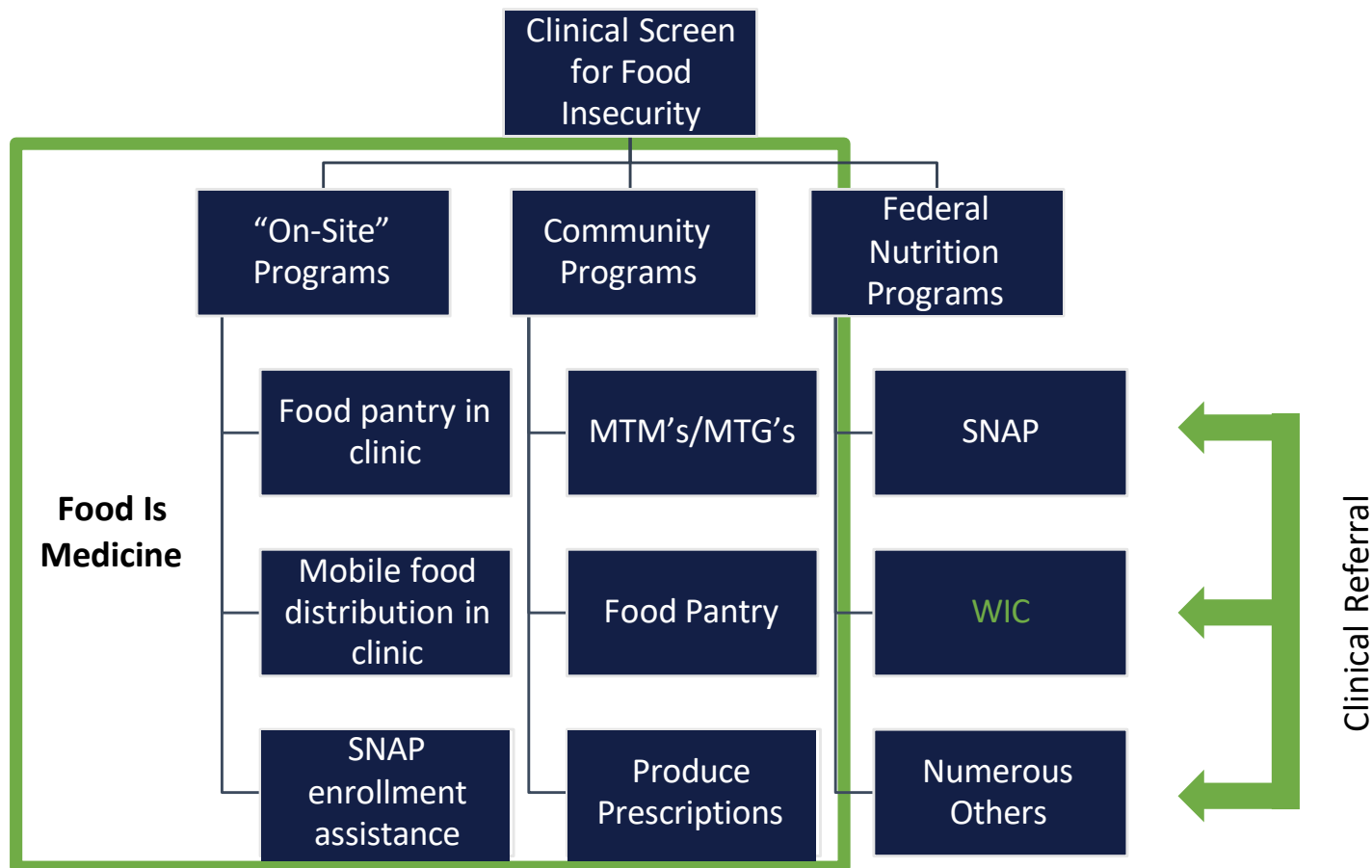
From the perspective of health care

MTM=Medically Tailored Meals

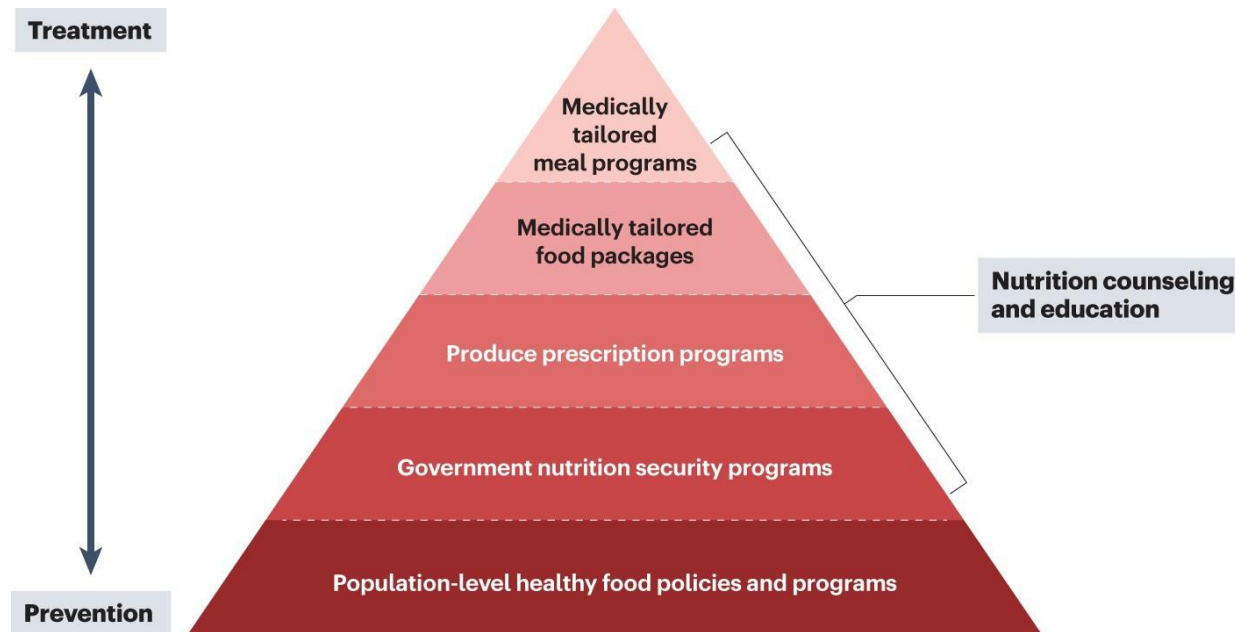
MTG=Medically Tailored Groceries

SNAP=Supplemental Nutrition Assistance Program

 = "food is medicine"



Spectrum of FIM Programs



Mozaffarian, D., Blanck, H.M., Garfield, K.M. *et al.* A Food is Medicine approach to achieve nutrition security and improve health. *Nat Med* **28**, 2238–2240 (2022). <https://doi.org/10.1038/s41591-022-02027-3>

Medically Tailored Meals

- Fully prepared meals designed by a RDN
 - Provides patients with 50-100% of their nutritional needs (10-21 weekly meals)
 - Duration varies: 4 weeks - 6 months
- Suitable for populations with the highest burden of disability and illness
 - Typically patients severe, complex chronic conditions that limit ADL's and cause high burdens of disability, illness, and health care utilization
- Relatively strong evidence suggests these interventions can lower hospital, emergency and nursing home admissions and health care costs
 - Studies also show improvements in diet quality, diabetes distress and improved ability to manage diabetes
- Relatively high cost

Medically Tailored Groceries

- Healthy food boxes or food packages
- “Dose” (pounds of food) and duration vary
- Lower cost of service than medically tailored meals
- Target population: typically patients with diet-related health condition, but can cook and prepare food
 - Often also low income/food insecure
- Fewer studies
