ECRONICON OPEN ACCESS

EC NUTRITION
Research Article

Food Insecurity in the United States: Implications for Health Outcomes and the Role of Food Assistance Programs

Kyle Copp[1]*, Kendall Brune[2] and TimMarie Williams[1]

[1]*University of the Incarnate Word School of Osteopathic Medicine, USA*

[2]*Arise Veteran Foundation, USA*

***Corresponding Author:** Kyle Copp, School of Medicine, University of the Incarnate Word School of Osteopathic Medicine, USA.

Received: March 18, 2024; **Published:** April 04, 2024

Abstract

Food insecurity persists as a significant challenge in the United States, impacting diverse demographic groups. Understanding its health implications and the effectiveness of food assistance programs is critical. This review synthesized recent literature from databases such as ProQuest Public Health Database and PubMed, focusing on studies published since January 1, 2014. Search terms included food insecurity, health outcomes, chronic diseases, and rural communities. Relevant studies referenced in the articles were also included. The review reveals the complex relationship between food insecurity and adverse health outcomes, notably chronic diseases like cardiovascular disease, diabetes mellitus, and obesity. Vulnerable populations, including children, the elderly, minorities, individuals with disabilities and those in rural or economically distressed areas, bear a disproportionate burden. Moreover, the role of food assistance programs, such as Supplemental Nutrition Assistance Program (SNAP) and community-based interventions, in alleviating food insecurity and improving health outcomes is underscored. Evidence suggests that SNAP participation is associated with positive health outcomes and reduced healthcare costs among low-income individuals and families. Community-based interventions also play a significant role in addressing food insecurity and promoting nutrition education and social connections. Challenges persist in effectively addressing food insecurity, particularly in rural and underserved communities, due to geographic disparities and social determinants of health. Comprehensive strategies are needed, requiring collaboration among policymakers, communities, and individuals. Continued research, advocacy, and action are essential to combat food insecurity and its adverse health effects. Policymakers must prioritize supportive policies, communities should establish sustainable food systems, and individuals can advocate for food justice to ensure access to nutritious food and good health for all.

Keywords: *Food Security; Health Outcomes; Cardiovascular Disease; Diabetes; Obesity; Food Assistance Programs*

Introduction

Food insecurity is defined as a household-level economic and social condition of limited or uncertain availability of nutritionally adequate and safe foods, or the inability to acquire them in socially acceptable ways, is a persistent and multifaceted challenge facing individuals, families, and communities globally, including within the United States [1]. Despite its status as one of the world's wealthiest nations, the United States continues to grapple with alarmingly high rates of food insecurity affecting millions of its citizens across diverse demographic groups.

In recent years, the intersection between food insecurity, nutrition, and health outcomes has garnered significant attention from researchers, policymakers, and public health advocates alike. Mounting evidence suggests that inadequate access to a consistent supply of nutritious foods not only exacerbates hunger and malnutrition but also contributes to a range of adverse health outcomes, thereby perpetuating a vicious cycle of poverty and poor health.

The United States Department of Agriculture (USDA) classifies food insecurity into two categories: low food security, characterized by reduced quality, variety, or desirability of diet without significant disruption of food intake, and very low food security, marked by multiple indications of disrupted eating patterns and reduced food intake [1]. According to the USDA's latest report, approximately 12.8 percent of households, or 17 million in the United States experienced food insecurity in 2022, with 5.1 percent, or 6.8 million experiencing very low food security [2]. In 2022, the prevalence of food insecurity increased by a statistically significant amount when compared to the 2021 rate of 10.2 percent and exceeded the observed prevalence from 2017 through 2020. Furthermore, the incidence of very low food security in 2022 represented a statistically significant rise from the 2021 figure of 3.8 percent surpassing the annual prevalence documented from 2017 through 2020 [2].

