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Evidence Assessment Library Medically Tailored Meals

Summary: There is **sufficient evidence** that medically tailored meals (MTM) can have positive impacts on health and social outcomes, and that for some diet-related diseases and populations, MTM will reduce healthcare costs and preventable utilization.

Age Group:	Adults; Older Adults	Payer Type:	Commercial; Medicare; Medicaid; Dually Enrolled
Conditions:	Heart Disease; Diabetes; HIV; Kidney Disease; Liver Disease; Other	Level of Prevention:	Tertiary
Need:	Food	Level of Intervention:	Programs & Care; Community & Home
Geography:	Urban; Rural	Sufficient or Strong Outcomes:	Sufficient

Impact Assessment

Medically tailored meals (MTM) are meals developed as part of a care plan by a Registered Dietitian Nutritionist to meet the specific nutritional needs of individuals with severe, complex, or chronic diseases in collaboration with a health provider or payer⁴.

This assessment synthesizes the results of studies on medically tailored meals across three domains of measurement:

- **Health:** Recipients of medically tailored meals had lower mortality, reduced HbA1c, reduced paracentesis, and potentially improved HIV viral suppression. There is **sufficient evidence** that medically tailored meals can have positive impacts on health, however more data is needed to define the necessary intensity and duration of the intervention.
- **Social:** Medically tailored meals can reduce food insecurity, improve dietary quality, reduce stress, and improve self-reported quality of life. There is **sufficient evidence** that medically tailored meals can improve social outcomes.
- **Healthcare Cost, Utilization & Value:** Mixed data was identified around medically tailored meal costs and associated utilization. Some studies found that medically tailored meals reduce healthcare costs by reducing ER visits, nursing facility admissions, and hospitalization frequency and length of stay. However, other studies found no impact and results may have been impacted by low numbers, diversity in intervention definitions (number of meals, definition of meals, weeks of receiving meals), and other methodological factors. There is **sufficient evidence** that for some diet-related diseases and populations, medically tailored meals will reduce healthcare costs and preventable utilization, however more research is needed to define the populations most likely to benefit from medically tailored meals in this way.



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Background of the Need / Need Impact on Health

Food-related needs fall into three interrelated categories: food insecurity, nutrition insecurity, and dietary quality.

Food Insecurity

Food insecurity is defined as not having access to enough food. In 2021, 10.2% (13.5 million) of United States (U.S.) households reported being food insecure over the last year. Of families experiencing food insecurity, 6.4% (8.4 million) were identified as having low food security and 3.8% (5.1 million) were identified as having very low food security². Food insecurity varies by race, ethnicity, household makeup, and income. Rates of food insecurity are higher than the national average (10.2%) for families that identify as Black (19.8%) or Hispanic/Latino (16.2%), for households with children (12.5%), and for households with income below 185% of the poverty line (26.5%)³. The majority of Medicaid enrollees fall in this low-income bracket. Additionally, food insecurity may be more common for those whose employment status, neighborhood of residence, and access to transportation further impact their food access^{4,5,6}.

Nutrition Insecurity

Nutrition security is the “consistent and equitable access to healthy, safe, affordable foods essential to optimal health and wellbeing⁷.” While most food insecure households are also nutrition insecure, food secure households can also be nutrition insecure. As most screenings focus on food security rather than nutrition security, national data on the prevalence of nutrition insecurity is not yet available. The concept of nutrition insecurity has been adopted by the United States Department of Agriculture (USDA) and the Centers for Disease Control and Prevention (CDC) as a core goal for their food-related initiatives. Nutrition security, beyond just food insecurity, is necessary to reduce the chronic illnesses caused as a result of poor nutrition⁸.

Dietary Quality

While food and nutrition insecurity are primary drivers of poor diet, other factors such as food availability (food deserts), personal preference, nutrition knowledge, and other psychosocial factors may contribute to dietary options and choices⁹. Analysis found that 45% of U.S. adults have a poor diet¹⁰. According to analysis of a representative sample of U.S. high school students, only “8.5% of high school students nationwide met [USDA] fruit recommendations and 2.1% met vegetable recommendations¹¹.” Research on adult dietary consumption has shown that income is a predictor for inadequate vegetable consumption (only 7% of adults below or close to the poverty level consume adequate vegetables) but even high income groups had inadequate vegetable consumption (only 11.4% of adults in the highest income categories consume adequate vegetables)¹². [Healthy People 2030](#) includes a number of specific nutrition objectives including increasing calcium, potassium, fruit, and vegetable (including dark green, red and orange, beans and peas) consumption in people over age two^{13,14,15,16,17,18,19}.