 - Improved food security, but inconsistent evidence of health outcomes
 - Studies of diabetes appropriate food boxes demonstrate improvements in fruit and vegetable intake, food security, food-medication trade offs, inconsistent findings for HbA1c

Produce Prescriptions

- Typically provided as paper voucher or via electronic (restricted spend) card
 - Vouchers can be used to purchase produce at participating vendors, can range from farmers' markets, mid-sized grocery stores/corner stores to national chains
- “Dose” (e.g., benefit amount) and duration vary
- Target population: typically individuals with at least one diet sensitive chronic disease
 - Also often prioritizes individuals who are low-income and/or food insecure
- Growing national momentum
 - USDA GusNIP
 - Veterans Affairs and Indian Health Services pilots
 - State and local programs across the US
- Moderate, but rapidly building evidence base
 - Improved dietary intake, food security
 - Some evidence to show improvements in BMI and HbA1c
 - Modeling studies show substantial downstream impacts on health outcomes and health care costs
- Lower cost of service

Modeling studies show potential impact of FIM programs

True Cost of Food: Food is Medicine Case Study

Tufts
UNIVERSITY

Gerald J. and Dorothy R. Friedman
School of Nutrition Science and Policy
FOOD IS MEDICINE INSTITUTE

SUPPORTED BY

The
Rockefeller
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What are the key takeaways from this case study of Produce Prescription Programs?

