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The Impact of Social Services on Alleviating Food Insecurity and Enhancing Health Outcomes in Low-Income Populations: A Systematic Review of Nutritional Interventions

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Abstract

Background: Food insecurity remains a pressing issue in the United States, affecting approximately 34 million individuals, particularly marginalized populations such as children, single-parent families, and racial minorities. This condition is linked to various health complications, including chronic illnesses and increased healthcare costs. Addressing food insecurity through social services has the potential to improve health outcomes and reduce healthcare expenditures.

Methods: This systematic review evaluated the effectiveness of three nutritional interventions initiative: medically tailored meal delivery, healthy food boxes, and produce prescription programs. A comprehensive search of peer-reviewed literature was conducted across multiple databases, focusing on studies that assessed dietary intake, food security status, and health outcomes in low-income populations experiencing food insecurity.

Results: Out of 21 studies included in the review, 81% reported improvements in dietary intake, with nearly 43% showing increased consumption of fruits and vegetables. Additionally, 66.7% of studies indicated enhancements in food security status, while 61.9% reported positive changes in various chronic health conditions. Notably, the majority of studies utilized quasi-experimental designs, with a limited number employing randomized controlled trials.

Conclusion: The findings suggest that targeted nutritional interventions can significantly reduce food insecurity and improve health outcomes in low-income communities. However, there is a need for further research utilizing rigorous methodologies to evaluate the cost-effectiveness and long-term impact of these programs. Policymakers should consider integrating these interventions into broader public health strategies to address food insecurity as a social determinant of health.

Keywords: Food Insecurity, Nutritional Interventions, Health Outcomes, Low-Income Communities, Social Determinants of Health

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1. Introduction

In 2021, the United States Department of Agriculture (USDA) stated that 34 million individuals in the United States experience food insecurity. A disproportionate percentage of children, single-parent families, racial and ethnic minorities, and individuals from underprivileged origins have poor food security [1]. Food insecurity correlates with inadequate glycemic regulation, cardiometabolic disorders, and chronic illnesses [2-4]. The rise in persons with these illnesses results in increased healthcare consumption and elevated expenditures and prices [5]. In response to elevated expenses linked to food poverty, Medicaid coverage has been expanded in some states to include new and revised nutrition programs aimed at mitigating food insecurity, which were not previously available [6,7]. The objective of the HOPs is to enhance health outcomes associated with socioeconomic determinants of health (e.g., food insecurity), thereby reducing Medicaid costs via better results [8]. Social determinants of health refer to the circumstances in which individuals are born, develop, reside, engage in employment, and age. Food insecurity is a social determinant of health, defined as a household-level economic and social state characterized by restricted or uncertain access to sufficient food.

Addressing food insecurity can reduce healthcare utilization and costs, as dietary intake, BMI, and diet-related health outcomes (such as blood pressure and cholesterol) are correlated with food insecurity; individuals experiencing food insecurity typically exhibit poorer dietary behaviors, resulting in elevated BMI and a heightened risk of hypertension and hypercholesterolemia [2-4]. Consequently, a reduction in food insecurity should lead to improvements in dietary intake, BMI, and other associated health outcomes, ultimately resulting in decreased healthcare expenditures [9-14].

Consequently, we choose these three therapies as the focal point of the present systematic study. This evaluation defines a produce prescription program as an initiative designed to influence the consumption of fresh fruits and vegetables by offering prescriptions in the form of vouchers, cash, or a card allocation [11]. Programs that provide medically customized meals customize particular, pre-packaged foods to fulfill nutritional requirements essential for managing certain chronic illnesses via diet [12]. Community-supported agriculture (CSA) is a direct-to-consumer marketing model that establishes a relationship between local farms and consumers, referred to as "members," who acquire a CSA share in exchange for regular food delivery from the farm. The food and the farm so become interconnected with the community, where the stewardship of the land is collectively managed, and the harvested commodities are distributed [15,16].

The objective of our systematic review was to assess the outcomes previously evaluated for specific nutritional interventions designed to mitigate food insecurity as a social determinant of health. The objective of this work is to delineate prospective research domains to enhance the efficacy of HOPs.