Health Impacts of Food and Nutrition Insecurity and Poor Diet



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Having an unhealthy diet and poor nutrition is associated with a range of physical and behavioral health conditions that are disproportionately experienced by people of color. Poor diet is associated with both obesity and Type 2 diabetes, as well as other chronic health conditions such as cardiovascular disease and cancer^{20,21}. Individuals experiencing food and nutrition insecurity are uniquely at risk and have a much higher risk of long-term chronic health conditions including obesity, diabetes, and hypertension^{22,23,24,25,26}. Consuming unhealthy food and beverages, such as sugar-sweetened beverages and highly processed foods, puts people at higher risk of at least 13 types of cancer, including endometrial (uterine) cancer, breast cancer in postmenopausal women, and colorectal cancer.

The length of time a person is food insecure impacts the severity of the health impacts. A study examining food insecurity in children over four years of age found that children who experienced food insecurity for longer periods of time had worse health outcomes²⁷.

According to the CDC, among those ages 2 to 19 the prevalence of obesity was 19.7% and affected about 14.7 million. Childhood obesity is also more prevalent among certain racial and ethnic groups (26.2% among Hispanic/Latino children, 24.8% among non-Hispanic Black children). Obesity-related conditions include high blood pressure, high cholesterol, Type 2 diabetes, breathing problems such as asthma and sleep apnea, and joint problems²⁸.

The rate of cardiovascular disease in the Black population is disproportionately high and is a primary cause of differences in life expectancy between Black and White individuals²⁹. Black Americans are disproportionately affected by colorectal cancer, with Black people being 20% more likely to develop colorectal cancer and 40% more likely to die from it than White people³⁰.

The impacts of food insecurity extend beyond diet-related diseases. Children who experience food insecurity have been shown to have a higher risk of iron deficiency anemia, lower non-cognitive performance, asthma, depression, suicide ideation, and tooth decay³¹. Food insecurity has been shown to be a major stressor in early childhood with implications for cognitive, language, motor, and socio-emotional skills³². Individuals experiencing food insecurity are more likely to go to the ER, less likely to have a usual source of care, and have higher healthcare costs^{33,34,35,36}.

Background on the Intervention

Medically tailored meals are designed to support the disease-specific diets and nutritional needs for individuals with severe, complex, and chronic diseases (for example HIV, kidney disease, diabetes, and heart failure) guided by the expertise of a Registered Dietitian Nutritionist^{37,38}. While there are generally accepted diets for disease-specific medically tailored meals, individual meals need to be customized according to taste, dietary restrictions, allergies, and medication interactions. [The Food is Medicine Coalition](#), [the United States Department of Veterans Affairs](#), [the National Kidney Foundation](#), [the American Diabetes Association](#), and [the Cleveland Clinic](#) all offer nutrition and dietary guidance for various chronic conditions. Adhering to restrictive diets is difficult in general and may be impossible for some individuals due to food insecurity. In such cases, providing complete Medically Tailored Meals may be a way to help them manage their conditions.



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Medically Tailored Meals are one of a spectrum of “Food is Medicine” interventions that address the critical link between health and nutrition³⁹.