- National coverage of produce prescriptions (average monthly voucher or food boxes of \$42 per patient or \$504/year) for patients with diabetes and food insecurity was estimated to produce meaningful reductions in CVD events and healthcare expenditures.
- Among 6.5 million eligible recipients, provision of produce prescriptions over a lifetime would prevent 292,000 CVD events and generate 260,000 QALYs. By payer, the most lifetime CVD cases per 100,000 were averted in patients with no insurance coverage at baseline, followed by those covered by Medicaid or private insurance at baseline.
- There was an estimated \$44.3 billion in programs costs and an estimated savings of \$39.6 billion in healthcare costs and \$4.77 billion in productivity costs over a lifetime.
- The program was highly cost effective from a healthcare perspective (incremental cost-effectiveness ratio: \$18,100/QALY) and cost saving from a societal perspective (net savings: \$0.05 billion). The intervention remained cost effective at shorter time horizons of 5 and 10 years. Results were similar in population subgroups by age, race/ethnicity, education, and baseline insurance status.
- Compared to modern weight loss medications, produce prescriptions are much more cost effective. The estimated ICER for weight loss medications is about \$200,000/QALY, which equates to more than ten times higher cost per health gained than produce prescriptions.

This case study suggests that implementing produce prescriptions nationally for patients with diabetes and food insecurity could improve health, reduce healthcare costs, and be highly cost effective in the United States. Findings support the testing, scaling, and evaluation of produce prescription programs for patients with diabetes and food insecurity for both public and private payers; with a focus on ensuring access to those with greatest need.

Food Insecurity Interventions in Health Care Settings: A Review of the Evidence

Figure 1. Number of studies by type of intervention (n=29)

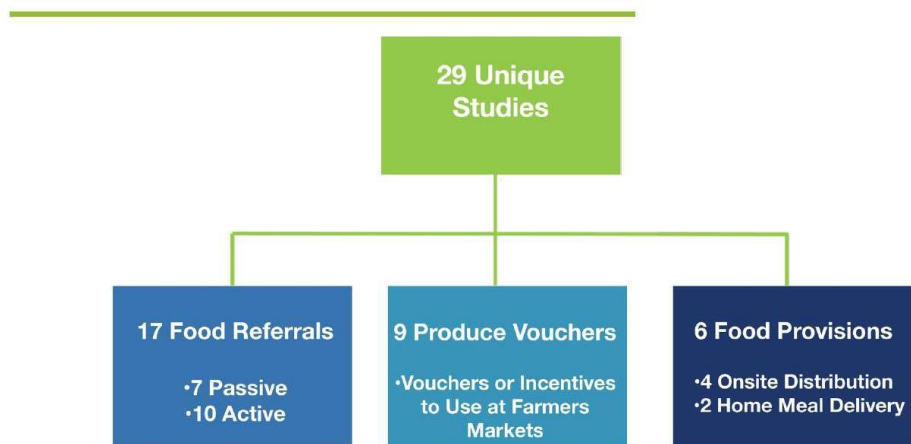


Table 1. Summary of review results: Food insecurity interventions

| Outcome | Impact | | |
|----------------------|---------------------------|---------------------------|--------------|
| | Referrals | Vouchers | Food* |
| Resource use | Mixed (4) | Improved (3) | - |
| Food security status | Improved [^] (2) | Improved (2) | Improved (1) |
| Health behaviors | Mixed (2) | Improved [#] (5) | Improved (1) |
| Health | Mixed (1) | Mixed (3) | Mixed (2) |
| Cost/utilization | Mixed (1) | - | Mixed (1) |

Numbers in parentheses indicate the number of studies that reported on each outcome.

* Based on two studies of home-delivered meals, and one study of an intervention offering infant formula, nutrition educational materials, and referrals to social work, a medical-legal partnership, and food banks

[^] Based on a study with a sample size 13 and a qualitative retrospective study so should be interpreted with caution.

[#] All five studies found improvements, although in one case only for fruit consumption and in another the improvements were not statistically significant.

