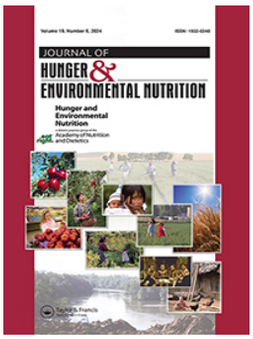

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A Mixed-methods Study of Nutrition-focused Food Banking in the United States

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ABSTRACT

Using an embedded mixed-methods approach, this study assesses efforts to improve nutritional quality of inventory at food banks. All else equal, food banks with medium and high levels of nutrition-focused food banking strategy adoption had lower mean percentages of unhealthy inventory compared to those with none. Despite positive progress in the charitable food system as a whole, national key stakeholders identified several challenges, including cost and donor reliance, in continuing this work. Findings highlight the significant progress of food banks to adopt nutrition-focused strategies and distribute healthier foods and underscore the role these strategies may have in shaping inventory quality.

KEYWORDS

Mixed methods research; food bank; community nutrition; fruits and vegetables

Introduction

Background

Food insecurity, defined as the lack of physical, social, or economic access to safe, sufficient, nutritious food necessary for a healthy, active life, remains a persistent concern in the United States (U.S.) with more than 10% of households experiencing food insecurity in 2019.[1] Food insecurity is associated with decreased diet quality[2,3]; higher risk of several diet-related diseases[4,5]; and other negative physical and mental health outcomes.[6] Although the federal food assistance programs (e.g., Supplemental Nutrition Assistance Program (SNAP), school meals) provide resources for low-income families to access food,[7] an estimated 46.5 million Americans rely on the charitable food system to supplement household food acquisition each year.[8,9]

The charitable food system was originally intended as a short-term solution for economically or socially disadvantaged individuals; however, due to demand, it has grown into a complex and sophisticated network of

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Supplemental data for this article can be accessed on the publisher's website.

suppliers, warehouses, transportation vehicles, philanthropic organizations, and volunteers that provides food for the chronically hungry.[10–13] Food banks are the warehouses situated at the center of this system[14]; purchasing or acquiring food donations from retailers and through government programs (e.g., The Emergency Food Assistance Program[15] and then redistributing food through direct-service sites (i.e., food pantries, communal dining programs).

In response to evidence that the families served by the charitable food system also experience high rates of chronic diet-related diseases,[9] there have been efforts to improve the nutritional quality of inventory in the charitable food system.[13,16,17] Two strategies recommended for food banks are (a) implementing a nutrition profiling system and (b) adopting a nutrition policy.[17,18] Implementing a nutrition profiling system involves quantitatively scoring the nutritional value of a food bank's inventory in order to help them identify and source healthful foods.[19,20] A benefit of this strategy is that data on the nutritional status of the inventory can be shared with funders, donors, board members, and others; however, sustained implementation may require substantial nutrition expertise.[10,18] This has led to calls for more research assessing if these systems improve nutritional quality of inventory.[18]

Nutrition policies typically outline specific steps a food bank take to increase the proportion of healthful inventory and decrease the distribution of unhealthy foods.[16] Although policies have the potential to create sustained, systemic changes to food bank inventory, there is some evidence that they can be difficult to implement.[10] Although one small study that examined the relationship between having a nutrition policy and the nutritional quality of the inventory among six California food banks did not find a significant association between the two,[21] additional research is needed to assess the prevalence and impact of adopting nutrition policy.

Previous research from Fisher and Jayaraman (2018) found that despite the standards imposed on food banks by Feeding America and government entities, immense variation exists between each organization with respect to its food sourcing, political stances, and programming.[22] Factors that shape these variations in food bank operation include the size, geographic service area, leadership, history, and the organizational disposition of each food bank.[22] Regional political affiliation has also been shown to be an influential factor in health policy adoption.[23–25] The aim of this study is to consider the national landscape of food banks in the U.S. and examine how they have responded to recent trends to improve the nutritional quality of food bank inventory. To better understand this phenomenon given differences in food bank operations, this study also incorporates contextual and organizational characteristics of food banks in its examination of nutrition-focused food banking.