The Centers for Medicare and Medicaid Services (CMS) released [a series of guidance documents](#) for states seeking to offer nutrition supports to Medicaid enrollees including “home delivered meals or pantry stocking, tailored to health risk and eligibility criteria.” This guidance details how states can use available authority including waivers (1115) and managed care rules (In Lieu of Services), and Home and Community Based Services authorities to offer nutrition support. The federal government further encouraged the field to think about the connection between nutrition and health through the 2022 White House Conference on Hunger, Nutrition, and Health. Economic analysis supports policymakers' approach, indicating that if Medically Tailored Meals were provided to people with cardiovascular disease, diabetes, and cancer, an estimated 1,594,000 hospitalizations and \$38.7 billion in health care expenditures could potentially be averted in one year. Program costs were \$24.8 billion, for an associated net savings of \$13.6 billion from a health care perspective. In 2019, 10 years of a national-scale Medically Tailored Meals intervention was anticipated to cost \$298.7 billion and to potentially be associated with 18,257,000 averted hospitalizations and reductions in health care expenditures of \$484.5 billion, for net savings of \$185.1 billion⁴⁰.

Additional Research and Tools

- [The Food is Medicine Coalition](#) has a variety of resources and tools on Medically Tailored Meals.

Evidence Review

Note: The vocabulary used in the table is the same terminology used in the study in order to preserve the integrity of the summary.

Study	Population	Intervention Summary	Type of Study Design	Outcomes
Berkowitz et al. (2018)	Adults dually eligible for Medicare and Medicaid as part of a community-based health plan.	Home delivery of either MTMs or non-tailored food.	Observation study with matched cohorts. For the analyses of the MTM program, the study included 133 participants who received the meals and 1002 matched controls. For the analyses of the non-tailored food program, the study included 624 participants and 1318 matched controls.	Healthcare Cost, Utilization & Value: Compared with matched nonparticipants, participants had fewer emergency department visits in both the MTM program and the non-tailored food program. Participants in the MTM program also had fewer inpatient admissions and lower medical spending. Participation in the non-tailored food program was not associated with fewer inpatient admissions but was associated with lower medical spending. A noted study confounder was that participation in the two food interventions programs did not occur at random.



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Study	Population	Intervention Summary	Type of Study Design	Outcomes
Berkowitz (2019a)	Recipients of MTMs who had at least 360 days of pre intervention claims data.	Weekly delivery of 10 ready-to-consume meals tailored to the specific medical needs of the individual under the supervision of a Registered Dietitian Nutritionist.	Observation study with comparison group. Retrospective cohort study using near/far matching instrumental variable analysis. 499 MTM recipients were matched with 521 nonrecipients.	Healthcare Cost, Utilization & Value: MTM receipt was associated with significantly fewer inpatient admissions and fewer skilled nursing facility admissions. The models estimated that, had everyone in the matched cohort received treatment and, after program costs are subtracted, mean per member per month healthcare costs would have been \$3838 vs \$4591.
Berkowitz et. al (2019b)	Individuals with type 2 diabetes and food insecurity.	24 total weeks of intervention, either first consisting of 12 weeks of “on-meals” (MTM home delivered 10 meals/week) and then 12 weeks of “off-meals” (usual care and a Choose MyPlate healthy eating brochure), or the inverse.	Randomized control trial. Randomized cross-over clinical trial (n=44).	Social: Healthy Eating Index 2010 score (HEI), assessed by three 24-hour food recalls. Higher HEI scores (range 0–100; clinically significant difference 5) represent better dietary quality. Study results found that mean “on-meal” HEI score was 71.3 while mean “off-meal” HEI score was 39.9 (difference 31.4 points). Participants experienced improvements in almost all sub-categories of HEI scores, with increased consumption of vegetables, fruits, and whole grains and decreased solid fats, alcohol, and added sugar consumption. Participants also reported lower food insecurity (42% “on-meal” vs. 62% “off-meal”). Health: Participants reported less hypoglycemia (47% “on-meal” vs. 64% “off-meal”), and fewer days where mental health interfered with quality of life (5.65 vs. 9.59 days out of 30).



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Study	Population	Intervention Summary	Type of Study Design	Outcomes
Berkowitz et al. (2020)	Participants were adults (age > 20 years) with type 2 diabetes in eastern Massachusetts.	Home-delivered MTM program.	Descriptive study. Semi-structured interviews with 20 individuals with type 2 diabetes (mean age 58 years; 60% women; 20% non-Hispanic Black, 15% Hispanic).	Health: Participants reported several positive effects of MTMs, including improved quality of life and ability to manage diabetes, and stress reduction. Participants suggested combining MTMs with diabetes self-management education or lifestyle interventions.



