Relationship Between Food Insecurity and Cardiovascular Health Outcomes and Efficacy of Food Banks in Improving Cardiovascular Outcomes Among Those Experiencing Food Insecurity

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Abstract

Food insecurity, an issue characterized by limited or uncertain access to sufficient and nutritious food, has wide-ranging consequences. Dietary choices significantly impact cardiovascular health, including the development of conditions like diabetes. However, individuals grappling with food insecurity often encounter constraints in their food options and struggle to obtain high-quality, nutritious meals. Consequently, they face an elevated risk of experiencing adverse cardiovascular outcomes. To address this critical concern, food banks have emerged as establishments dedicated to meeting the nutritional needs of individuals confronted with food insecurity. Traditionally, food banks have provided emergency food assistance during times of crisis. More recently, researchers have explored the potential of food banks to serve as platforms for implementing nutritional interventions aimed at improving cardiovascular health outcomes and addressing risk factors. This review aims to assess different interventions that have been implemented through food banks in the United States to address the interconnected issues of food insecurity and increased risk of cardiovascular outcomes and risk factors, especially diabetes. By synthesizing the existing evidence, this review seeks to identify effective strategies for improving cardiovascular health among food-insecure populations and inform future interventions in this field.

Introduction

Food insecurity, a condition in which households lack access to adequate food because of limited money or other resources, is a leading health and nutrition issue in the United States (Gundersen and Ziliak). The Food and Agriculture Organization of the United Nations has developed a scale for food insecurity, defined from food security to severe food insecurity (“Hunger”). Those experiencing moderate food insecurity consume a lower quality and/or quantity of food and are not certain about their ability to obtain food (“Hunger”). This can cause malnutrition, stunted growth in children, micronutrient deficiencies, and obesity (“Hunger”). Those experiencing severe food insecurity do not have food to eat, even going days without eating.

Food insecurity remains a relevant and pervasive issue. In 2021, approximately 10.2 percent (13.5 million) of households experienced food insecurity at some point during the year (*USDA ERS - Key Statistics & Graphics*). These households lacked sufficient money or resources to acquire enough food for all their members (*USDA ERS - Key Statistics & Graphics*). Among the food-insecure households, 6.4 percent (8.4 million) had low food security, meaning they managed to avoid significant disruptions to their eating patterns by adopting coping strategies such as relying on federal food assistance programs or community food pantries (*USDA ERS - Key Statistics & Graphics*). On the other hand, 3.8 percent (5.1 million) of households faced very low food security, resulting in disrupted eating patterns and reduced food intake for one or more household members due to insufficient resources (*USDA ERS - Key Statistics & Graphics*). In terms of population, 33.8 million individuals lived in food-insecure households in 2021 (*USDA ERS - Key Statistics & Graphics*). Within this group, 8.6 million adults resided in households with very low food security (*USDA ERS - Key Statistics & Graphics*). Additionally, there were 5.0 million children living in food-insecure households where both adults and children faced food insecurity (*USDA ERS - Key Statistics & Graphics*). Among the nation's children, 521,000 (0.7 percent) lived in households where at least one child experienced very low food security (*USDA ERS - Key Statistics & Graphics*).

One way food insecurity can manifest is an insufficient quantity of food. Those experiencing food insecurity may not have enough food to meet their dietary needs, leading to hunger and malnutrition (*Hunger and Poverty in America | Feeding America*). Food insecurity can also result in the consumption of poor-quality food due to the lack of access to nutritious foods. Individuals affected by this may have to rely "on low-cost, energy-dense foods that are often high in unhealthy fats, added sugars, and sodium," leading to an increased risk of chronic diseases (Gundersen and Ziliak). Further, food insecurity can include uncertainty about consistent and reliable access to food, causing individuals stress and anxiety (*Hunger and Poverty in America | Feeding America*). Lastly, there are several coping strategies individuals experiencing food insecurity may employ, including eating less food, foregoing some meals, and consuming a lower-quality diet. (*Hunger and Poverty in America | Feeding America*).

