REVIEW OF RESEARCH ON INTERVENTIONS AIMED AT ADDRESSING FOOD INSECURITY AMONG COLLEGE STUDENTS

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Abstract

About three in five college students are food insecure. Students can participate in the Supplemental Nutrition Assistance Program (SNAP) to address their insecurity, but complex enrollment processes might have prevented many students from enrolling. It is critical for postsecondary administrators to address students' food insecurity because it is associated with lower achievement. A systematic review focused on food insecurity was conducted and fifteen articles were found. The evidence is limited as many studies did not use a rigorous study design. However, there were three large scale randomized studies. Two yielded null results. The authors reported low utilization of the food distribution programs in these studies. The third examined a meal voucher program that showed promising results on academic outcomes.

Keywords: food insecurity, college students, food distribution, meal vouchers, basic needs

Introduction

Since 2015, The Hope Center for Student Basic Needs at Temple University has conducted the largest national survey to assess college students' basic needs. In the latest wave of the survey—administered between January 2023 and July 2024—74,350

students from 91 postsecondary institutions across 16 states completed the Student Basic Needs Survey. Based on the responses, about three in five students reported facing basic needs insecurity, such as food, housing, healthcare, etc. This dispelled the myth that college students are traditional students straight out of high school, have financial support from family, and are attending school full-time (The Hope Center for Student Basic Needs, 2024).

College students experiencing food insecurity may receive assistance to purchase groceries through the Supplemental Nutrition Assistance Program (SNAP), formerly known as food stamps. SNAP can provide significant financial assistance to alleviate food insecurity, but many who qualify do not enroll. This disparity in the number of people eligible for SNAP and those who actually enroll is colloquially referred to as the 'SNAP gap'. This gap may be due to the program's complex eligibility rules and application processes (Hilliard & McKibben, 2023). In 2018, the U.S. Government Accountability Office (GAO) found that just 31% of college students who met SNAP income limits reported receiving benefits, while 69% of potentially eligible college students did not receive the benefit (U.S. Government Accountability Office, 2018). This clearly indicates a non-negligible student SNAP gap. Hence, many college students are facing unaddressed food insecurity that may impact their academic performance and success in college.

Relationship between Food Insecurity and Achievement

A literature review of the relationship between experiencing food insecurity in college and academic achievement found that food insecurity was negatively associated with academic performance. Most of the articles that examined the relationship between food insecurity and academic performance used grade point average (GPA) as the academic measure. Though academic success means more than just GPA (such as persistence, graduation, sense of belonging), GPA is one of the more straightforward approaches of measuring academic success.

Among the 15 articles that focused on college students' GPA as an academic outcome, 11 suggested a negative association between food insecurity and GPA (Elzein, 2017; Phillips, McDaniel & Croft, 2018; Camelo & Elliott, 2019; Hickey, Shields, & Henning, 2019; Van Woerden, Hruschka, & Bruening, 2019; Weaver et al, 2020; DeBate et al, 2021; Leung et al, 2021; Zigmont, Linsmeier, & Gallup, 2021; Marmolejo et al, 2022; Tin et al, 2022). Four found no relationship between food insecurity and overall GPA (Maroto,

Snelling, & Linck, 2015; Hagedorn & Olfert, 2018; Raskind, Haardörfer, & Berg, 2019; Ryan et al, 2022). The latter four studies that suggested a null relationship between food insecurity and GPA all employed self-reported GPA as the outcome measure, indicating potential bias by using self-reported data to measure academic outcomes. Of the three retrieved articles that reported on college students' persistence as an academic outcome (Silva et al, 2017; Weaver et al, 2020; Mechler et al, 2021), two indicated a significant negative relationship between food insecurity and persistence (Silva et al, 2017; Mechler et al, 2021). Though none of these studies provided causal evidence (that is, food insecurity causes a college student to achieve poorer academic outcomes), evidence of a negative association should still warrant concern that this association could have implications for college retention and completion (Maroto, Snelling, & Linck, 2015) and may have implications for students trying to graduate "on time." After all, success in postsecondary education often means success in employment (Weaver et al, 2020).