Methods

Study Design

The current study used an embedded mixed-methods design. To assess the prevalence and impact of nutrition-focused food banking strategies, we quantitatively assessed the presence of these strategies and the nutritional quality of food inventory among a national sample of food banks using data collected in the 2017 MAZON National Food Bank Survey Assessment of Nutrition Practices and Policies in combination with other publicly available data.[26] We qualitatively assessed perspectives of the current state of nutrition-focused food banking among a sample of 10 national stakeholders including representatives from academic research; policy advocacy; the national food bank association; and direct service organizations. The quantitative study was deemed exempt from review by the Institutional Review Board at the University of Connecticut, and the qualitative study was deemed exempt from review by the Institutional Review Board at the University of California Los Angeles.

Quantitative Assessment

MAZON National Food Bank Survey Assessment of Nutrition Policies and Practices

The purpose of the national survey was to assess the range of nutrition policies and procedures employed by food banks and examine how they are associated with the nutritional quality of their inventory.[26] Food banks were defined as any U.S-based organization that serves agencies such as food pantries, soup kitchens, or other meal providers. The total target population was 310 food banks: these included Feeding America members and affiliates (n = 202), as well as independently operated organizations identified by MAZON through an internet search for food banks in every state (n = 108).

In May 2017, all Chief Executive Officers, Chief Operation Officers, and nutrition managers (if applicable) were emailed an invitation and link to complete the online survey.[27] Recipients from each food bank were asked to coordinate and select one representative from each organization to complete the survey. Participation was voluntary and there was no monetary incentive for participation. Reminder e-mails were sent to non-responders at 2 weeks and 3 weeks after the initial invitations. A total of 196 (63%) food banks completed the survey. The survey included 22 items and took approximately 20 minutes to complete.

Measures

Inventory Assessment

Respondents were asked to consider their overall annual inventory and estimate the percentage comprised from six categories of foods: (a) fresh produce (i.e., fruits and vegetables); (b) soda; (c) other sugar-sweetened beverages (e.g.,

energy/sports drinks, fruit drinks, bottled coffee/tea drinks, etc.); (d) sweet snack foods and desserts (e.g., cookies, cakes, bakery products, etc.); (e) savory snack foods (e.g., crackers, chips, etc.); and (f) candy. The response scale included ranges from 0%, 1–2%, 3–4%, 5–10%, and then 5% increments up to 100%. Responses for each food type were recoded into the mean value within the selected range. The analyses used the value for fresh produce, and then the sum of the remaining foods (i.e., unhealthy foods).

Nutrition Tracking System

Respondents were asked about their food bank's use of a nutrition tracking system. Response choices were as follows: (a) Broad Foods to Encourage (F2E); (b) Detailed Foods to Encourage (DF2E); (c) Choose Healthy Options Program (CHOP); (d) Customized tracking system; (e) Do not currently use a system to track nutritional quality of inventory. Responses were recoded as either yes if the respondent reported using DF2E, CHOP, or customized tracking system and no if the respondent reported do not currently use a system to track nutritional quality of inventory. Because of its broad categorization of products and limited accuracy, food banks reporting using F2E were also recorded as no.

Nutrition Policy

Respondents were asked if their food bank had (a) formal, written nutrition policies to promote the distribution of healthful foods and beverages; (b) informal nutrition guidelines to promote the distribution of healthful foods and beverages; or (c) no policies or guidelines.

Nutrition Strategy Adoption

Responses to the nutrition tracking system and nutrition policy items were combined and categorized into four groups: none, low, medium, and high. Food banks that reported having neither a nutrition tracking system or nutrition policy were categorized at none. Those who reported having a nutrition tracking system or an informal nutrition guideline policy were categorized as low. Food banks with a nutrition tracking system and informal nutrition guideline were categorized as medium. Those with a nutrition tracking system and formal nutrition policy were categorized as high.

Inventory Stream

Respondents were asked to estimate the percentage of their inventory that was: (a) purchased; (b) donated; and (c) from government sources, so that the total equaled 100%. The values assigned to each inventory stream were used as continuous variables.

Socio-demographic Variables for Each Food Bank

Organization Size

Form 990 tax returns were obtained from Charity Navigator, a website that aggregates and makes publicly available basic data from 1.8 million nonprofit organizations in the U.S.[28] Fiscal year 2017 annual revenue for all of the food banks in the sample was used create size tertiles.