Food insecurity can be long-term or temporary and does not necessarily cause hunger, but it is a possible outcome. Food insecurity affects individuals and communities across various socio-economic strata, with certain populations disproportionately bearing the brunt of its consequences. Vulnerable groups such as children, the elderly, racial and ethnic minorities, individuals with disabilities, and those living in rural or economically distressed areas are particularly susceptible to the adverse effects of food insecurity [1,3,4,7]. In 2022, 36.7 percent of low-income households were food insecure, more than a 20 percent increase in prevalence when compared with the national average [2]. Elevated unemployment rates within low-income communities pose significant challenges in fulfilling basic household food requirements [3]. Children from households with unemployed care givers exhibit heightened levels of food insecurity compared to those with employed guardians. Moreover, individuals with disabilities face heightened vulnerability to food insecurity due to limited employment prospects and the financial strain of healthcare-related expenses, which diminishes available income for food purchases [4,5]. Racial and ethnic discrepancies are evident concerning food insecurity, with Black non-Hispanic households experiencing almost double the likelihood of food insecurity compared to the national average in 2022 (22.4 percent versus 12.8 percent, respectively) [2]. Similarly, Hispanic households exhibited a prevalence of food insecurity at 20.8 percent, surpassing the national average [2]. Contributing factors to these inequities may encompass neighborhood conditions, physical barriers to accessing food, and transportation deficits.

Rural areas account for 63% of counties in the U.S., and 87% of counties with the highest rates of food insecurity [6]. Furthermore, a report from 2018 indicates that 13.3% of those living in rural areas faced food insecurity, compared with 11.5% in urban areas [7]. Higher rates of food insecurity in rural areas are attributable to numerous reasons including economic factors such as poverty, unemployment, and low wages. Food availability and access is another factor, studies found limited grocery store availability and distance to certain store types is associated with food insecurity [8].

Food deserts in rural areas, as defined by the US Department of Agriculture (USDA), refer to regions where a significant portion of the population, typically low-income, lacks access to affordable and nutritious food due to the absence of nearby supermarkets, supercenters, or large grocery stores. Specifically, a rural food desert is identified by a low-income census tract with at least 500 people or where 33% of the population lives more than 10 miles from the nearest major food retailer [9]. The consequences of food deserts in rural areas are profound and contribute significantly to food insecurity within these communities. Resources, such as SNAP benefits, and other programs for those of low Social Economic Status (SES), are imperative for those in rural communities, as many in these areas are at risk of being food insecure. Thus, initiatives like the Supplemental Nutrition Assistance Program can aid in alleviating food insecurity among vulnerable households and improve dietary intake when adequate access to nutritious choices is available. Furthermore the impact of food insecurity extends beyond immediate hunger and malnutrition, exerting profound implications for long-term health and well-being. Studies have

linked food insecurity with a myriad of negative health outcomes, including but not limited to obesity, diabetes, cardiovascular disease, mental health disorders, poor dietary quality, and micronutrient deficiencies.

Understanding the intricate interplay between food insecurity, its effects on health outcomes, and the role of food assistance programs is crucial for developing and refining effective interventions and policies aimed at alleviating the burden of food insecurity and improving the overall health and resilience of communities. By examining the existing body of literature, this review seeks to clarify the nuanced relationships between food insecurity in rural and underserved communities, the obstacles related to accessing nutritious produce and meals, and the functions and limitations of food assistance programs and interventions in meeting immediate food needs. Through a comprehensive synthesis of empirical evidence, this review aims to contribute to the existing knowledge base, inform evidence-based interventions, and advocate for policies that promote food security and improved health outcomes for all individuals and communities affected by food insecurity in the United States.

Methods

Our main objective was to review the literature to gather evidence on the relationship between food insecurity, chronic diseases such as cardiovascular diseases and diabetes mellitus, and the influence of food assistance programs. We aimed to identify any distinct mechanisms of development discussed in the existing literature. To do this, we conducted a review of recent literature across two databases, ProQuest Public Health Database and PubMed. Our final search strategies included Food Insecurity OR Food Insufficiency OR Food Disparity OR Hunger AND Health Outcomes OR Health Consequences OR Health Impacts OR Health Effects AND Chronic Diseases of Cardiovascular Disease OR Diabetes OR Obesity AND Rural Communities OR Rural Populations. We additionally included studies found in the references of articles our search uncovered. We limited our search to articles published on or after 1 January 2014. Duplicates across the two databases were consolidated during the literature review process.