Scope and Objective of Paper

To address college students' food insecurity, postsecondary administrators should know what evidence-based food interventions or programs work. This paper describes a systematic review that was conducted of existing research focused on examining the impact of food insecurity interventions or programs on college students facing food insecurity. Specifically, we want to know the extent of the research evidence base for food insecurity interventions aimed at addressing college students' food insecurity. Knowing what works, beyond SNAP, will have tremendous implications for how postsecondary administrators should approach college students' food insecurity.

Method

Time Period of Search

We used Harzing's (2007) Publish or Perish software to search Google Scholar for articles on food insecurity and college students in the Unted States published between January 2015 and January 2023. Our search started in 2015 because The Hope Center first administered its national survey on college students' basic needs in 2015. In addition, it is around 2015 that researchers, policymakers, and postsecondary administrators started to pay attention to college students' basic needs insecurity. We conducted the Google Scholar search in January 2023. Google Scholar was chosen as the search engine because it is

known to have broad coverage compared to other search engines and thus, it allows for access to grey literature. Given that college students' basic needs is a relatively new field of study, we suspect that there will be more relevant articles published outside of peer-reviewed academic journals.

Keywords and Boolean Used

We used the following keywords in our search: 'food insecurity', 'food security', 'food insecure', and 'food secure'. We also searched for articles using the keyword 'food pantry' as pantries are currently the most popular food support on college and university campuses (Speirs et al, 2023). To ensure relevant results that focused on college students in the United States, we also added the following search string to each of the keywords: AND 'student' AND 'college' OR 'university' OR 'postsecondary' AND 'United States.'

Screening Retrieved Articles

The search yielded a total of [*n*=4,996] articles. We then screened the retrieved articles in two steps due to the large number of hits. First, we reviewed the title, abstract, and/or full text of each article as necessary to confirm that it met the criteria for inclusion in this review. Besides excluding articles on non-U.S. college students, we also excluded master's theses, opinion pieces, non-empirical articles (though review articles or meta-analyses of empirical studies are included). In addition, articles where food insecurity was not a primary focus were also excluded (e.g., not measured or assessed directly but mentioned only in passing). However, we kept research studies in grey literature, such as reports posted by researchers on their institutions' websites or dissertations.

Many articles [*n*=347] still remained after screening. When we examined these articles, they can be classified into various, disparate categories such as prevalence rates of food insecurity, focus on specific populations, mental health outcomes, and/or academic outcomes, pandemic related, systematic reviews of food insecurity prevalence rates, measuring food insecurity, SNAP, food pantries and resources etc. Thus, for the second step, we specifically looked for research studies that examined food intervention programs that addressed food insecurity among college students. The articles remaining from this second step of screening formed the basis of our systematic review.

Table 1 provides details of the retrieval process. This includes the keywords used, the exclusion criteria employed, the date of the search conducted, and the number of

articles retrieved for the review. In addition, Figure 1 presents the overall steps that were used in this paper's systematic review process. This starts from defining the scope and objective of the systematic review, to the screening and review process, and ends with the articles that met the final criteria for synthesis. Our systematic review process was adapted from the Cochrane handbook (Higgins et al, 2023).