Service Area

The location and service area for each food bank was identified at the county level using the 2017 Map the Meal Gap data or individual food bank websites. If the service area was unclear on the individual food bank's website, food banks were contacted by phone or e-mail to identify the counties served. Service area data were matched to the 2010 Census Geographic regions.

Region

The location of each food bank was used to assign it to one of four U.S. regions: West, Midwest, Northeast, or South.

Area Need

Area need for each food bank's service area was quantified using the percent of households receiving SNAP benefits and the 5-year estimates of county-level food insecurity based on the 2017 American Community Survey.[29]

Conservative Political Landscape

This variable was operationalized as the percent of voters in the service area that voted Republican in the 2016 presidential election using the County Presidential Election Returns.[30]

Statistical Analysis

Analysis were conducted in Stata 14.2.[31] Descriptive statistics were calculated for the full sample. A Shaprio–Wilk's normality test indicated that the distribution of the fresh produce and unhealthful inventory values were non-normal. A histogram analysis of the fresh produce inventory variable indicated that it was sufficiently normal for use in a linear regression analysis. A log transformation of the unhealthful inventory variable was used to address non-normality of the variable. Linear regression models were used to test the relationship between the use of nutrition-focused food banking strategies and the nutritional quality of food bank inventory controlling for size, inventory stream, region, area need, and area conservativeness. To facilitate interpretation of the model, we mean-centered continuous covariates and scaled by

100. We restricted the analysis to observations that had no missing data on the outcome or any of the covariates, which reduced the sample size to 172 for fresh produce inventory and 158 for unhealthful inventory.

Qualitative Assessment

Participants

Ten individuals were identified for semi-structured, in-depth key stakeholder interviews. We purposively selected representatives from five stakeholder groups: academic researchers; policy advocates; national food bank association staff members; representatives of direct service organizations; and food and beverage donors. Several attempts were made to interview a representative of a food and beverage donor; however, no one from this sector was willing to be interviewed for the study. A senior staff member at MAZON invited key stakeholders from all organizations to participate via e-mail. If the representative expressed interest in participating in the interview, SER contacted the individual to schedule the interview. For individuals who did not respond, two additional follow-up attempts occurred by e-mail.

Data Collection Procedures

Interviews

The semi-structured interviews occurred using the VoIP (Voice over Internet Protocol) software Zoom and were digitally recorded. Participants provided verbal consent prior to beginning the interview. SER conducted each interview, which lasted approximately 60 minutes. At the end of each interview, we collected demographic information for each participant.

The semi-structured interview guide (*see Supplemental Table 1*) was developed based on a review of the existing literature. It included three topic areas: 1) understanding how organizations within the charitable food system promote healthy eating, including barriers, facilitators, and its effect on relationship with dependent organizations; 2) exploring how efforts to promote healthy eating are implemented and sustained; and 3) describing any innovations in the sector that have resulted from the promotion of healthy eating.

Analysis

Interviews were transcribed and validated using secure transcription service. SER coded and analyzed the transcripts using the constant comparison analysis method employed in the qualitative descriptive approach to achieve straightforward description of a phenomena.[32] Coding was completed using Dedoose version 8.1[33] using an initial codebook based on the semi-structured interview guide[34] that was iteratively revised as emergent codes were added,

and finalized after coding all 10 interviews. A sub-analysis was conducted of select codes: progress, barriers to inventory change, coordination, and the future of inventory change.

Results

Survey

Table 1 presents the characteristics of the survey sample in total. More than half of food banks in the sample had a formal nutrition policy. A little more than one-quarter of food banks (26.4%) reported having a nutrition tracking system. About 10% of food banks had no nutrition focused strategy adoption. On average, 59% of food bank inventory came from donations. About one third of food banks were located in the West with another 29.7% located in the South, 17.4% in the Northeast, and 20.9% in the Midwest. On average, one-quarter of food bank inventory was made up of unhealthy inventory and 31% of inventory consisted of fresh produce.

Table 1. Sample Characteristics of Food Banks in Total (n = 178).