De Marchis E, Fichtenberg C, Gottlieb LM. Food insecurity interventions in health care settings: A review of the evidence. 2020. San Francisco, CA: Social Interventions Research & Evaluation Network. [Available online.](#)



**Reduces food
insecurity by 20-30%**

**Supplemental Nutrition Assistance
Program (SNAP)**

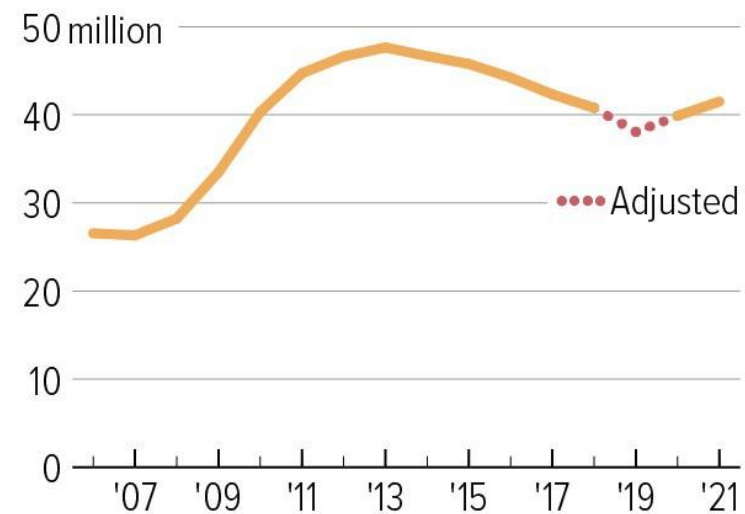
SNAP reduces poverty and
food insecurity while
stimulating economic growth.

SNAP Participation

In 2021, SNAP served more than 41 million people in the US

After Years of Decline, SNAP Participation Rose During COVID-19 Pandemic

Number of SNAP participants in average month in fiscal year



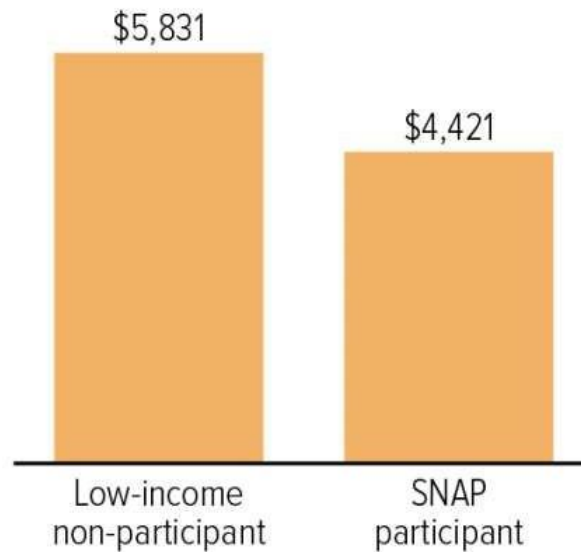
Note: Published 2019 SNAP participation data from the U.S. Department of Agriculture (USDA) are adjusted for the early issuance of February 2019 benefits in January 2019 due to the partial federal government shutdown. Annual participation in fiscal year 2019 is estimated to be closer to 38 million if the shutdown had not occurred, rather than the nearly 36 million reported by USDA.

Source: Department of Agriculture

FIGURE 10

A SNAP Participant Incurs \$1,400 Less for Health Care

Estimated annual per-person health care spending



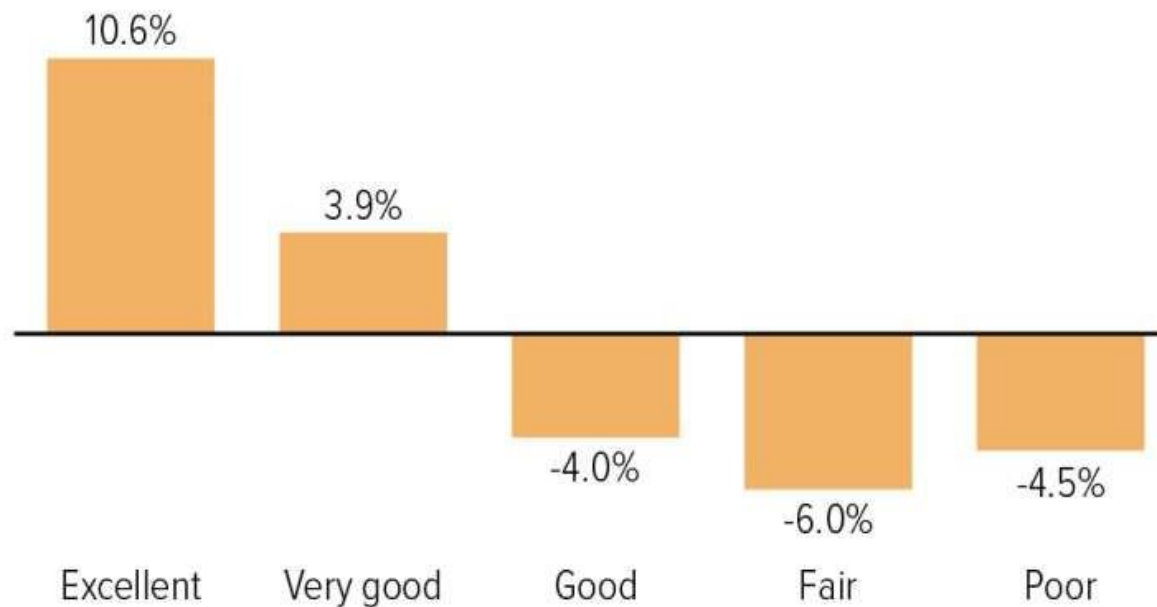
Note: Health care spending includes out-of-pocket expenses and costs paid by private and public insurance, including Medicare and Medicaid.