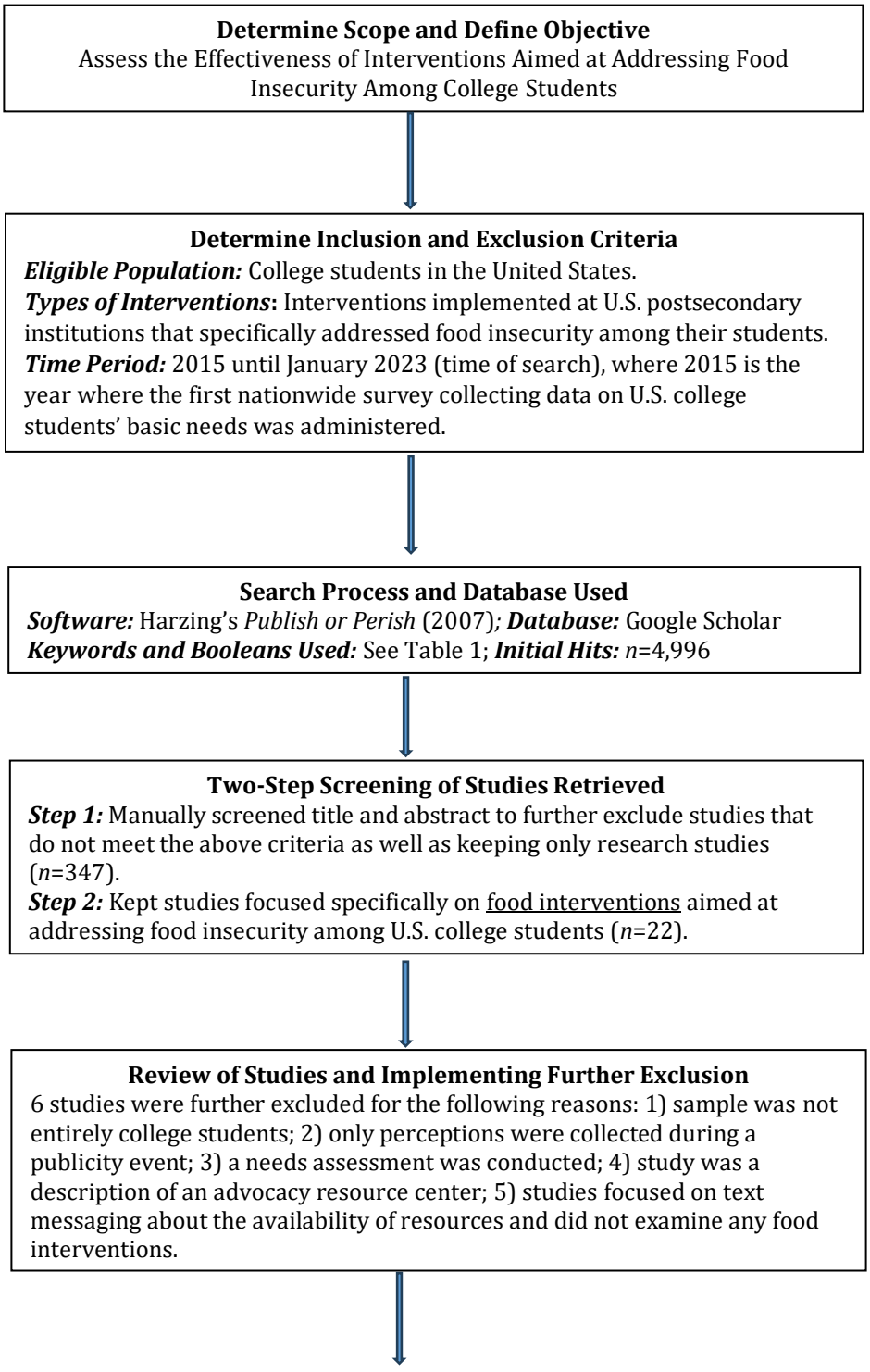
Table 1

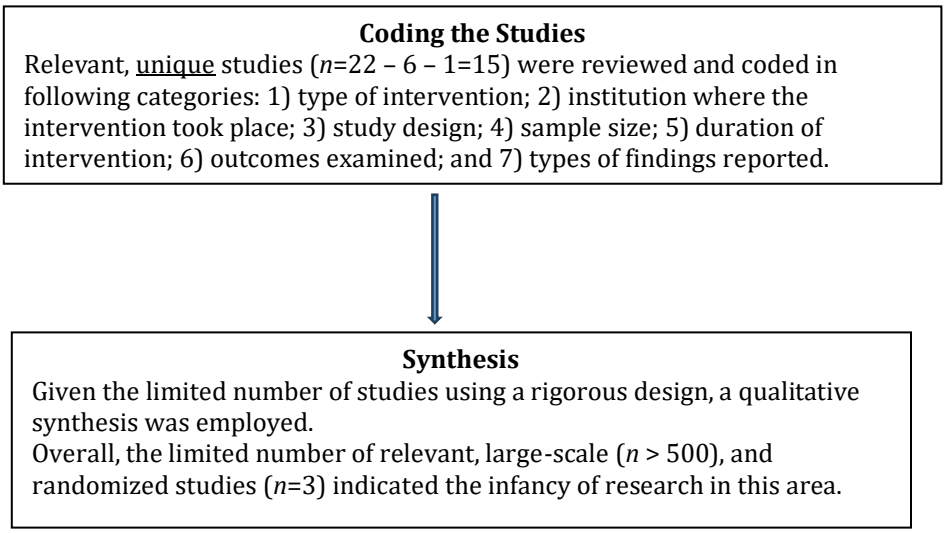
Parameters Used for Searching Relevant Articles on Food Insecurity Among College Students in the United States

Software	Harzing's *Publish or Perish* (2007)
Database Searched	Google Scholar
Main Keywords Used	'food insecurity' 'food security' 'food insecure' 'food secure'
Other Keywords Used	'food pantry'
Boolean Terms Used	Search string added to each of the keywords: AND 'student' AND 'college' OR 'university' OR 'postsecondary' AND 'United States'
Exclusion Criteria	• Not in the United States • Not postsecondary • Opinion pieces or non-research • Food insecurity not a primary focus • Prior to 2015 publication date
Search Date	January 23rd, 2023
Initial Total Number of Hits	4,996 articles
Number of Hits Focused on Interventions after Screening	21 + 1 about to be published article (March 2023) that came to the authors' attention when the search was just completed

Figure 1

Flowchart on the Systematic Review Process, as Adapted from the Cochrane Handbook





Number of Articles Retained for Review

Based on the systematic review process presented in Table 1 and Figure 1, we retained 21 articles that focused on interventions aimed at addressing college students' food insecurity. In addition, a journal article that was about to be published right after our search ended was brought to our attention. Since it is a relevant article focused on an intervention related to food insecurity, we also included the article in our review. Thus, we retained a total of 22 articles focused on food insecurity interventions for college students.

Further Exclusion

Upon further review, we deemed six of the articles were not relevant because they did not examine and evaluate an intervention that was specifically focused on addressing college students' food insecurity. For example, two of the studies focused on randomizing text messages to students and providing more information about available resources but these studies did not examine the effectiveness of any food insecurity interventions per se. The specific reasons for excluding each of the six articles are as follows:

1. Study participants were not entirely college students.
2. Only students' perceptions were collected during a publicity event.
3. A needs assessment was conducted prior to developing a food program.
4. A case study describing the implementation of an advocacy resource center.
5. Two studies focused on randomizing text messages to students that provided information on the availability of benefits or on food assistance resources.

Results

Types of Intervention

After further exclusion, 16 articles remained but two of the articles were the same study with the same findings. Hence, only 15 unique articles were retained to be reviewed, coded, and synthesized. Of these 15 articles that examined food insecurity interventions, we classified the interventions into two types—educational interventions or food distribution interventions. Study designs were primarily either randomized studies or pre-post (i.e. before and after intervention) design on a single sample. One study was a quasi-experimental design using matched comparison. Three articles used a descriptive design. Table 2 shows the studies that were reviewed, coded, and synthesized by type of intervention, study design, and findings. Given the differences in types of intervention and the limited number of studies that used a rigorous design (such as a randomized study or a quasi-experimental study), synthesizing through summarizing with an overall effect size estimation across the studies was not possible. Instead, we conducted a qualitative synthesis where we reviewed each study and drew common themes from them where possible (McKenzie & Brennan, 2023). Below, we synthesized the findings from the education interventions separately from the food distribution interventions.