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Study	Population	Intervention Summary	Type of Study Design	Outcomes
Boxer et al. (2023)	Kaiser Permanente Colorado enrollees pending hospital discharge, aged ≥ 18 years with at least one chronic condition (heart failure, cancer, chronic obstructive pulmonary disease, diabetes mellitus, chronic liver disease/cirrhosis, chronic kidney disease).	Participants were randomized to receive one MTM a day for either two weeks or four weeks from Project Angel Heart, a community-based MTM provider. Meals were designed to adhere to dietary standards established by the Academy of Nutrition and Dietetics, tailored for specific chronic conditions such as diabetes, renal issues, bland diet needs, and heart-healthy requirements.	Randomized control trial—unblinded. Randomization occurred for 650 participants, 325 randomized to each group.	<p>Healthcare Cost, Utilization & Value: There was no significant difference in emergency department visits and rehospitalizations between the two meal duration groups.</p> <p>Health: Hospital Anxiety Depression Scale (HADS): Changes were minor, with the two-week group experiencing a slight reduction in anxiety from 5.4 to 4.9 ($p = .03$) and in depression from 5.4 to 4.8 ($p = .005$). The four-week group saw minimal changes in both anxiety and depression, with no significant difference in the change between groups.</p> <p>Katz Activities of Daily Living (ADLs): Improvement in both groups; the two-week group's score changed from 5.3 to 5.6 ($p \leq .0001$) and the four-week group's from 5.2 to 5.5 ($p \leq .0001$). The difference in change between the groups was not statistically significant.</p> <p>Social: DETERMINE Nutritional Risk: The two-week group showed improvement from 7.2 to 6.4 ($p = .0006$), while the four week group changed from 7 to 6.7 ($p = .19$). The difference in change between the groups was not statistically significant.</p>



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Study	Population	Intervention Summary	Type of Study Design	Outcomes
Farford et al. (2024)	Individuals with Type 2 diabetes.	Diabetes-designed meal delivery program.	Randomized control trial. There were 69 participants across two sites.	<p>Health: The mean three-month change in HbA1c (primary outcome) was nearly a half point lower with meal delivery (-0.44% [95% CI: -0.85%, -0.03%]; P = 0.037).</p> <p>Social: The estimated mean three-month change in quality of life was approximately two points lower (better) with meal delivery (-2.2 points [95% CI: -4.2, -0.3]; P = .027).</p>
Go et. al. (2022)	Patients from five hospitals within Kaiser Permanente Northern California, an integrated health care delivery system with heart failure, diabetes, or chronic kidney disease being discharged home between April 27, 2020, and June 9, 2021.	Participants were pre-randomized to 10 weeks of MTM with or without virtual nutritional counseling compared to usual care. MTMs were provided to the participant and eligible household members, with nutritional recommendations based on the Food is Medicine Coalition standards.	Randomized control trial. Remote pragmatic randomized trial. Of 1,977 participants total, 993 received MTMs, with 497 assigned to also receive virtual nutritional counseling; while 984 were assigned to usual care.	<p>Healthcare Cost, Utilization & Value: Compared with usual care, MTMs did not reduce all-cause hospitalizations at 90 days after discharge (aHR: 1.02, 95% CI: 0.86–1.21). MTMs were associated with fewer hospitalizations for heart failure (aHR: 0.53, 95% CI: 0.33–0.88) but not for any emergency department visits (aHR: 0.95, 95% CI: 0.78–1.15) or diabetes-related hospitalizations (aHR: 0.75, 95% CI: 0.31–1.82). No additional benefit was observed with virtual nutritional counseling.</p> <p>Health: MTMs were associated with lower mortality (aHR: 0.65, 95% CI, 0.43–0.98).</p>
Gurvey et al. (2013)	Philadelphia-based Metropolitan Area Neighborhood Nutrition Alliance (MANNA) clients.	Participants received three nutritionally balanced meals a day, seven days a week, free of charge. Meals can also be modified to accommodate various dietary restrictions and	Observation study with matched cohorts. (n=65; 58% male; mean age 52 years; 77% Black, 20% White) with a similar comparison group (n=633; 64% male; mean age 51 years; 79% Black, 19%	<p>Healthcare Cost, Utilization & Value: Health care expenditures were examined before and after clients began receiving services. The study found that the mean monthly health care costs significantly decreased after three consecutive months of initiation of MANNA services, as well as after 12 months of services. There was also a</p>