Several specific groups had rates of food insecurity that surpassed the national average of 10.2 percent (*USDA ERS - Key Statistics & Graphics*). These groups included all households with children, with a rate of 12.5 percent, and households with children under the age of 6, with a rate of 12.9 percent (*USDA ERS - Key Statistics & Graphics*). Furthermore, households headed by a single woman experienced a higher rate of 24.3 percent, while households headed by a single man had a rate of 16.2 percent (*USDA ERS - Key Statistics & Graphics*). Women living alone had a food insecurity rate of 13.2 percent, and men living alone had a rate of 12.3 percent (*USDA ERS - Key Statistics & Graphics*). Moreover, food insecurity was more prevalent in households with Black, non-Hispanic reference persons (19.8 percent) and Hispanic reference persons (16.2 percent) (*USDA ERS - Key Statistics & Graphics*). A household reference person is an adult household member in whose name the housing unit is owned or rented (*USDA ERS - Key Statistics & Graphics*). Additionally, households with incomes below 185 percent of the poverty threshold had a significantly higher rate of 26.5 percent (*USDA ERS - Key Statistics & Graphics*). In 2021, the Federal poverty line for a family of four was $27,479 (*USDA ERS - Key Statistics & Graphics*). These findings highlight the disparities in food insecurity rates among specific demographic and economic groups, emphasizing the need for targeted support and interventions to address these challenges.

According to the Universal Declaration of Human Rights, "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control" (Nations). To respect and ensure the protection of this human right, it is essential to address the issue of food insecurity.

The consequences of food insecurity include reduced productivity and earnings, increased healthcare costs, economic losses for communities, and perpetuation of poverty cycles with inter-generational impacts (*Hunger and Poverty in America | Feeding America*). Malnutrition and hunger associated with food insecurity can lead to decreased energy levels, difficulty concentrating, and impaired cognitive function, all of which hinder work performance and limit educational attainment (*Hunger and Poverty in America | Feeding America*). Furthermore, individuals experiencing food insecurity are more likely to have chronic health conditions, resulting in higher healthcare expenses (Seligman, Laraia, et al.). Inadequate nutrition exacerbates health problems, leading to additional healthcare needs and costs (Seligman, Laraia, et al.).

The impact of food insecurity extends beyond individuals to communities (*USDA ERS - Key Statistics & Graphics*). Insufficient access to food affects local economies by reducing

workforce productivity and constraining consumer spending (*USDA ERS - Key Statistics & Graphics*).

One of the most significant long-term effects of food insecurity is its contribution to poverty cycles (*Hunger and Poverty in America | Feeding America*). Limited access to nutritious food impedes individuals' ability to thrive, ultimately restricting their educational attainment and future earning potential (*Hunger and Poverty in America | Feeding America*). Consequently, children growing up in food-insecure households may face persistent challenges in education, employment, and overall economic well-being, perpetuating the cycle of poverty across generations (*Hunger and Poverty in America | Feeding America*).

Health Outcomes of Concern

The primary cardiovascular outcomes of concern in this review are heart attack and stroke. A stroke occurs when a blood vessel bursts in the brain or when the blood supply to the brain is blocked ("About Stroke | Cdc.Gov"). A heart attack occurs when enough blood does not reach part of the heart muscle ("Heart Attack Symptoms, Risk Factors, and Recovery | Cdc.Gov"). Individuals with diabetes have an increased likelihood of developing heart disease. Further, they are more prone to possessing specific risk factors, such as high blood pressure or high cholesterol, which elevate the risk of experiencing heart attacks or strokes (*Diabetes, Heart Disease, & Stroke - NIDDK*). The elevated blood glucose levels that are associated with diabetes can inflict damage on blood vessels and nerves that regulate heart function and blood flow (*Diabetes, Heart Disease, & Stroke - NIDDK*). This damage accumulates and contributes to the development of heart disease (*Diabetes, Heart Disease, & Stroke - NIDDK*). Diabetics often develop heart disease earlier in life than those without diabetes. Compared to adults without diabetes, adults with diabetes are almost twice as likely to experience heart disease or stroke (*Diabetes, Heart Disease, & Stroke - NIDDK*).