Table 2

Articles Reviewed and Coded by Type of Intervention, Study Design, and Findings

Type of Intervention	Study Design	Type of Findings	Study Citation
Educational (7 studies)	Randomized	Positive	• Macchi & Coccia (2022)
	Pre-Post Design	Positive	• Flynn, George, & Schiffman (2021) • Matias, Rodriguez-Jordan, & McCoin (2021) • El Zein et al (2021)
		Mixed	• Clerkin et al (2021) • Morgan et al (2023)
	Descriptive	Qualitative	• Ahmed et al (2023)
Food Distribution (8 studies)	Randomized	Positive	• Broton, Mohebali, & Goldrick-Rab (2023)
		Null	• Goldrick-Rab et al (2020)

		• Hernandez et al (2021)
Quasi-Experimental	Null	• Baugus (2020)
Pre-Post Design	Positive	• Gamba et al (2021)
	Null	• Alexis et al (2022)
Descriptive	Qualitative	• OoNorasak et al (2022) • Frank (2022) • Frank, Finkbinder, & Powell (2021)

Note. The last two articles – [classified as Food Distribution, Descriptive, Qualitative] – is the same study with the same results. Hence, they were considered as one single study throughout the review.

Educational Interventions

Of the 15 articles that were reviewed, seven studies examined educational interventions. The educational interventions were in the form of videos, workshops, lectures, a cooking curriculum or some combination. In terms of their content, we found that the educational interventions could be of different formats such as cooking classes, a food literacy curriculum or video series, a cooking and nutrition education program, lectures followed by a teaching kitchen lab, or engaging students in discourse on food systems. Some studies reported the duration of the intervention, lasting from 4-weeks to 14-weeks. Three of the studies reported that the cooking curriculum was based on Social Cognitive Theory (SCT). Sample sizes for the studies tend to be small, ranging from 49 to 216. The study samples were primarily convenience samples, though some studies reported recruiting food insecure students or low-income students. One study recruited medical students.

Food Distribution Interventions

Of the 15 articles reviewed, eight of them focused on food distribution interventions. Across these studies, some limited their study participants to low-income students or students experiencing food insecurity or at risk of food insecurity. Others were open to all students. We found a variety of interventions among them, such as food pantries and food distribution programs, free weekly meal programs, free food after catered events, or gift certificates for restaurant delivery or grocery stores. Two of the studies were descriptive studies and another two studies used a pre-post design. One of the pre-post studies was originally a randomized study where participants were randomized to either first receive a

GrubHub restaurant gift card or a grocery gift card and then they switched over to the other type of gift card. However, the findings reported on either intervention (i.e., restaurant gift card or grocery gift card) were based on pre-post analysis. Another article was a quasi-experimental study while the remaining three studies were randomized studies. The randomized studies had the largest sample sizes, with n = 598, 1,000 and 2,000.

Types of Findings across the Studies Reviewed

Table 3 shows the type of intervention, the study design, and whether there were any significant positive findings for each of the relevant studies reviewed. The coding of a study's findings is as follows: 1) a study would be classified as having positive findings when the majority of the main findings presented were significantly positive (i.e. $p < .05$), 2) a study would be classified as having null findings when the majority of the main findings were not statistically significant, and 3) a study would be classified as having mixed findings when the main findings had a relatively equal number of significantly positive and negative/null findings. Qualitative studies were not coded according to positive, null, or mixed findings and were labeled as qualitative findings since these studies tended to select positive quotes as part of their presentation of findings.