Source: Seth Berkowitz, Hilary K., Seligman, and Sanjay Basu, "Impact of Food Insecurity and SNAP Participation on Healthcare Utilization and Expenditures," University of Kentucky Center for Poverty Research, 2017.

FIGURE 6

SNAP Participants Report Better Health Than Eligible Non-Participants

Percent more or less likely to describe health as:

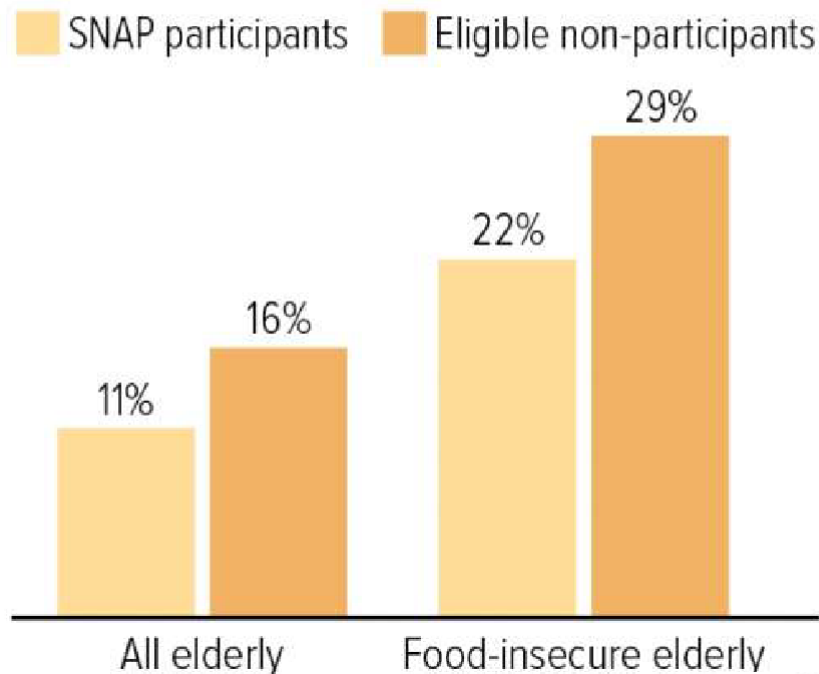


Source: Christian A. Gregory and Partha Deb, "Does SNAP Improve Your Health?" Food Policy, 2015. Adjusted for differences in demographic, socioeconomic and other characteristics. Sample includes adults aged 20 to 64 in households with income at or below 130% of the federal poverty level.