Hypertension significantly increases the risk of heart disease and stroke, two leading causes of death in the United States ("Facts About Hypertension | Cdc.Gov"). In 2021 alone, hypertension was a primary or contributing cause of 691,095 deaths in the United States ("Facts About Hypertension | Cdc.Gov"). Alarmingly, nearly half the adults in the United States, approximately 116 million individuals, have hypertension ("Facts About Hypertension | Cdc.Gov").

Strokes and heart attacks also pose significant health risks. In 2021, approximately 1 in 6 deaths attributed to cardiovascular disease was due to a stroke ("About Stroke | Cdc.Gov"). Someone in the United States experiences a stroke every 40 seconds, and strokes claim a life, on average, every 3 minutes and 14 seconds ("About Stroke | Cdc.Gov"). Annually, over 795,000 individuals in the United States suffer from a stroke ("About Stroke | Cdc.Gov").

Diet plays a crucial role in cardiovascular health. Research suggests that a higher-quality diet is associated with a reduced risk of recurrent cardiovascular events in individuals aged 55 and above with cardiovascular disease or diabetes (Dehghan et al.). This shows the importance of promoting healthy eating habits to reduce the recurrence of cardiovascular events.

The impact of food insecurity on cardiovascular health is notable. When people do not have adequate access to nutritious food, they are unable to consume the nutritious food necessary to prevent cardiovascular health issues. Notably, Wang et al. showed that between 2011 and 2017, a rise in food insecurity correlated with elevated cardiovascular mortality rates among nonelderly adults. This connection remained significant after accounting for shifts in demographics, economic conditions, and healthcare accessibility (Wang et al.). The link

between food insecurity and increased cardiovascular mortality could be the effect food insecurity has on the prevalence of cardiovascular risk factors like diabetes and hypertension (Wang et al.). Further, it may also have made medication adherence more challenging (Wang et al.). Between 2011 and 2017, Wang et al. demonstrated there was an association between food insecurity's increase in US counties and nonelderly adults' increase in cardiovascular mortality rates after accounting for demographic, economic, and healthcare access factors. Food insecurity may have an association with higher cardiovascular mortality through increasing the prevalence of diabetes and hypertension, which are cardiovascular risk factors; it may also complicate medication adherence (Wang et al.).

In summary, diet plays a crucial role in preventing cardiovascular events, emphasizing the importance of a high-quality diet. Because food insecurity limits access to nutritious food, it can lead to the development of cardiovascular risk factors and exacerbate cardiovascular health outcomes. Promoting healthy eating habits and addressing food insecurity are essential in mitigating the risks associated with cardiovascular disease.

Consolidation of Key Findings

A major finding across the included literature was that food bank users were often not consuming the required amounts of food and nutrients. *The Role of Food Banks in Addressing Food Insecurity: A Systematic Review* stated studies using 24-hour diet recall saw the underconsumption of required amounts of fruits, vegetables, meat or meat alternatives, and milk among almost all participants, while several also saw underconsumption of legumes (Bazerghi et al.) The same review also stated that through reviewing food-bank-provided food, only one study concluded the food was adequate, whereas others found the food to be inadequate (Bazerghi et al.). Among the studies that found food provided by food banks to be inadequate, requirements for micronutrients, such as vitamins A and C, milk, meat, and meat alternatives were not met, and a sufficient quantity of food for one week was not found to be provided, revealing that in many cases food banks were not able to meet the nutritional needs of their users (Bazerghi et al.).