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Study	Population	Intervention Summary	Type of Study Design	Outcomes
		cultural preferences. MANNA's registered dietitians provide medical nutrition therapy to the clients and offer support through nutrition counseling and meal planning.	White) of Medicaid individuals who did not receive MANNA services.	significant decrease in average monthly inpatient costs during the first three months of services. Other health care cost-related factors, such as length of stay and number of hospital admissions also displayed a downward trend.
Huang et al. (2024)	Pregnant individuals under 35 weeks of gestation and a diagnosis of diabetes. Individuals who did not speak English or Spanish were excluded.	Registered dietitians in an obstetric practice reviewed and approved participants for either three or six months of MTMs and received weekly home delivery of 21 frozen meals including breakfast, lunch, dinner, and a snack. Additional meals were offered for dependents.	Descriptive study. 20 participants received MTMs.	<p>Health: For participants also experiencing food insecurity, there was a statistically significant improvement in diabetes self-efficacy scores.</p> <p>Social: Most participants reported that the program helped with eating healthier, improved their household finances, and reduced mental stress.</p>
Palar et al. (2017)	People living with HIV and/or Type 2 diabetes (T2DM) in San Francisco, CA.	A six-month community-based, medically appropriate food support intervention. Median food pick-up adherence was 93%.	Pre-post analysis. Assessed paired outcomes at baseline and six months using validated measures. 52 people completed the study (65.1% male; mean age 57.2 years; 28.9% Black, 28.9% White; 21.2% Hispanic/Latino).	<p>Social: Very low food insecurity decreased significantly from 59.6% to 11.5%. Frequency of consumption of fats decreased, while frequency increased for fruits and vegetables. Among people with diabetes, the frequency of sugar consumption decreased. The study also reported decreased depression symptoms and binge drinking. At follow-up, fewer participants sacrificed food for healthcare or prescriptions, or sacrificed healthcare for food.</p>



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Study	Population	Intervention Summary	Type of Study Design	Outcomes
Tapper et al. (2020)	Individuals with cirrhosis and ascites at the time of a paracentesis.	Standard of care (SOC) (low-sodium diet educational handout) or MTMs.	Randomized control trial. 12-week, 1:1 randomized trial of standard of care (SOC) (low-sodium diet educational handout) (n=20) or MTMs (n=20).	<p>Health: Results found that at baseline, subjects reported a median of two paracentesis in the prior four weeks. After 12 weeks, those in the MTM arm required fewer paracentesis per week than those in the SOC group (median (Interquartile Range): 0.34 (0.14–0.54) vs 0.46 (0.25–0.64) per week). Adherence to the meal schedule was excellent, save for when hospitalizations occurred.</p> <p>Social: Ascites-specific quality of life improved to a greater degree in the MTM arm compared to the SOC arm, by 25% vs 13%, respectively.</p>
Yu et al. (2022)	People experiencing food-insecurity and living with HIV (PLHIV) in three rural counties.	California state-funded program that provided home-delivered medically supportive meals from online meal vendors.	Pre-post analysis. Retrospective longitudinal analysis on a pilot study. Results examined outcomes 36-months post-enrollment for 158 participants.	<p>Social: Pre-post analyses demonstrated increased prevalence of food security. From this, the study concluded that home-delivered, medically supportive meals may improve food security status.</p> <p>Health: Population-averaged trends using generalized estimating equations adjusted for participant demographics demonstrated increased odds of viral suppression and CD4 T cell count \geq 500 and increased CD4 count for every six months of program enrollment. From this, the study concluded that home-delivered, medically supportive meals may improve HIV viral suppression, and immune health for low-income PLHIV in rural settings.</p>



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Systematic Reviews

Note: The vocabulary used in the table is the same terminology used in the study in order to preserve the integrity of the summary.