FIGURE 8

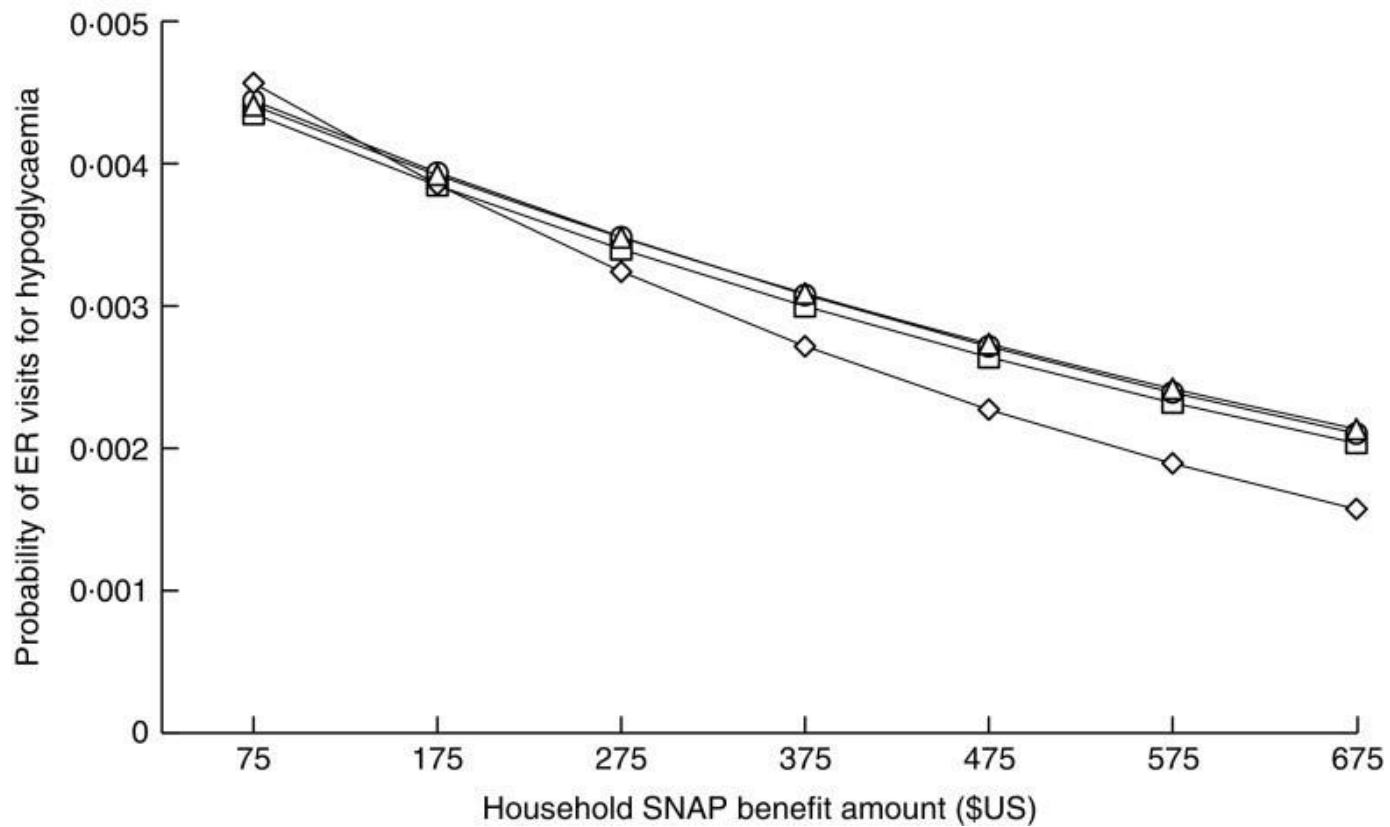
Elderly SNAP Participants Less Likely to Skip Needed Medications

Percent who skip or stop medications, take smaller doses, or delay a prescription due to cost



Source: Mithuna Srinivasan and Jennifer A. Pooler, "Cost-Related Medication Nonadherence for Older Adults Participating in SNAP, 2013–2015." *American Journal of Public Health*, December 2017

Higher benefits associated with better outcomes



SNAP and health outcomes

- Among food insecure older adults, receipt of SNAP was associated with lower risk of poor glucose control
- Decrease in medication nonadherence among older adults
- Fewer hospitalizations, shorter length-of-stay, and decreased nursing home admissions
- Lower health care expenditures
- Decreased nursing home admissions
- Receipt of SNAP during childhood is associated with reductions in metabolic syndrome later in life