Table 3

Type of Intervention, Study Design, and Findings of Relevant Articles Focused on Food Insecurity Interventions

Type of Intervention	Study Design	Type of Findings	# of Studies	Specific Outcomes
Educational (7 studies)	Randomized	Positive	1	(+) Increased health views, reciprocal determinism, self-efficacy (+) Increased fruit and vegetable intake (0) Null on nutrition knowledge and outcome expectations
	Pre-Post Design	Positive	3	(+) Increased food security and self-efficacy (+) Decreased stigma and perceived stress

		Mixed	2	(+) Increased food literacy, self-efficacy, and confidence (+) Increased vegetable intake for females (-) Decreased vegetable intake for males (0) Null on food security
	Descriptive	Qualitative	1	(Positive quotes were presented)
Food Distribution (8 studies)	Randomized	Positive	1	(+) Completing more credits (+) More students graduating (0) Persistence
		Null	2	(0) Food security (0) Dietary intake (0) Sense of belonging, levels of stress (0) Academic outcomes
	Quasi-Experimental	Null	1	(0) Retention, persistence
	Pre-Post Design	Positive	1	(+) Food security
		Null	1	(0) Food security (0) Total Health Eating Index (HEI) - 2015
	Descriptive	Qualitative	2	(Selective quotes presented) (+) Student who used the program more often reported more positive perceptions

Note.
(+) Finding was significantly positive
(0) Finding was not significant
(-) Finding was significantly negative

Evidence Base on the Large-Scale, Randomized Studies

Randomized studies are considered the gold standard in educational research (What Works Clearinghouse, 2022). Our review found three randomized studies that also had large study samples (i.e. $n > 500$). Because of their rigor and large sample size, they deserve more attention. Hence, their findings were synthesized to form the evidence base in this systematic review of food distribution interventions aimed at addressing food insecurity among college students.

Two of the randomized studies were conducted at the same institution. One of them focused on a food scholarship program that sent students an email telling them they could pick up a card that could be used for redeeming groceries at an on-campus market every other Friday. The other was a weekly food distribution program. In the food distribution program, the food distribution lasted four hours and the experience was made to resemble a farmer's market experience. The programs in these two studies targeted low-income students. In both studies, the findings were null and not statistically significant. The authors for both studies reported low utilization of the programs which could be an explanation for the null findings. Specifically, one study reported half of the randomly assigned treatment students did not engage with the program at all while the other study reported only one third of the randomly assigned treatment students utilized the program.

The third randomized study focused on a meal voucher program and found a positive relationship between the intervention and some academic outcomes. Specifically, students randomly assigned to the treatment group completed more credits and were more likely to graduate. However, the outcomes did not hold after three years.

Overall, a meal voucher program was found to be effective, at least in the short-term. The other two large-scale, randomized studies that focused on some type of food distribution program did not yield positive results. Meal vouchers seem to be a promising intervention. Thus, it remains that more research on meal voucher programs is needed to solidify the evidence base.

Discussion

In summary, the major takeaways from this systematic review on interventions aimed at addressing food insecurity among college students are as follows: For studies that were focused on educational interventions, there is limited evidence. This is because most studies used a weak study design such as a pre-post design and/or had a small study sample. Studies focused on food distribution interventions were a mix of study designs. Those that were randomized studies were large scale (i.e. $n > 500$) and thereby provided the strongest evidence on the impact of interventions aimed at addressing food insecurity among college students.

Two of the large-scale randomized studies focused on the distribution of groceries via a food scholarship program or a food distribution program and the findings were null.

The authors reported that there was low utilization of the programs by students randomly assigned to these programs. Half to two-thirds of the treatment students did not utilize the programs.

The third randomized study focused on a meal voucher program and found positive impact on academic outcomes such as credits completed and graduation rates, but those positive changes did not persist after three years. For example, null findings were found for persistence. Therefore, it remains to be seen if a meal voucher program is definitively more effective in addressing food insecurity among college students compared to a food distribution program.

Implications and Recommendations

This systematic review suggests that certain strategies may be able to effectively address college students' food insecurity, at least in the short term. Based on this evidence base, we will discuss its implications and recommendations separately for research, practice-and-research partnership, and policy. The purpose of discussing separately is only for organizational purposes of this paper. Ultimately, researchers, practitioners, and policymakers must collaborate to truly address food insecurity among college students.