Similarly, *The nutritional quality of food parcels provided by food banks and the effectiveness of food banks at reducing food insecurity in developed countries: a mixed-method systematic review* mentions that one study that evaluated the nutritional quality of food parcels "reported a mean Nutrient Density Score of 0.3 (SD 0.3)," suggesting food parcels are deficient in important nutrients (Oldroyd et al.). This review also states that one study found that only 25 percent of food bank parcels met the requirements for fruits and vegetables, which is notable because fruits and vegetables are necessary components for heart-healthy diets (Oldroyd et al.). Food banks did, however, increase the fruit and vegetable intake of their users, with this same review stating that average fruit and vegetable servings per person increased from 0.22 to 3.33 in the pre-post study (Oldroyd et al.).

This review also included that one study stated carbohydrates contributed the greatest proportion of energy in the parcels (62.2%); this proportion is considerably higher than the recommended proportion of carbohydrates (50%) (Oldroyd et al.). Furthermore, between the two studies that reported the sugar content of the parcels, both found sugar recommendations to be exceeded (Oldroyd et al.). These points are notable because disproportionate consumption of carbohydrates and sugar may lead to an increased risk of heart disease, diabetes, and poor cardiovascular outcomes.

This review was unable to determine a decisive conclusion about the impact of food banks on health outcomes. However, it was found food banks could address food insecurity, improve dietary intake, and make a slight impact on specific health markers. *The nutritional quality of food parcels provided by food banks and the effectiveness of food banks at reducing food insecurity in developed countries: a mixed-method systematic review* stated studies that evaluated the effect of food banks on insecurity saw improvements in food insecurity after six months, showing that over time, food banks were able to ameliorate some food insecurity. Further, this review found a positive correlation between the quality of food parcels and the quality of users' diets, meaning that if food banks provided high-quality food to their users, the quality of users' diets was also high, demonstrating how food banks could help improve clients' diets. For example, by improving food parcels' nutritional quality through increasing fruits and vegetables and removing nutrient-poor snacks, the intake of vitamin C, potassium, and fruits and vegetables was improved significantly (Oldroyd et al.).

Moreover, food banks' diabetes interventions were able to improve dietary intake, showing that food bank initiatives targeted specifically at diabetics were also successful. In summary, after assessing dietary quality compared to no intervention in controls, a considerable improvement was observed through interventions (Oldroyd et al.). Also importantly, two studies in Figure 3 of *Interventions to Address Food Insecurity Among Adults in Canada and the US A Systematic Review and Meta-analysis,* show that food insecurity interventions led to significant changes in glucose levels, highlighting that food banks are able to affect positive health outcomes in their users (Ferrer et al.; Seligman, Lyles, et al.).

Conclusions

Based on the literature, food banks have the potential to address and improve specific cardiovascular health markers but are not currently able to reduce the risk of long-term cardiovascular diseases. One review stated that food banks play a significant role in providing short-term solutions to exacerbated food insecurity, but they have limitations in their ability to improve overall food security outcomes because of lacking amounts of nutrient-dense foods, especially vegetables, fruits, and dairy, indicating that food banks are able to help keep people fed in emergencies, but the quality and nutritional value of the available foods limit their ability to serve their users (Bazerghi et al.).

This study also suggests that because food banks cannot completely ameliorate short or long-term food insecurity and cannot meet nutritional requirements for their users, they may actually contribute to users' poorer health outcomes. (Bazerghi et al.).

However, there is evidence that food banks have the potential to improve health markers, including Hb1Ac. One included paper showed food banks' diabetes interventions improved food insecurity and diet, and improved health outcomes such as HbA1c levels, although it is also stated that the studies' findings cannot be generalized to all food bank users and that findings did not always reach significance (Oldroyd et al.). Further, a separate review stated among the 15 studies encompassing clinically significant health outcomes, the ones focusing on correlations with HbA1c exhibited the most robust evidence, and while the association was not statistically significant, a possible association with HbA1c reduction was indicated by the pooled analysis, further suggesting that food banks may have the ability to improve health outcomes, especially diabetes (Oronce et al.).