1. Improving Care and Promoting Health in Populations: *Standards of Care in Diabetes—2023*

Diabetes Care 2023;46(Suppl. 1):S10–S18 | <https://doi.org/10.2337/dc23-S001>

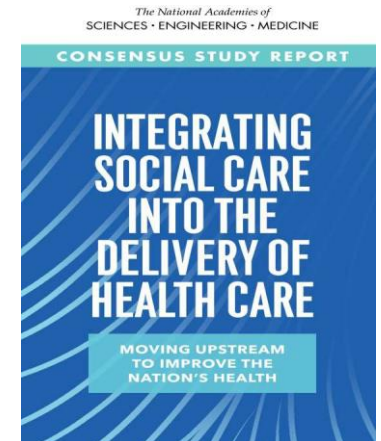
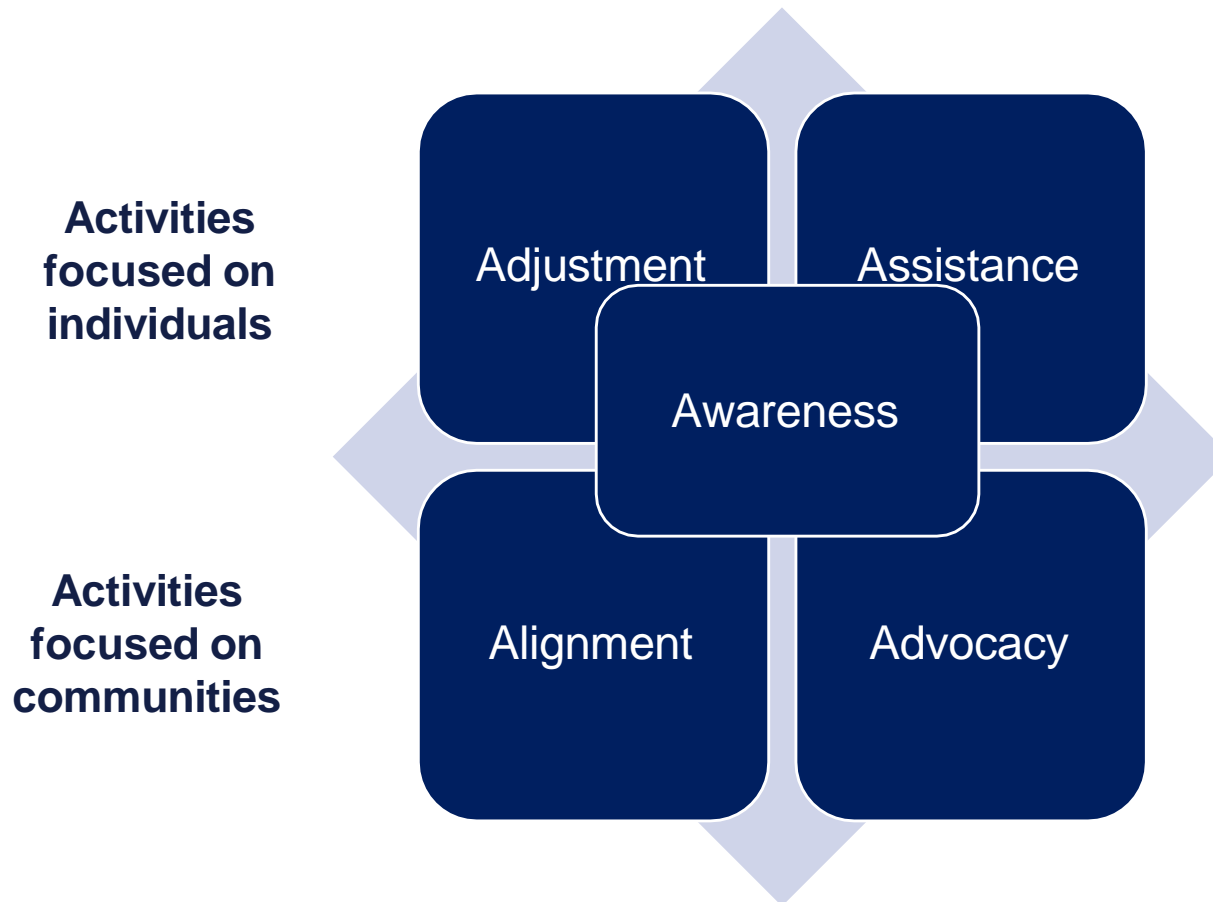
Nuha A. ElSayed, Grazia Aleppo, Vanita R. Aroda, Raveendhara R. Bannuru, Florence M. Brown, Dennis Bruemmer, Billy S. Collins, Marisa E. Hilliard, Diana Isaacs, Eric L. Johnson, Scott Kahan, Kamlesh Khunti, Jose Leon, Sarah K. Lyons, Mary Lou Perry, Priya Prahalad, Richard E. Pratley, Jane Jeffrie Seley, Robert C. Stanton, and Robert A. Gabbay, on behalf of the American Diabetes Association