Characteristics	Total Mean (SD) or %
Organizational	
Nutrition Policy	
None	9.9
Informal	34.3
Formal	55.8
Nutrition Tracking System	
No	73.6
Yes	26.4
Nutrition Focused Strategy Adoption	
None	10.3
Low	19.7
Medium	56.3
High	13.7
Organization Size	
Small	26.7
Medium	36.1
Large	37.2
% Donated Inventory Stream	0.59 (0.20)
Contextual	
U.S. Region	
Midwest	20.9
Northeast	17.4
South	29.7
West	32.0
% Area Need	0.13 (0.046)
% Political Conservativeness	0.49 (0.14)
% Fresh Produce Inventory	0.31 (0.16)
% Unhealthy Inventory	0.25 (0.23)

Note: Because of missing data, some summary statistics presented here were calculated with a smaller sample size than reported in the table. Percentages may not sum to 100 due to rounding. Percentages may not sum to 100 due to rounding

The results of the logistic regression models predicting nutrition focused strategy adoption are presented in Table 2. With respect to nutrition policy, food banks in the Midwest and Northeast had significantly lower odds of adoption as compared to food banks in the Western U.S., (OR = 0.29 CI 0.10, 0.85) and (OR 0.27 CI 0.089,0.79), respectively. Area need was also associated with nutrition policy adoption such that food banks with higher mean averages of need in their service area had lower odds of adoption (OR = 0.92 CI 0.22, 0.99). All else equal, both small and medium-sized food banks had lower odds (OR 0.31 CI 0.11, 0.86) and (OR 0.35 CI 0.15, 0.82), respectively – of adopting a nutrition tracking system as compared to large food banks. Similarly, food banks located in the Midwest region had lower odds of tracking system adoption as compared to food banks located in the Western U.S (OR = 0.24 CI 0.070, 0.81).

Table 3 presents the results of the linear regression model for fresh produce inventory. Nutrition-focused food banking strategy adoption was not significantly associated with fresh produce inventory quantity. However, as compared to food banks located in the Western U.S., food banks in the Midwest, South, and Northeast had significantly lower average percentages of fresh fruits and vegetables (7.8%, 8.5%, and 8.2%, respectively). Additionally, each unit increase in political conservativeness above the mean was associated with an average decrease of 0.29% in fresh produce inventory.

Table 4 presents the results of the linear regression model for the log-transformed outcome, unhealthy inventory. Nutrition-focused food banking strategy adoption had a significant relationship with unhealthy inventory quantities. All else equal, food banks with medium and high levels of nutrition focused food banking strategy adoption had an average 45% decrease in the geometric mean of unhealthy inventory compared to food banks with none. Inventory stream was also significantly associated with unhealthy inventory

Table 2. Logistic Regression Models Predicting Nutrition Policy and Nutrition Strategy Adoption.

Characteristics	Nutrition Policy Adoption (n = 176) OR (95% CI)	Nutrition Strategy Adoption (n = 178) OR (95% CI)
Organizational		
Organization Size		
Small	0.44 (0.17, 1.12)	0.31 (0.11, 0.85)*
Medium	0.66 (0.30, 1.47)	0.35 (0.15, 0.82)*
Large (ref)		
Inventory Stream	0.99 (0.98, 1.01)	1.0 (0.98, 1.02)
Contextual		
U.S. Region		
Midwest	0.29 (0.10, 0.85)*	0.24 (0.070, 0.81)*
Northeast	0.27 (0.089, 0.79)*	0.93 (0.33, 2.62)
South	0.59 (0.22, 1.55)	0.63 (0.23, 1.75)
West (ref)		
Area Need	0.92 (0.85, 0.99)*	0.94 (0.87, 1.03)
Political Conservativeness	0.98 (0.95, 1.01)	1.01 (0.98, 1.04)

*p < 0.05, ** p < 0.01, *** p < 0.001

Table 3. Linear Regression Model Predicting Fresh Produce Inventory among a National Sample of Food Banks (n = 172).