Results and Discussions

Food insecurity as a social determinant of health (SDOH)

Food insecurity is a powerful social determinant of health that can directly impact health outcomes. The heightened prevalence of obesity and associated chronic disease within rural communities in the United States in comparison to urban counterparts is disproportionately alarming. Multifaceted social and environmental factors including poverty, socioeconomic status, and residential instability contribute to health disparities in rural areas. Limited knowledge of health-promoting behaviors, including poor dietary habits and sedentary lifestyles, exacerbates these disparities [10].

Growing evidence reveals food insecurity to be a risk factor for poor health across the life course. Adherence to a healthy diet is a primary method of prevention and management for common chronic cardiometabolic diseases, as one can imagine, this is more difficult when people are food insecure. Children and adults living in food insecure households may have an increased risk for negative health outcomes such as poor development, overall poor health, adverse mental health conditions, chronic diseases, functional limits, and potentially shorter life expectancy compared with those living in food secure households [11]. This review will focus on chronic diseases such as cardiovascular disease (hypertension, stroke, coronary heart disease, heart failure, and disease of the arteries), diabetes mellitus, and obesity.

Cardiovascular disease

Cardiovascular disease (CVD) is the number one leading cause of death globally and in the USA, CVD death was primarily attributable to coronary heart disease (CHD, 42.6%), followed by stroke (17.0%), hypertension (10.5%), heart failure (9.4%), and diseases of arteries (2.9%); other minor CVD causes combined accounted for 17.6% [12,13]. The estimated annual direct and indirect cost of CVD was $351.2 billion for 2014 - 2015, and the total cost is expected to reach $1.1 trillion in 2035 [12]. Although estimates suggest that approximately

80% of CVD can be prevented by controlling risk factors and adopting a healthy lifestyle, currently in the USA, the prevalence of heart-healthy behaviors is low, and substantial barriers to implementation exist including low socioeconomic status and food insecurity [11]. Studies have found that poor dietary intake in the setting of low and very-low food security combined with the potential cycles of bingeing and fasting alongside the fluctuating nature of food insecurity can lead to adverse metabolic effects such as insulin resistance and poor weight management that increase the risk of CVD [11]. Research using comparable risk assessment methods and nationally representative data has shown that about 45% of cardiometabolic deaths were attributable to poor dietary habits [14]. The leading dietary risk factors for cardiometabolic deaths included low consumption of vegetables and fruits (15%), high sodium intake (10%), low consumption of nuts/seeds (9%), high consumption of processed meats (8%), low intake of seafood omega-3 fats (8%), and high consumption of sugar-sweetened beverages (7%), many of which have been associated with food insecurity [11,14].

Studies suggested a compelling association between each level of reduced food security and CVD risk. A particularly strong association between very low food security (FS) with CVD related outcomes. Specifically, there was a statistically significant increase in the prevalence of hypertension for adults as food security worsens with high FS at 20%, moderate FS at 24%, low FS at 28%, and very low FS at 36% [11]. Some researchers suggest a bidirectional relationship between food insecurity and cardiovascular health. Food insecure individuals were reported to have higher odds of delaying medication, postponing needed medical care, and hospitalization compared with food secure individuals [11].

Mendy., *et al*. utilized survey responses to investigate the correlation between specific cardiovascular disease (CVD) risk factors and food insecurity among adults in Mississippi and to evaluate variations in food insecurity based on sociodemographic and health attributes [15]. This study controlled for age, gender, race, education, annual household income, and health insurance, revealed several associations between food insecurity and sociodemographic and health characteristics in Mississippi adults, and should not be generalized for the entire US population. Although, the study found individuals with high blood pressure had a 51% higher likelihood of experiencing food insecurity compared to those without high blood pressure. Similarly, those with diabetes, inactive lifestyles, and lower fruit and vegetable consumption also had higher odds of being food insecure. Furthermore, individuals with higher BMI categories and current smokers showed increased odds of food insecurity compared to their counterparts [15]. These results highlight the interconnectedness between food insecurity and various health and lifestyle factors, emphasizing the need for comprehensive approaches to address food insecurity and its associated health risks.