Research

As seen in our review, the only randomized study that yielded positive results is the meal voucher program which was conducted at only one institution. To build up the evidence beyond one institution, more studies are needed in other settings with other types of student populations. In addition, the study only found positive impact in the short-term. Thus, it might be worthwhile to investigate what drives the short-term impact and why there was no impact in the long-term. There is not only a need for more expansive studies but also a need for studies that more deeply investigate the short-term impacts of this intervention program and whether there are any program features that might drive long-term impact.

Practice and Research Partnership

Postsecondary institutions are addressing students' food insecurity in various ways such as food pantries, meal swipes, and food recovery (Community Commons, n.d.). However, our review showed a lack of rigorous research done to evaluate the effectiveness of these programs. To expand the small evidence base of effective interventions,

practitioners should seek to incorporate evaluation measures into the design of new or existing programs—ideally with the support of their institutional research and/or faculty colleagues. If researchers can provide meaningful feedback about whether these interventions are helping students, practitioners will be able to effectively design programs that truly meet students' needs.

For example, one of the issues raised with the food scholarship and food distribution programs that we reviewed was the low utilization rates of the programs by study participants. This points to the need for colleges and universities to evaluate and address barriers that prevent students from participating in the programs such as social stigma, lack of information on program participation policies, and inconvenient hours (El Zein et al, 2018). If practitioners address issues that would help increase utilization, then the programs might be able to provide the support that food insecure students needed. Practitioners and researchers should partner on investigations that can reveal the key barriers to students' utilization of available resources as well as to understand how interventions may meaningfully reduce or eliminate those barriers.

Policy

Lastly, there are ways for policy and advocacy work to occur to address college students' food insecurity. In addition to raising awareness with state and federal entities, school administrators and researchers should also advocate for funding for high quality, replicable research studies of new or existing basic needs programs. Institutions might have already exhausted their limited resources in implementing the program without funding left for research and feedback. Thus, there is a need to advocate for research funding. The findings and feedback from such studies will be valuable to practitioners for identifying and implementing evidence-based best practices. This would potentially avoid delivering ineffective programs to students.

Limitations

There are a few limitations to this review as we consider the evidence base on interventions aimed at addressing food insecurity among college students. First, this review is limited to college students in the United States. Our main reason for doing so is due to the significant differences between how postsecondary institutions and the social safety net (i.e., resources for food, housing, and other basic needs) are organized and

funded in the United States versus other countries. There might be limitations on the transferability of interventions to non-U.S. contexts.

In addition, we only used Google Scholar as the database for the search. Google Scholar covers a wide range of publications and resulted in an extensive number of hits as indicated by the *n*=4,996 hits we initially obtained. Given the infancy in this field on college students' food insecurity, we wanted to include grey literature, such as reports, or white papers found on websites. For this reason, Google Scholar is the most appropriate search engine.

Finally, the literature search for this review was conducted at a distinct point in time and limited to articles published from 2015 to 2023. A different time period might yield a different set of studies. For example, the study that examined the meal voucher program was only found after we had already conducted our literature search in Google Scholar. This particular study was about to be published when we started our review. If this study was not included, it might have changed this review's conclusions about the evidence base.

Conclusion

Given the large-scale randomized studies we reviewed, it appears that meal voucher programs have a potentially positive impact on student academic outcomes in the short-term while food scholarship or food distribution programs yielded null results.

Food insecurity among college students is a pressing issue, given that 41% of college students are food insecure (The Hope Center for Student Basic Needs, 2024). While SNAP enrollment may be one way for students to address food insecurity, enrolling in SNAP may pose a challenge for many students due to the complexity in enrollment and lack of awareness by students about their eligibility. Postsecondary institutions should prioritize the issue of addressing food insecurity as it is found to be negatively associated with academic success. More work needs to be done to not only build-up the limited evidence base on interventions aimed at addressing college students' food insecurity but also create a tighter partnership between researchers, practitioners, and policymakers to work closely together to truly address food insecurity among college students.

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