2. Results

The sample populations exhibited demographic variability; however they mostly included a racially and ethnically diverse cohort. Furthermore, 16 of the studies included a mostly female participant demographic, whilst 3 did not disclose the gender of the participants. Fourteen of the studies required that participants be food insecure, uninsured, or recipients of government food assistance programs, such as SNAP or WIC, to qualify for participation. Fifteen out of the twenty-one studies mandated that program participants possess a diagnosis of at least one chronic disease or exhibit risk factors for a chronic condition to qualify for participation. Participants were required to be diagnosed with or at risk of chronic illnesses such as prediabetes, type 2 diabetes, a cardiometabolic disorder, or overweight/obesity [17-27].

Of the 21 studies evaluated, 10 (47.6%) analyzed alterations in BMI, 17 (81.0%) investigated changes in dietary intake, 13 (61.9%) assessed enhancements in food security status, 14 (66.7%) measured improvements in participants' chronic conditions, 12 (57.1%) evaluated feasibility-related outcomes, and 4 (19.0%) examined cost-related outcomes. Among the 10 research evaluating alterations in BMI, 2 studies [27,29] reported a statistically significant decrease in BMI, 7 studies [17,18,26,28,30,31,32] indicated non-statistically significant changes, and 1 study [33] saw an increase in BMI. In the 17 studies regarding dietary

intake (81.0%), 9 (42.9%) saw a rise in fruit and/or vegetable consumption [19-28,32], whereas 5 (23.8%) reported no statistically significant changes in this consumption [19,26,31-34]. Two studies (9.5%) identified an increase in whole grain intake [24,33]. In investigations using the HEI (n = 3), all reported statistically significant enhancements in the HEI score [27,30,35]. Of the 13 studies investigating food insecurity, 12 reported enhancements in the participants' food security status [16,18,19-24,27,29-35]. Additionally, 14 out of 21 studies assessed improvements in various health conditions, including hemoglobin A1c, hypertension, waist circumference, mental and physical health, cholesterol, and diabetes management. The findings yielded varied results, with the majority lacking statistical significance. Four studies identified reductions in blood pressure [18,22,29,35], four reported decreases in hemoglobin A1c [22,26,31,33], two saw reductions in waist circumference [22,29], and one noted improvement in cholesterol levels [27]. Twelve studies assessed feasibility [16-19,24,26,27,31-35] by evaluating key metrics such as redemption or distribution rates, adherence to provided nutrition instruction, food waste, and participant satisfaction. Studies that monitored cost-related results [5,16,26,27] included cost per redemption, total costs allocated to participants, averted produce expenses for participants, and projected monthly reductions in medical expenditures.

3. Discussion

This literature analysis analyzed the outcomes evaluated in three distinct nutrition treatments targeting food insecurity as a social determinant of health, with the objective of identifying necessary improvements to progress the field (n = 21 studies). The bulk of publications included in this thorough literature analysis are to food prescription programs (n = 13, 61.9%). Additional research should focus on assessing the efficacy of MTMs, CSAs, and other non-clinical nutritional therapies. Furthermore, the majority of studies were on adult populations, necessitating further research in pediatric populations, since children have not yet established chronic illnesses. Additionally, interventions in children are likely to provide a substantial return on investment. When children adopt and sustain healthy behaviors throughout their lives, it is expected to reduce healthcare consumption and expenditures associated with chronic illness management in older adult populations.

The majority of research used a quasi-experimental pre-post design. Further research using randomized controlled trials as the study design is required. registered and dedicated health departments or federally registered health institutions might serve as prospective referral bodies, hence increasing intervention accessibility across several areas. Eight studies included a nutrition education element. In several instances, these nutrition education courses saw low attendance and insufficient use. Additional efforts are required to promote engagement in nutrition education programs, enabling participants to enhance their knowledge and confidence in using the offered produce.

The main outcome assessed was changes in food consumption among the trial participants. The second most often assessed outcome was changes in food security status. Given that the three treatments analyzed in this study aim to mitigate food insecurity and enhance nutrition security, further assessments of analogous programs should include metrics for food insecurity and nutrition security outcomes. Moreover, only one research included in this review [27] used objective assessments of food consumption. Subsequent research should assess the effects of these three nutritional treatments on objective dietary measurements, which are immune to recollection errors and social desirability influences [36,37].