Diabetes mellitus

Diabetes mellitus disproportionately affects low-income Americans. As food insecurity has already been associated with low-income populations, it can be explained by one mechanism in which people are at an increased risk of poor diabetes outcomes. Food insecurity acts as an independent risk factor for poor health outcomes, including glycemic control in adults with diabetes. Ippolito., *et al*. aimed to explore the association between the level of food security and diabetes self-management among food pantry clients [16]. The descriptive cross-sectional study included a sample of 1,237 adults, with an average age of 56 years. Among the study population, 84% experienced food insecurity, with half of them facing very low food security. Point-of-care glycated Hb (HbA1c) testing was utilized to assess glycemic control and survey diabetes self-management among participants. The findings revealed no significant variation in mean HbA1c (8.1) across different food security statuses. However, individuals with very low food security, when compared to both low food security and food secure individuals, exhibited lower levels of diabetes self-efficacy, higher levels of diabetes distress, increased medication non-adherence, a greater prevalence of severe hypoglycemic episodes, elevated rates of depressive symptoms, more challenges with medication affordability, and a greater tendency to make trade-offs between food, medicine, or health supplies [16].

Another study explores the connection between food insecurity and diabetes to determine if any specific mechanism of development exists [17]. First, it explored food insecurity in the context of risk for type 2 diabetes stating that nutrition, metabolism, and inflammation

are associated with food insecurity. Considerable attention has been directed towards exploring the connection between food insecurity and obesity (defined as a body mass index (BMI) > 30 kg/m^2), particularly concerning their interplay with dietary habits. Additionally, research has examined the links between food insecurity, inflammation, and diabetes. Systemic markers of inflammation including cytokines like interleukin (IL)-6 and tumor necrosis factor (TNF)-α are positively correlated with insulin resistance and have been implicated in the development of type 2 diabetes [17]. Also, acute phase reactants, such as C-reactive protein, a nonspecific marker of inflammation, have been associated with both cardiovascular disease and type 2 diabetes along with food insecurity [17]. Researchers observed that individuals experiencing food insecurity were more prone to fall into a higher quartile of C-reactive protein (CRP) levels (CRP > 5.3 mg/L) compared to those who were food secure (adjusted odds ratio (OR) 1.21; 95% confidence interval (CI) 1.04 - 1.40) [18]. Additionally, food insecurity correlated with heightened white blood cell counts, indicating increased immune system activity. Those with very low food security showed a nearly 40% higher likelihood of having elevated white blood cell counts compared to food secure individuals. The authors suggested that the stress and dietary changes associated with food insecurity may induce inflammation and alter the immune system in affected individuals [18]. Further investigation is needed to understand the potential implications of these findings on diabetes risk [17].

Obesity

Given that obesity poses a significant risk for type 2 diabetes, understanding this relationship holds relevance in the link between food insecurity and diabetes. A recent comprehensive review by Morales., *et al*. researched this subject extensively [19]. While the review uncovered robust evidence linking food insecurity with inadequate dietary patterns, the evidence regarding the association between food insecurity and obesity remains mixed. The review underscored significant limitations in existing research methodologies, particularly the prevalent use of cross-sectional study designs, which struggle to unravel the intricate interplay among food insecurity, dietary habits, and weight status [19]. In developed societies, one defining feature of food insecurity is the affordability and accessibility of low-quality, highly processed foods compared to healthier alternatives such as whole grains, fresh fruits, vegetables, and lean proteins [17]. This disparity is often exacerbated by cyclical patterns of resource availability, leading to periods of overeating (binging) at the start of the month when resources are abundant, followed by periods of reduced food intake (fasting) once budgets are depleted. These dynamics are likely to contribute to the complex relationship between food insecurity and obesity [17].