Study	Population	Intervention Summary	Type of Study Design	Outcomes
Gao et al. (2022)	People with lower incomes or experiencing food-insecurity with prediabetes or diabetes across the life span.	Food is medicine interventions and their effect on fruit and vegetable (F&V) intake and glycated hemoglobin (A1c) levels.	Seven databases were searched from January 1, 2000, to October 26, 2021, for full-text articles written in English. The 16 studies included experimental studies of any duration and design.	<p>Social: Five of the eight studies that evaluated fruit and vegetable intake reported a significant increase in food and vegetable intake.</p> <p>Health: Seven of the 14 studies that evaluated A1c reported a significant decrease in A1c levels. A meta-analysis of five randomized controlled trials (n=843) resulted in clinically meaningful reductions in A1c compared with control (mean difference, -0.47%; 95% confidence interval, -0.66 to -0.29, I2=88%, p<0.0001). Half (n=8) of the studies have a high risk of bias due to missing data, detection bias, and confounding variables.</p>



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Assessment Synthesis Criteria

Strong Evidence	Sufficient Evidence	More Evidence Needed or Mixed Evidence
<p>There is strong evidence that the intervention will produce the intended outcomes.</p>	<p>There is sufficient evidence that the intervention will produce the intended outcomes.</p>	<p>There is insufficient evidence that the intervention will produce the intended outcomes, however the results directionally indicate potential impact.</p>
<ul style="list-style-type: none"> ● At least one well-conducted systematic review or meta-analysis (including two or more large, randomized trials) showing a significant and clinically meaningful health effect; and ● Consistent findings of health effects from other studies (cohort, case-control, and other designs). 	<ul style="list-style-type: none"> ● At least one well-conducted systematic review or meta-analysis (including two or more large, randomized trials) showing a significant and clinically meaningful health effect, but inconsistent findings in other studies; or ● Consistent findings from at least three non-randomized control trial studies (cohorts, practical trials, analysis of secondary data); or ● A single, sufficiently large well-conducted randomized controlled trial demonstrating a clinically meaningful health effect and consistent evidence from other studies; or ● Multiple expert opinions/government agencies supporting the intervention. 	<ul style="list-style-type: none"> ● Lack of demonstration of improved health outcomes based on any of the following: (a) a systematic review or meta-analysis; (b) a large randomized controlled trial; (c) consistent positive results from multiple studies in high-quality journals; or (d) multiple expert opinions or government agencies supporting the intervention. ● An insufficient evidence rating does not mean there is no evidence, or that the intervention is unsafe or ineffective. ● In many cases, there is a need for more research or longer-term follow-up.