Characteristics	β (SE)
Organizational	
Nutrition Strategy Adoption	
None (ref)	
Low	−0.0065 (0.044)
Medium	−0.0038 (0.039)
High	0.026 (0.027)
Organization Size	
Small	−0.031 (0.032)
Medium	−0.0081 (0.027)
Large (ref)	
Inventory Stream	0.00013 (0.00061)
Contextual	
U.S. Region	
Midwest	−0.078 (0.035)*
Northeast	−0.085 (0.035)*
South	−0.082 (0.033)*
West (ref)	
Area Need	−0.0029 (0.0026)
Political Conservativeness	−0.0029 (0.00095)**
Intercept	0.38 (0.046)***

*p < 0.05, ** p < 0.01, *** p < 0.001

Table 4. Linear Regression Model Predicting Log Transformed Unhealthy Inventory among a National Sample of Food Banks(n = 161).

Characteristics	β (SE)
Organizational	
Nutrition Strategy Adoption	
None (ref)	
Low	−0.50 (0.26)
Medium	−0.79 (0.23)***
High	−0.79 (0.29)**
Organization Size	
Small	0.093 (0.19)
Medium	0.039 (0.17)
Large (ref)	
Inventory Stream	0.013 (0.004)***
Contextual	
U.S. Region	
Midwest	0.36 (0.21)
Northeast	0.31 (0.22)
South	0.51 (0.20)*
West (ref)	
Area Need	0.0053 (0.016)
Political Conservativeness	0.016 (0.0056)**
Intercept	−1.47 (0.27)***

*p < 0.05, ** p < 0.01, *** p < 0.001

such that each 1% increase above the mean percentage of donated inventory was associated with an average increase of 1.3% in unhealthy inventory. Location in the U.S. was shown to be significant with those food banks located in the South, as compared to those in the West, had an average 67% increase in the geometric mean of unhealthy inventory. Additionally, each percent

increase in above the average percentage of political conservativeness of the service area was associated with an average increase of 1.6% in unhealthy inventory.

Themes from Interviews

The characteristics of the national stakeholders that participated in key informant interviews are presented in Supplemental Table 2. Findings and select quotes for each of the themes are presented in Table 5.

Progress Toward Inventory Change

Participants described an ideological consolidation around the importance of improving the nutritional quality of food distributed in charitable food system. Key factors underpinning this momentum were as follows: increased understanding of the relationships between food insecurity, diet, and health; the work of advocacy organizations such as the Partnership for a Healthier

Table 5. Findings and Select Quotations from National Charitable Food System Key Informant Interviews.

Progress Toward Inventory Change	"There is tremendous, although not universal, recognition that the charitable food system needs to take its role as a provider of food to a really high-risk population seriously. And what that has meant is that there is widespread interest in distributing not just any calorie, but in distributing nutritious calories." "If a food bank is understaffed and low-resourced and there isn't necessarily the time or capacity or feeling of the time and capacity to sit and do that strategic thinking of 'How do we change the way that we do our work?' and those are really adaptive challenges, and those are tricky, then you of course do what you're really good at, and things stay the same."
Challenges for Inventory Change	"And that's where you get into much more difficult conversations around the increased costs of these foods, the lower weight of these foods, the challenges with talking to donors about what foods they do and do not want, the sort of philosophical challenges around, should food banks be purchasing food, or should we only be gleaning food out of the system that wouldn't otherwise be sold." "Well, the reality is, that means we're turning down all this non-nutritious food, because we're getting it whether we want it or not. So, do we tell them to bury all of the brownies and cookies in landfill because we won't distribute them versus everybody deserves a cookie now and then?" "Retailers are incentivized to give more, not better. So, underlying all of this is the fact that the metric that we have used to celebrate the success of the emergency food system is sort of keeping these institutions from making these changes . . . "
The Future of Inventory Change	"That it's almost kind of getting food banks a facelift, where they're no longer seeing this like this dumping ground for Halloween candy and soda and sheet cakes and whatever, but actually that there's a commitment to wanting to give high-quality nutritious food to food banks to making sure that what they distribute is maybe even better or more nutritious than what you can buy at a grocery store." "I think there's still a large portion of people and policymakers who think that food banks are just like last resorts for people, or maybe a place that they turn to once a month or something just to fill these very short-term gaps in food assistance, but that's actually not really the case and hasn't been for a while . . . I think longer term we need to be just more honest about the roles that they play and create a system where they're not constantly playing catch-up but rather they have the resources they need to meet the demand that they face on a regular basis but, obviously, also during a pandemic."