It has been established that food banks have a strong potential to improve cardiovascular health markers and reduce the cardiovascular risk factors of their users, most notably through

improving diabetes markers. However, there are some factors preventing food banks from best serving their clients and most effectively improving their health outcomes. For example, there are some groups that are often overlooked. One such group is those who cannot cook food; a user stated, “Well they give ya a lot of rice and they give ya a lot of vegetables… but if you're homeless like me it is not necessarily easy to cook those types of food” (Douglas et al.). This shows that food banks sometimes do not consider those who are unable to cook their food, causing even nutritious food that must be cooked to be unhelpful. Another group that is sometimes overlooked is those with religious restrictions. One user stated, “I found some foods that I didn't really use because I am Hindu and we didn't eat beef and sometimes like canned food or the noodles or whatever they have beef flavours,” showing that the food provided by food banks may not be suitable for all religious groups (Lee et al.). A third group that is also often not considered is those with medical dietary needs, including those with diabetes. One food bank client stated “Since I became diabetic I can't eat 90% of the stuff they have there so it's not been that much help to me. The stuff they give out, I can't have” (Enns et al.). Thus, food banks are not always catering to their clients’ medical needs, with some being unable to use the provided resources.

These situations highlight some of the overarching areas of improvement for food banks. One review remarks that food banks can improve food security outcomes when perishable food groups are available, when operational resources are sufficient, and when the needs of users are recognized and addressed (Bazerghi et al.) In addressing these issues, food banks will improve the food security of their clients, therefore helping improve their health outcomes. The same review identifies three main hurdles food banks face in meeting the needs of their users: that food bank clients are increasing in number, that donations are not increasing accordingly or are not appropriate for the food bank’s needs, and that enough nutritional training to provide education and advice to users is not provided to food bank staff (Bazerghi et al.).

To address these issues, this paper proposes some possible solutions. First, food banks can provide clients with increased food choices. This will allow users to select the foods that are best suited to their needs and preferences. Continuing on this idea, food banks can tailor their offerings to better suit their clients’ needs. They can consider dietary restrictions, whether for religious, medical, or other reasons and provide food that accommodates these needs, allowing all users to be served effectively by food banks. Similarly, they can provide options that do not need to be cooked to better serve those who are unable to cook their meals. They can also increase staff training to ensure staff are equipped to give advice on nutrition and diet. Such an initiative would help educate food bank users about eating food that is best for their heart and overall health, which would help improve cardiovascular health outcomes and reduce the risk factors of food bank clients. Finally, to make the mentioned suggestions possible, it is imperative that more funds are allocated to food banks. This would ensure they have the resources to best serve their populations.

Works Cited

“About Stroke | Cdc.Gov.” *Centers for Disease Control and Prevention*, 4 May 2023, https://www.cdc.gov/stroke/about.htm.

Bazerghi, Chantelle, et al. “The Role of Food Banks in Addressing Food Insecurity: A Systematic Review.” *Journal of Community Health*, vol. 41, no. 4, Aug. 2016, pp. 732–40. *DOI.org (Crossref)*, https://doi.org/10.1007/s10900-015-0147-5.

Dehghan, Mahshid, et al. “Relationship Between Healthy Diet and Risk of Cardiovascular Disease Among Patients on Drug Therapies for Secondary Prevention: A Prospective Cohort Study of 31 546 High-Risk Individuals From 40 Countries.” *Circulation*, vol. 126, no. 23, Dec. 2012, pp. 2705–12. *DOI.org (Crossref)*, https://doi.org/10.1161/CIRCULATIONAHA.112.103234.

Diabetes, Heart Disease, & Stroke - NIDDK. https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-problems/heart-disease-stroke. Accessed 7 Aug. 2023.

Douglas, Flora, et al. “Resourcefulness, Desperation, Shame, Gratitude and Powerlessness: Common Themes Emerging from A Study of Food Bank Use in Northeast Scotland.” *AIMS Public Health*, vol. 2, no. 3, 2015, pp. 297–317. *PubMed*, https://doi.org/10.3934/publichealth.2015.3.297.