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Endnotes

1. Office of Disease Prevention and Health Promotion. Food is Medicine. Types of Interventions. Retrieved on 10/17/2024
2. Coleman-Jensen A, Rabbitt MP, Gregory CA, et al. Household Food Security in the United States in 2021. United States Department of Agriculture (USDA), Economic Research Service; 2022. Available at: <https://www.ers.usda.gov/webdocs/publications/104656/err-309.pdf?v=6629.3>. Accessed on April 10, 2023.
3. Coleman-Jensen A, Rabbitt MP, Gregory CA, et al. Household Food Security in the United States in 2021. United States Department of Agriculture (USDA), Economic Research Service; 2022. Available at: <https://www.ers.usda.gov/webdocs/publications/104656/err-309.pdf?v=6629.3>. Accessed on April 10, 2023.
4. Nord, M. Characteristics of low-income households with very low food security: an analysis of the USDA GPRA food security indicator. U.S. Dept. of Agriculture, Econ. Res. Serv. 2007. Available at: https://www.ers.usda.gov/webdocs/publications/44171/11530_eib25_1.pdf?v=5687.7. Last Accessed: April 13, 2023.
5. United States Department of Health and Human Services (HHS) A, HealthyPeople 2030. Food Insecurity. Available at: <https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries/food-insecurity>. Accessed on April 13, 2023.
6. Zenk SN, Schulz AJ, Israel BA, et al. Neighborhood racial composition, neighborhood poverty, and the spatial accessibility of supermarkets in metropolitan Detroit. American Journal of Public Health. 2005; (95):660-667.
7. United States Department of Agriculture. Food Insecurity. Available at: <https://www.usda.gov/nutrition-security>. Last Accessed: September 25, 2024
8. Mozaffarian, D. "Measuring And Addressing Nutrition Security To Achieve Health And Health Equity," Health Affairs Health Policy Brief, March 30, 2023.
9. Eicher-Miller HA, Graves L, McGowan B, Mayfield BJ, Connolly BA, Stevens W, Abbott A. A Scoping Review of Household Factors Contributing to Dietary Quality and Food Security in Low-Income Households with School-Age Children in the United States. Adv Nutr. 2023 Jul;14(4):914-945. doi: 10.1016/j.advnut.2023.05.006. Epub 2023 May 13.
10. Rehm CD, Peñalvo JL, Afshin A, Mozaffarian D. Dietary Intake Among US Adults, 1999-2012. JAMA. 2016;315(23):2542-2553. doi:10.1001/jama.2016.7491
11. Moore LV, Thompson FE, Demissie Z. Percentage of youth meeting federal fruit and vegetable intake recommendations, youth risk behavior surveillance system, United States and 33 States, 2013. J Acad Nutr Diet. 2017;117(4):545-553.e3.
12. Lee-Kwan SH, Moore LV, Blanck HM, et al. Disparities in state-specific adult fruit and vegetable consumption — United States, 2015. MMWR Morb Mortal Wkly Rep 2017;66:1241-1247.
13. U.S. Department of Health and Human Services (HHS) A, HealthyPeople 2030. Increase fruit consumption by people aged 2 years and over – NWS-06. Retrieved from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating/increase-fruit-consumption-people-aged-2-years-and-over-nws-06>. Last Accessed: October 21, 2022. .
14. U.S. Department of Health and Human Services (HHS) B, HealthyPeople 2030. Increase vegetables consumption by people aged 2 years and over – NWS-07. Retrieved from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating/increase-vegetable-consumption-people-aged-2-years-and-older-nws-07>. Last Accessed: October 21, 2022.
15. U.S. Department of Health and Human Services (HHS) C, HealthyPeople 2030. Increase consumption of dark green vegetables, red and orange vegetables, and beans and peas by people aged 2 years and over – NWS-08. Retrieved from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating/increase-consumption-dark-green-vegetables-red-and-orange-vegetables-and-beans-and-peas-people-aged-2-years-and-over-nws-08>. Last Accessed: October 21, 2022
16. U.S. Department of Health and Human Services (HHS) D, HealthyPeople 2030. Increase potassium consumption by people aged 2 years and over – NWS-14. Retrieved from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating/increase-potassium-consumption-people-aged-2-years-and-over-nws-14>. Last Accessed: October 21, 2022.
17. U.S. Department of Health and Human Services (HHS) E, HealthyPeople 2030. Increase calcium consumption by people aged 2 years and over – NWS-13. Retrieved from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating/increase-calcium-consumption-people-aged-2-years-and-over-nws-13>. Last Accessed: November 30, 2022.
18. U.S. Department of Health and Human Services (HHS) F, HealthyPeople 2030. Reduce household food insecurity and hunger – NWS-01. Retrieved from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating/reduce-household-food-insecurity-and-hunger-nws-01>. Last Accessed: November 30, 2022.