Meanwhile, another review by Carvajal-Aldaz., *et al*. discusses that most of the current literature has consistently shown a significant association between obesity and food insecurity but only in women from high-income countries particularly, the United States. They report that the evidence is lacking to suggest a clear mechanism to explain this paradox between obesity and food insecurity [20]. This paradox has puzzled researchers due to the seeming contradiction that individuals with limited access to food can still become obese [20]. Recent studies have attempted to unravel this paradox. Kowaleski-Jones., *et al*. investigated potential mediating factors such as access to healthy foods, physical activity, and stress but found no clear mediators of the relationship between food insecurity and obesity, although the positive association was observed primarily in women [21]. Potochnick., *et al*. examined Hispanic/Latino youth in the US and discovered that those from food insecure households had higher BMIs and depression scores, potentially linked to familial stressors, and weakened support systems. This finding aligns with other studies suggesting that poor diet quality and weight gain may be associated with food insecurity, particularly in low-income contexts [22]. Gender disparities in the impact of food insecurity were explored by Taylor., *et al*. who found that mothers were more likely to sacrifice their diet quality to feed their families, possibly due to traditional gender roles [23]. Farrell., *et al*. proposed contextual mechanisms such as the affordability of energy-dense foods as key factors modifying the association between food insecurity and obesity risk. Additionally, social support has been suggested as a potential mitigating factor, with food insecure women reporting lower levels of social support being more likely to be obese [24].

Food assistance programs and community based interventions

The United States government over the years has launched a variety of emergency programs that have been successful in providing food to the low-income population, these include the Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Meals on Wheels, and the school breakfast and lunch program [25]. Additionally, at the state and local level, through charitable agencies and the implementation of food banks, food pantries, and community gardens reallocate and provide large quantities of food to people in need, which is critical for reducing food insecurity in the USA. Food banks and food pantries directly serve the end users free of charge and in the USA distribute free grocery items to over 46.5 million Americans in need annually. Estimations of food insecurity among pantry clients in the US range from 50 - 84% [26].

SNAP is the largest federally funded nutrition program in the U.S., serving as a household supporting infrastructure for individuals facing food insecurity. SNAP helps close to 40 million Americans afford a nutritious diet in an average month [27]. High SNAP participation and eligibility rates of up to 16% and 90% in rural areas, respectively highlight the vital role SNAP plays for those living in rural areas [10]. While participation and eligibility in urban areas are only 13% and 82% and these differences only continue to increase [10]. Although evaluating SNAP's true impact is difficult because of its broad coverage and because participants may differ in important but unmeasurable ways from nonparticipants, it has contributed to measurable improvements in the health and well-being of Americans.

Emerging research suggests a strong association between participation in SNAP and improved health outcomes [27]. Adults enrolled in SNAP demonstrate more positive self-assessments of their health status, miss fewer days of work due to illness, make fewer physician office visits, and exhibit a reduced likelihood of experiencing psychological distress [27]. In fact, adults receiving SNAP are 30% less likely to take less medication than prescribed due to cost, compared to nonparticipants. This is particularly significant, as cost-related medication nonadherence affects up to 1 in 4 working-age adults [27]. Moreover, children in households receiving SNAP report better health statuses compared to their nonrecipient counterparts. Additionally, households of SNAP recipients are less likely to forgo health care to meet other essential expenses, highlighting the program's role in ensuring access to necessary medical services [27].

Furthermore, SNAP participation has been linked to lower rates of nursing home and hospital admissions among elderly individuals [27]. Research indicates that elderly SNAP participants are 30% less likely to take less medication than prescribed due to cost compared to nonparticipants. Similarly, low-income seniors enrolled in SNAP are 23% less likely to enter a nursing home and 4% less likely to be hospitalized one year after enrollment, compared to those not participating in the program. Notably, longitudinal studies show a significant reduction in hospitalization rates among food-insecure elderly individuals participating in SNAP. Additionally, an analysis of national data reveals a correlation between SNAP participation and decreased healthcare expenditures. Low-income adults enrolled in SNAP have annual healthcare costs approximately 25% lower than those of nonparticipants, with even greater differences observed among individuals with hypertension and coronary heart disease [27].