Enns, Aganeta, et al. “Experiences of Food Bank Access and Food Insecurity in Ottawa, Canada.” *Journal of Hunger & Environmental Nutrition*, vol. 15, May 2020, pp. 1–17. *ResearchGate*, https://doi.org/10.1080/19320248.2020.1761502.

“Facts About Hypertension | Cdc.Gov.” *Centers for Disease Control and Prevention*, 6 July 2023, https://www.cdc.gov/bloodpressure/facts.htm.

Ferrer, Robert L., et al. “Primary Care and Food Bank Collaboration to Address Food Insecurity: A Pilot Randomized Trial.” *Nutrition and Metabolic Insights*, vol. 12, 2019, p. 1178638819866434. *PubMed*, https://doi.org/10.1177/1178638819866434.

Gundersen, Craig, and James P. Ziliak. “Food Insecurity And Health Outcomes.” *Health Affairs*, vol. 34, no. 11, Nov. 2015, pp. 1830–39. *DOI.org (Crossref)*, https://doi.org/10.1377/hlthaff.2015.0645.

“Heart Attack Symptoms, Risk Factors, and Recovery | Cdc.Gov.” *Centers for Disease Control and Prevention*, 12 July 2022, https://www.cdc.gov/heartdisease/heart_attack.htm.

“Hunger.” *Food and Agriculture Organization of the United Nations*, http://www.fao.org/hunger/en/. Accessed 6 Aug. 2023.

Hunger and Poverty in America | Feeding America. https://www.feedingamerica.org/hunger-in-america/poverty. Accessed 7 Aug. 2023.

Lee, Sarah, et al. “Exploring the Experience of Food Insecurity among University Students Caring for Children: A Qualitative Descriptive Study.” *Journal of Hunger & Environmental Nutrition*, vol. 15, Dec. 2018, pp. 1–12. *ResearchGate*, https://doi.org/10.1080/19320248.2018.1557093.

Nations, United. “Universal Declaration of Human Rights.” *United Nations*, United Nations, https://www.un.org/en/about-us/universal-declaration-of-human-rights. Accessed 7 Aug. 2023.

Oldroyd, Lucy, et al. “The Nutritional Quality of Food Parcels Provided by Food Banks and the Effectiveness of Food Banks at Reducing Food Insecurity in Developed Countries: A Mixed-Method Systematic Review.” *Journal of Human Nutrition and Dietetics*, vol. 35, no. 6, 2022, pp. 1202–29. *Wiley Online Library*, https://doi.org/10.1111/jhn.12994.

Oronce, Carlos Irwin A., et al. “Interventions to Address Food Insecurity Among Adults in Canada and the US.” *JAMA Health Forum*, vol. 2, no. 8, Aug. 2021, p. e212001. *PubMed Central*, https://doi.org/10.1001/jamahealthforum.2021.2001.

Seligman, Hilary K., Courtney Lyles, et al. “A Pilot Food Bank Intervention Featuring Diabetes-Appropriate Food Improved Glycemic Control Among Clients In Three States.” *Health Affairs (Project Hope)*, vol. 34, no. 11, Nov. 2015, pp. 1956–63. *PubMed*,

https://doi.org/10.1377/hlthaff.2015.0641.

Seligman, Hilary K., Barbara A. Laraia, et al. “Food Insecurity Is Associated with Chronic Disease among Low-Income NHANES Participants.” *The Journal of Nutrition*, vol. 140, no. 2, Feb. 2010, pp. 304–10. *PubMed Central*, https://doi.org/10.3945/jn.109.112573.

USDA ERS - Key Statistics & Graphics. https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-u-s/key-statistics-graphics/. Accessed 7 Aug. 2023.

Wang, Stephen Y., et al. “Food Insecurity and Cardiovascular Mortality for Nonelderly Adults in the United States From 2011 to 2017: A County-Level Longitudinal Analysis.” *Circulation: Cardiovascular Quality and Outcomes*, vol. 14, no. 1, Jan. 2021, p. e007473. *DOI.org (Crossref)*, https://doi.org/10.1161/CIRCOUTCOMES.120.007473.