One result used to evaluate feasibility was the redemption rate; however, the measurement of redemption rates varied throughout the articles. For instance, Abel et al. [17] analyzed the ratio of vouchers redeemed to vouchers provided, while Aiyer et al. [16] assessed the average number of prescriptions redeemed per participant and the mean frequency of prescription redemptions. Further research might identify the most significant metrics of redemption rates to guarantee consistent definitions throughout future studies.

Additional assessments have been undertaken to evaluate how clinics or healthcare institutions provide access to nutritious diets. Veldheer et al. evaluated 8,876 papers and kept 44 manuscripts for inclusion in their review study [38]. The study by Veldheer et al. only used clinic-based publications, whereas the present review included materials from both clinical and community health centers. The incorporation of

public health departments or centers may have offered a more comprehensive understanding of the population in each specific location, since marginalized and underprivileged groups tend to get treatment at community health facilities. Veldheer et al. did not evaluate the cost-effectiveness or feasibility of the included research [38]. It is essential to evaluate the cost-benefit ratio of each research to examine, duplicate, and enhance input vs output expenditures.

Bhat et al. [39] performed a meta-analysis to investigate the effects of healthy food prescription programs on dietary habits, body mass index (BMI), systolic and diastolic blood pressure, HbA1c, and blood lipids. A 22% increase in fruit and vegetable consumption was seen, with a drop in BMI of 0.6 kg/m^2 and a reduction in HbA1c of 0.8% [39]. Bhat et al. emphasized the need for extensive, randomized controlled studies to assess the effectiveness of healthy food prescription programs [39].

As of now, 41 states have implemented Medicaid expansion. Certain governments, including North Carolina, have initiated the implementation and assessment of measures that may decrease healthcare expenditures. The outcomes of Medicaid expansion initiatives, including PPP, MTM, and CSAs, will provide insight into their efficacy in enhancing diet, general health and well-being, and healthcare cost savings, thereby decreasing hospital readmission rates and reliance on emergency services. Should the outcomes of these assessments prove favorable, Medicaid and other insurance providers may gain from investing in food delivery initiatives, given their potential to decrease healthcare costs. This study indicated that few studies assessed cost-related outcome data (healthcare expenditures), maybe owing to measurement challenges. Due to the negotiation of price between private and public insurance companies and healthcare organizations, quantifying healthcare expenses is challenging, particularly when analyzing costs across various healthcare institutions and geographic areas or states. Consequently, adopting a more direct metric of healthcare consumption may provide more insights for researchers analyzing the cost-effectiveness of feeding programs.

The USDA-sanctioned GusNIP provides cash to offer incentives to low-income individuals via nutrition incentive programs and produce prescription initiatives. Data from some initiatives have been assessed, while others are undergoing evaluation to determine feasibility, diet-related results, and reductions in healthcare usage. This thorough literature analysis may assist in guiding future GusNIP requests for proposals and provide insights to prospective grantees about lessons gained and successful strategies to date.

This paper has both advantages and drawbacks. A notable strength is that two independent writers reviewed full-text publications and gathered data from all included studies. Discrepancies were addressed at a scheduled time between the two writers, resulting in a consensus on each article or disagreement. A librarian was engaged to do a Boolean search in the PubMed advanced database. Nonetheless, this evaluation has several limitations. This literature study only used the PubMed database, and the inclusion of other search engines may have produced varied or supplementary findings. Furthermore, the principal author reviewed titles and abstracts; nevertheless, to enhance the validity of the findings, both independent writers may have examined all items from the outset of the procedure. Moreover, the absence of a precise criteria for developed nations may have resulted in the unintended exclusion of some studies. Two of the publications considered [16,23] pertained to food versus produce prescription programs; nonetheless, they were included owing to their particular emphasis on produce in the description of the intervention. In the future, it will be essential to evaluate the results of food vs produce prescription programs. Finally, the writers did not do a quality evaluation of each paper.