Furthermore, studies designed to control for potential biases have consistently found an association between SNAP participation and reduced healthcare costs, with reductions of up to $5000 per person per year documented. These findings underscore the substantial impact of SNAP participation on improving health outcomes and reducing healthcare expenditures among low-income individuals and families [27].

A qualitative study found SNAP to be viewed by rural residents in a largely positive light, describing it as a crucial stop-gap program that keeps families from experiencing persistent food insecurity, making food dollars stretch when the family budget is tight, and helping them purchase healthier foods [28]. Further, emerging research supports this qualitative study and also links SNAP, food pantry-based intervention, and community garden participation to improvement in food security, nutrition knowledge, diet, cooking skills, and health outcomes [10,25-29].

One study found the likelihood of experiencing food insecurity decreased by ≥ 1.17-fold when food donations were included in the total dietary intake, particularly those abundant in fruits, total vegetables, grains, dairy, and protein foods ($p < 0.05$) [25]. Thus, the intake of food donations had a more pronounced effect on enhancing the food security status of clients, primarily attributed to increased consumption of fruits, vegetables, and protein foods, compared to consuming the base diet alone (without donations), as indicated by the odds ratio values ($p < 0.05$). Furthermore, the risk of food insecurity decreased after consuming a base diet with high nutritional value, comprising substantial proportions of total vegetables, whole grains, dairy, or protein foods, albeit with lower sodium content ($p < 0.05$). Therefore, the improved dietary quality of the total diet following the addition of food donations positively influenced the food security of participants [25]. Other studies found that the availability of fruits and veggies in food pantries increased their client's intake by one serving per day. These outcomes are further supported by the present results in which the inclusion of veggies in the food donation improved diet quality by 1-6 fold ($P= 0.01$) [25].

The systematic review conducted by Hume., *et al*. (2022) examines the effects of community gardens on various outcomes, including diet, health, psychosocial well-being, and community cohesion. Community gardens play a significant role in addressing food insecurity and improving health outcomes by providing access to fresh produce, promoting physical activity, fostering social connections, and enhancing community resilience.

One of the key findings of the study is the positive impact of community gardens on dietary habits. Participation in community gardening encourages individuals to consume a greater variety of fruits and vegetables, thereby improving overall diet quality. A study showed increased consumption of fruits and vegetables for those receiving their produce from community gardens to not (OR: 2.18; 95%CI: 1.24, 3.81) [30]. A study explored the feasibility of church garden's impact on health outcomes in rural African American youth and adults. Their findings, although not statistically significant, showed youth fruit and vegetable knowledge and daily intake increased from 12.9 to 14.5 ($p = 0.08$) and 2.25 to 2.5 ($p = 0.08$), respectively. While in adults fruit and vegetable knowledge increased from 20.3 to 21.1 and daily servings from 2.3 to 2.5 [31]. Access to fresh, locally grown produce from community gardens can help address food insecurity by supplementing individuals' diets with nutritious foods that may otherwise be inaccessible or unaffordable.

Furthermore, community gardens contribute to improved health outcomes by promoting physical activity and outdoor engagement. Engaging in gardening activities offers opportunities for moderate exercise, which can have positive effects on cardiovascular health, weight management, and mental well-being. Additionally, spending time in green spaces and connecting with nature has been linked to reduced stress levels and improved mental health outcomes.

Beyond individual health benefits, participation in community gardens fosters social connections and strengthens community bonds. Gardening activities provide opportunities for collaboration, knowledge-sharing, and skill-building among community members. This sense of belonging and social support network can be particularly beneficial for vulnerable populations facing food insecurity, as it creates a supportive environment where individuals can access resources, share experiences, and build resilience together [29].