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19. U.S. Department of Health and Human Services (HHS) G, HealthyPeople 2030. Eliminate very low food security in children – NWS-02. Retrieved from: <https://health.gov/healthypeople/objectives-and-data/browse-objectives/nutrition-and-healthy-eating/eliminate-very-low-food-security-children-nws-02>. Last Accessed: November 30, 2022.
20. Centers for Disease Control and Prevention (CDC) A. Poor nutrition. 2022. Available at: <https://www.cdc.gov/chronic-disease/about/index.html> . Accessed on November 17, 2022.
21. Corona G, Dubowitz T, Troxel WM, et al. Neighborhood food environment associated with cardiometabolic health among predominately low-income, urban, Black women. *Ethnicity & Disease*. 2021; 31(4):537-546.
22. Gundersen C, Ziliak JP. Food insecurity and health outcomes. *Health Aff (Millwood)*. 2015; 34(11):1830-1839.
23. United States Department of Health and Human Services (HHS) A, HealthyPeople 2030. Food Insecurity. Available at: <https://health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries/food-insecurity>. Accessed on April 13, 2023.
24. Holben DH, Pheley AM. Diabetes risk and obesity in food-insecure households in rural Appalachian Ohio. *Prev Chronic Dis*. 2006; 3(3):1-9.
25. Seligman HK, Smith M, Rosenmoss S, et al. Comprehensive diabetes self-management support from food banks: a randomized controlled trial. *Am J Public Health*. 2018;108(9):1227-1234.
26. Hill JO, Galloway JM, Goley A, et al. Scientific Statement: Socioecological Determinants of Prediabetes and Type 2 Diabetes. *Diabetes Care*. 2013; 36(8):2430–2439.
27. Ryu, J.-H., & Bartfeld, J. S. (2012). Household food insecurity during childhood and subsequent health status: The Early Childhood Longitudinal Study—kindergarten cohort. *American Journal of Public Health*, 102(11). <https://doi.org/10.2105/ajph.2012.300971>
28. Centers for Disease Control and Prevention (CDC) B, 2022. Childhood obesity facts. Available at: <https://www.cdc.gov/nchs/fastats/obesity-overweight.htm>. Accessed on September 27, 2022
29. Mazimba S, Peterson PN. JAHA spotlight on racial and ethnic disparities in cardiovascular disease. *J Am Heart Assoc*. 2021; 10(17):1-4.
30. American Cancer Society (ACS). Colorectal cancer rates higher in African Americans, rising in younger people. 2020. Available at: <https://www.cancer.org/latest-news/colorectal-cancer-rates-higher-in-african-americans-rising-in-younger-people.html>. Accessed on October 25, 2022.
31. Gundersen C, Ziliak JP. Food Insecurity And Health Outcomes. *Health Aff (Millwood)*. 2015 Nov;34(11):1830-9. doi: 10.1377/hlthaff.2015.0645. PMID: 26526240.
32. Dantas de Oliveria et al., [Household food insecurity and early childhood development: systematic review and meta-analysis](#). *Maternal and Child Nutrition*. 2020; 16 (3).
33. Tarasuk, V., Cheng, J., Oliveira, C. de, Dachner, N., Gundersen, C., & Kurdyak, P. (2015, October 6). *Association between household food insecurity and annual health care costs*. *CMAJ*. Retrieved 2023, from <https://www.cmaj.ca/content/187/14/E429>
34. Johnson, K. T., Palakshappa, D., Basu, S., Seligman, H., & Berkowitz, S. A. (2021). Examining the bidirectional relationship between food insecurity and healthcare spending. *Health Services Research*, 56(5), 864–873. <https://doi.org/10.1111/1475-6773.13641>
35. Palakshappa, D., Garg, A., Peltz, A., Wong, C. A., Cholera, R., & Berkowitz, S. A. (2023). Food insecurity was associated with greater family health care expenditures in the US, 2016–17. *Health Affairs*, 42(1), 44–52. <https://doi.org/10.1377/hlthaff.2022.00414>
36. Peltz, A., & Garg, A. (2019). Food insecurity and health care use. *Pediatrics*, 144(4). <https://doi.org/10.1542/peds.2019-0347>
37. Chen AMH, Draime JA, Berman S, et al. Food as medicine? Exploring the impact of providing healthy foods on adherence and clinical and economic outcomes. *Explor Res Clin Soc Pharm*. 2022;5:100129.
38. The Food is Medicine Coalition. The medically tailored meal intervention. Available at: <https://www.fimcoalition.org/our-model>. Accessed on February 8, 2023.
39. Hager, K., Kummer, C. et al. Food is Medicine Research Action Plan. Aspen Institute. 2024. Available at: <https://aspenfood.org/food-is-medicine/> Accessed on September 25, 2024
40. Hager K, Cudhea FP, Wong JB, et al. Association of national expansion of insurance coverage of medically tailored meals with estimated hospitalizations and health care expenditures in the US. *JAMA Network Open*. 2022;5(10):e2236898.