4. Conclusions

Further research is required to inform evidence-based policy that supports financing for nutrition interventions aimed at addressing food insecurity as a social determinant of health. Only a limited number of studies included in the present evaluation incorporated cost-related outcomes. Consequently, further research is required to evaluate the cost-effectiveness of programs targeting food security as a social determinant of health. Given that GusNIP has been financing nutrition incentive programs, we anticipate that grantees will continue in disseminating their findings. In the 2018 agriculture bill, GusNIP particularly

expanded its scope to include healthcare expenses and use rates. Nonetheless, this data has been challenging to assess. In the future, there must be explicit differentiations between the typical expenses associated with acute care stays or medical consultations for chronic diseases and food poverty, as opposed to the cost-benefit evaluations of these non-acute care nutrition treatments. Similarly, studies demonstrating practicality will promote replication in other regions where the services are required.

The dietary treatments had several favorable outcomes, likely leading to decreased healthcare expenditures and enhanced public health. Should other studies be undertaken and provide comparable favorable findings regarding health outcomes and cost savings, further expenditures in these initiatives will be justified.

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أثر خدمات الرعاية الاجتماعية في التخفيف من انعدام الأمن الغذائي وتعزيز النتائج الصحية في الفئات ذات الدخل المنخفض: مراجعة منهجية للتدخلات الغذائية

الملخص

الخلفية :يظل انعدام الأمن الغذائي قضية ملحة في الولايات المتحدة، حيث يؤثر على حوالي 34 مليون شخص، وخاصة الفئات المهمشة مثل الأطفال، الأسر ذات الوالد الواحد، والأقليات العرقية. يرتبط هذا الوضع بالعديد من المضاعفات الصحية، بما في ذلك الأمراض المزمنة وزيادة تكاليف الرعاية الصحية. إن معالجة انعدام الأمن الغذائي من خلال خدمات الرعاية الاجتماعية لديها القدرة على تحسين النتائج الصحية وتقليل النفقات الصحية.

الطرق :قامت هذه المراجعة المنهجية بتقييم فعالية ثلاث مبادرات تدخل غذائي: توصيل الوجبات المعدة طبيًا، صناديق الطعام الصحية، وبرامج وصفات المنتجات. تم إجراء بحث شامل للأدبيات المحكمة عبر العديد من قواعد البيانات، مع التركيز على الدراسات التي قيّمت المدخول الغذائي، حالة الأمن الغذائي، والنتائج الصحية في الفئات ذات الدخل المنخفض التي تعاني من انعدام الأمن الغذائي

النتائج :من بين 21 دراسة تم تضمينها في المراجعة، أفادت 81% بتحسن في المدخول الغذائي، مع ظهور زيادة في استهلاك الفواكه والخضروات بنسبة 43%. بالإضافة إلى ذلك، أظهرت 66.7% من الدراسات تحسينات في حالة الأمن الغذائي، بينما أفادت 61.9% بتغيرات إيجابية في الحالات الصحية المزمنة المختلفة. من الجدير بالذكر أن الغالبية العظمى من الدراسات استخدمت تصاميم شبه تجريبية، مع عدد محدود فقط من الدراسات التي اعتمدت على التجارب العشوائية المحكمة.

الاستنتاج :تشير النتائج إلى أن التدخلات الغذائية المستهدفة يمكن أن تقلل بشكل كبير من انعدام الأمن الغذائي وتحسن النتائج الصحية في المجتمعات ذات الدخل المنخفض. ومع ذلك، هناك حاجة إلى مزيد من البحث باستخدام منهجيات صارمة لتقييم فعالية التكلفة والأثر طويل الأمد لهذه البرامج. ينبغي على صانعي السياسات أن يفكروا في دمج هذه التدخلات في استراتيجيات الصحة العامة الأوسع لمعالجة انعدام الأمن الغذائي كمحدد اجتماعي للصحة.

الكلمات المفتاحية :انعدام الأمن الغذائي، التدخلات الغذائية، النتائج الصحية، المجتمعات ذات الدخل المنخفض، المحددات الاجتماعية للصحة.