Despite a modest benefit, SNAP assistance alone may not be sufficient enough to reduce food insecurity [10]. Nevertheless, it is a necessary factor to help prevent higher rates among those who are eligible for its benefits. The intricate relationship between improving diet quality and addressing food insecurity necessitates a nuanced approach. While participation in SNAP offers a pathway to food security, it's evident that in contexts like rural Appalachian communities, where economic disparities are pronounced, it does not guarantee consistent access to nutritious food [10]. This underscores the multifaceted nature of food insecurity, which is influenced by a myriad of factors beyond income alone. Moreover, the rural geography of these areas plays a crucial role in shaping food perceptions and purchasing patterns, given the disparities in access and availability. Previous research has highlighted the distinct challenges faced by rural populations in accessing nutritious food, further emphasizing the need for tailored interventions that account for geographic

disparities and socioeconomic realities. Therefore, addressing food insecurity effectively requires comprehensive strategies that go beyond income support programs like SNAP, considering the unique needs and constraints of rural communities to ensure equitable access to nutritious food for all [10].

Conclusion

The findings from recent research studies highlight the intricate relationship between food insecurity and various adverse health outcomes, including, but not limited to cardiovascular disease, diabetes mellitus, and obesity. Notably, individuals experiencing food insecurity exhibit higher rates of chronic diseases, poor dietary quality, and compromised overall well-being. Moreover, vulnerable populations, including children, the elderly, racial and ethnic minorities, individuals with disabilities, and those residing in rural or economically distressed areas, bear a disproportionate burden of food insecurity and its associated health consequences.

Furthermore, the role of food assistance programs, such as SNAP in alleviating food insecurity and improving health outcomes cannot be overstated. SNAP and other similar initiatives play a vital role in ensuring access to nutritious food for millions of low-income individuals and families, thereby mitigating the adverse effects of food insecurity on health. Additionally, community-based interventions, such as food banks, food pantries, and community gardens, contribute significantly to addressing food insecurity by providing essential resources, promoting nutrition education, and fostering social connections within communities.

However, despite these efforts, challenges persist in effectively addressing food insecurity, particularly in rural and underserved communities. Geographic disparities, limited access to nutritious food, economic barriers, and social determinants of health continue to pose significant obstacles to achieving food security for all. Therefore, policymakers, communities, and individuals must collaborate on comprehensive strategies aimed at improving access to fresh and nutritious food, enhancing food assistance programs, and addressing the underlying social and economic factors contributing to food insecurity.

In light of the evidence presented in this paper, there is an urgent need for continued research, advocacy, and action to combat food insecurity and its detrimental effects on health and well-being. Policymakers must prioritize policies that support food security, allocate resources to vulnerable populations, and promote equitable access to nutritious food. Communities should work together to establish sustainable food systems, support local initiatives, and foster social connections to address food insecurity effectively. Individuals can contribute by advocating for food justice, supporting local food initiatives, and engaging in efforts to promote health equity within their communities.

Ultimately, addressing food insecurity requires a comprehensive and collaborative approach that recognizes the interconnectedness of social, economic, and environmental factors influencing food access and health outcomes. By working together, policymakers, communities, and individuals can create positive change and build resilient communities where everyone has access to fresh, nutritious food, and the opportunity to lead healthy and fulfilling lives.

Bibliography

1. U.S. Department of Agriculture, Economic Research Service. “Definitions of food security” (2023).
2. U.S. Department of Agriculture, Economic Research Service. “Food Security and Nutrition” (2023).
3. Nord M. “Characteristics of low-income households with very low food security: An analysis of the USDA GPRA food security indicator”. USDA-ERS Economic Information Bulletin 25 (2007).

4. Coleman-Jensen A and Nord M. "Food insecurity among households with working-age adults with disabilities". USDA-ERS Economic Research Report 144 (2013).

5. Huang J., *et al*. "Food insecurity and disability: Do economic resources matter?" *Social Science Research* 39.1 (2010): 111-124.

6. Gunderson C., *et al*. "Map the meal gap 2020". Feeding America (2020).

7. Coleman-Jensen A. "Household food security in the United States in 2016". United States Department of Agriculture: Economic Research Report 237 (2017).

8. Thomas BJ. "Food deserts and the sociology of space: distance to food retailers and food insecurity in an urban American neighborhood". *International Journal of Humanities and Social Sciences* 4 (2010): 1545-1554.

9. Dutko P., *et al*. "Characteristics and influential factors of food deserts". USDA-ERA Economic Research Report 140 (2012).