TAILORING TREATMENT FOR SOCIAL CONTEXT

Recommendations

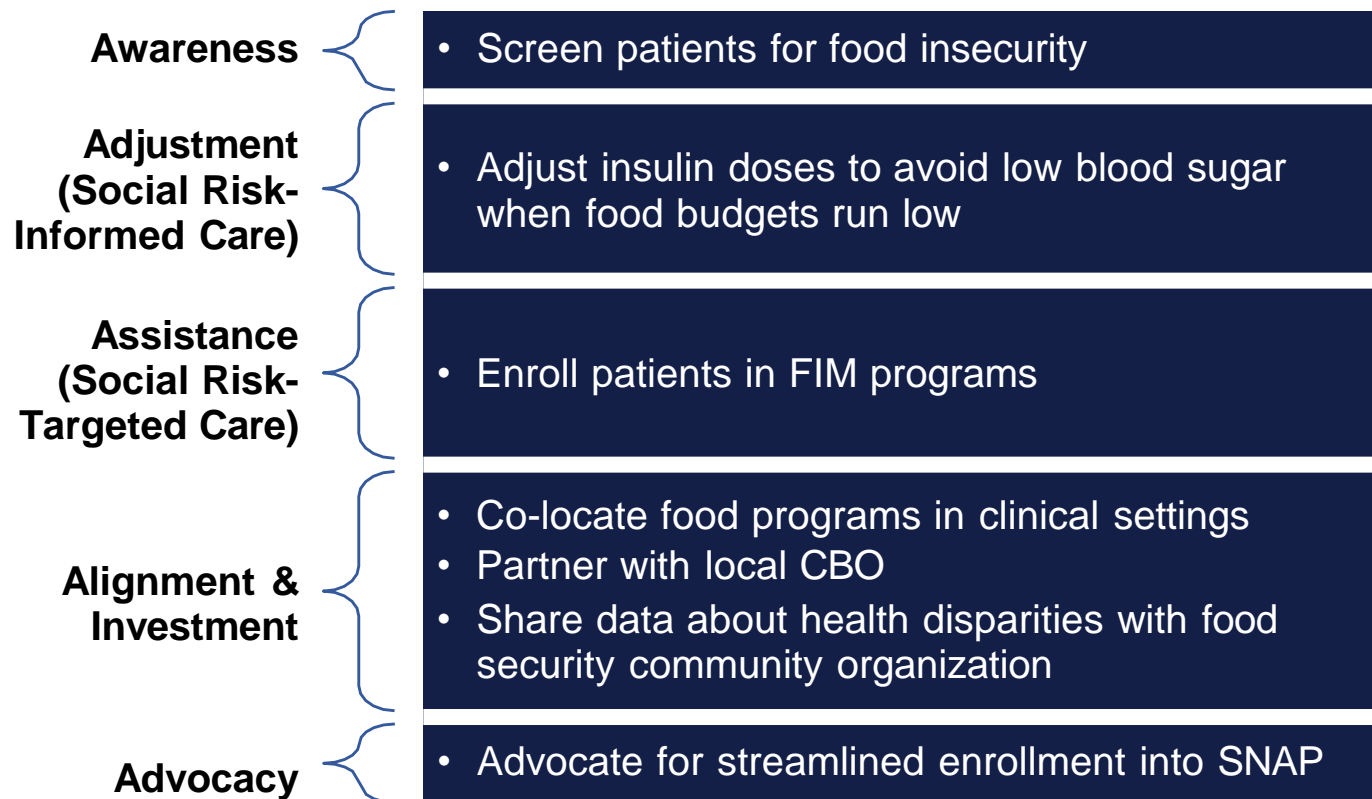
- 1.5** Assess food insecurity, housing insecurity/homelessness, financial barriers, and social capital/social community support to inform treatment decisions, with referral to appropriate local community resources. **A**
- 1.6** Provide patients with additional self-management support from lay health coaches, navigators, or community health workers when available. **A**
- 1.7** Consider the involvement of community health workers to support the management of diabetes and cardiovascular risk factors, especially in underserved communities and health care systems. **B**

NASEM Health Care System Activities that Strengthen Social Care Integration: 5 A's



A Vision for the Future

5.16.18



Adapted from: SIREN (Laura Gottlieb)

Conclusions

- Food and nutrition security are common and increase risk for diabetes
- Tremendous momentum toward implementing FIM programs across the US
 - Good evidence that programs can impact fruit and vegetable intake and food security
 - Less consistent evidence about their impact on health
- More high quality studies needed to understand how to design these programs for different populations
- Policy and practice efforts needed to scale and sustain these programs

Thank you! Questions?

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MCNER Upcoming Events

Webinar Series:

12/13/23. 12-1PM ET. Psychological Considerations in the Dietary Management of DGBI (Disorders of Gut-Brain Interaction)

Presented by Laurie Keefer, PhD.

→ Register on MacDonald Center for Nutrition Education and Research website



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Q&A



Moderator:
Lisa Diewald, MS, RDN, LDN
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If you are an RD or RDN and have any questions or concerns about this continuing education activity, you may contact CDR directly at QualityCPE@eatright.org.