10. DeWitt E., *et al*. "Rural SNAP participants and food insecurity: How can communities leverage resources to meet the growing food insecurity status of rural and low-income residents?" *International Journal of Environmental Research and Public Health* 17.17 (2020): 6037.

11. Liu Y and Eicher-Miller HA. "Food insecurity and cardiovascular disease risk". *Current Atherosclerosis Reports* 23.6 (2021): 24.

12. Virani S., *et al*. "Heart disease and stroke statistics-2020 update: a report from the American Heart Association". *Circulation* 141.9 (2020): 139-596.

13. Blackwell D and Villarroel M. "Tables of summary health statistics for US adults: 2017 National Health Interview Survey". Centers for Disease Control and Prevention (2017).

14. Micha R., *et al*. "Association between dietary factors and mortality from heart disease, stroke, and type 2 diabetes in the US". *JAMA* 317.9 (2017): 912-924.

15. Mendy VL., *et al*. "Food insecurity and cardiovascular disease risk factors among Mississippi adults". *International Journal of Environmental Research and Public Health* 15.9 (2018): 2016.

16. Ippolito MM., *et al*. "Food insecurity and diabetes self-management among food pantry clients". *Public Health Nutrition* 20.1 (2017): 183-189.

17. Essien UR., *et al*. "Food insecurity and diabetes in developed societies". *Current Diabetes Reports* 16.9 (2016): 79.

18. Gowda C., *et al*. "The association between food insecurity and inflammation in the US adult population". *American Journal of Public Health* 102.8 (2012): 1579-1586.

19. Morales ME and Berkowitz SA. "The relationship between food insecurity, dietary patterns, and obesity". *Current Nutrition Reports* 5.1 (2016): 54-60.

20. Carvajal-Aldaz D., *et al*. "Food insecurity as a risk factor for obesity: A review". *Frontiers in Nutrition* 9 (2022): 1012734.

21. Kowaleski-Jones L., *et al*. "Unpacking the paradox: testing for mechanisms in the food insecurity and BMI association". *Journal of Hunger and Environmental Nutrition* 14.5 (2019): 683-697.

22. Potochnick S., *et al*. "Food insecurity among hispanic/latino youth: who is at risk and what are the health correlates?". *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine* 64.5 (2019): 631-639.

23. Taylor EA., *et al*. "Examining factors related to the food insecurity-obesity paradox in low-income mothers and fathers". *Food and Nutrition Bulletin* 42.2 (2021): 309-316.

24. Farrell P., *et al*. "How food insecurity could lead to obesity in LMICs: When not enough is too much: a realist review of how food insecurity could lead to obesity in low- and middle-income countries". *Health Promotion International* 33.5 (2018): 812-826.

25. Mousa TY and Freeland-Graves J. "Food security of food recipients of a food pantry and soup kitchen". *Public Health Nutrition* 22.8 (2019): 1451-1460.

26. An R., *et al*. "A systematic review of food pantry-based interventions in the USA". *Public Health Nutrition* 22.9 (2019): 1704-1716.

27. Keith-Jennings B., *et al*. "Links of the supplemental nutrition assistance program with food insecurity, poverty, and health: evidence and potential". *American Journal of Public Health* 109.12 (2019): 1636-1640.

28. Haynes-Maslow L., *et al*. "Examining rural food-insecure families' perceptions of the supplemental nutrition assistance program: a qualitative study". *International Journal of Environmental Research and Public Health* 17.17 (2020): 6390.

29. Hume C., *et al*. "Community gardens and their effects on diet, health, psychosocial and community outcomes: a systematic review". *BMC Public Health* 22.1 (2022): 1247.

30. Barnidge EK., *et al*. "The effect of education plus access on perceived fruit and vegetable consumption in a rural African American community intervention". *Health Education Research* 30.5 (2015): 773-785.

31. De Marco MM., *et al*. "Harvest of Hope: The impact of a church garden project on African American youth and adults in the rural American South". *Journal of Hunger and Environmental Nutrition* 11.3 (2016): 317-327.

Volume 19 Issue 4 April 2024