America and [ORGANIZATION]; a new generation of food bank leaders focused on health; as well as the support and buy-in from Feeding America. This collective interest had pushed the sector past old paradigms which emphasized the right to food (*any* food) toward the right to healthier foods.

Beyond this philosophical shift, participants described real progress toward this goal. They attributed a significant increase in the distribution of meat, poultry, dairy, and fresh produce to: investments in necessary infrastructure; identification of new donation sources; efforts of individual food banks; and the backing of Feeding America. Participants also reported that progress had been made to reduce the distribution of certain unhealthy items, namely soda and other sugar-sweetened beverages.

However, many participants felt that more progress was needed. They reported an uneven advancement in nutrition focus among foods banks. Some felt this was due to ideological opposition from food banks, while others explained that the change process required intensive investment. Some participants felt that rural food banks were particularly disadvantaged in these efforts because of their limited food and beverage donor options. For the system as a whole, additional progress in supplying healthier foods required *"going beyond the low hanging fruit"* and posed major operational challenges for the field. Several participants also discussed an ambiguous end goal of these efforts. From a nutrition standpoint, participants felt increasing the distribution of perishable foods and produce while decreasing candy, sugar-sweetened beverages, and snack foods were reasonable goals. But they expressed uncertainty about the extent to which the system should restrict the distribution of unhealthy foods and how it should handle foods that fall outside of those categories (non-whole grains, high fat meats, etc.).

Challenges for Inventory Change

Participants identified several structural barriers to inventory change efforts. Like the progress in the field, these challenges were both philosophical and real. Part of the struggle lay in the how the system had been established. Although participants described increased acceptance of the idea of nutrition-focused food banking and expanded efforts to distribute healthier foods, they also explained that the initial formation and identity of the charitable food system was rooted in entirely different goals. For example, for some, waste diversion remained a salient aspect of the charitable food system mission. Diverting food that would otherwise be thrown away to those in need, has also kept operation costs relatively low for food banks. Several participants noted that the distribution of foods with higher nutritional quality would substantially increase operations costs due to the need to purchase food, as well as the necessary investment in the infrastructure needed to transport, store, and distribute more perishable items.

Another structural challenge noted is the use of poundage as a measure of impact. Both food and beverage donors and food banks are motivated to increase the number of pounds that go through the system, which makes it more difficult to focus on healthier foods. For food banks, the number of meals distributed (where each meal is equivalent to 1.2 pounds of food), is woven into their organizational identity. However, participants pointed out that the use of this metric obscures the types of food that are getting distributed. Often, nutritionally dense foods weigh less than unhealthy food items like soda. Thus, a shift toward the distribution of healthier foods runs the risk of lessening the appearance of a food bank's impact.

A third key structural factor impinging on efforts to increase the distribution of healthier foods is the reliance on food and beverage donations. As food and beverage donations (versus purchased foods) continue to make up the largest source of inventory food banks are left *"at the mercy of donations."* Many participants felt that the nutritional quality of food available in the charitable food system reflected the greater food system, for better and for worse. A few participants felt that the U.S. food system had become healthier in recent years and attributed some of the improvements in charitable food system inventory to this larger change. Moreover, some felt that the bidirectional relationship between the charitable food system and the broader food system presented an opportunity: if organizations within the charitable food system stopped accepting these unwanted, unhealthy donations, companies may ultimately reduce production of these items. In contrast, other participants felt that these items were too valuable and would be channeled to different outlets such as directly to pantries or to dollar stores.

The Future of Inventory Change

For many of the participants, the ultimate vision for the charitable food system was providing a range of foods similar to that of a grocery store. Some felt that this could be best achieved by increasing the value of SNAP benefits and reducing the role of the charitable food system as a regular source of food for food insecure households. Yet, many also felt that the expansion of SNAP was unlikely. Thus, they felt that continued efforts to improve the nutritional quality of distributed foods was important.

Despite these structural challenges, participants described incremental successes and hoped these would eventually institutionalize nutrition-focused banking so that the availability of nutritionally dense foods was the *"norm rather than an exception."* One larger example of progress noted by many participants was the Robert Wood Johnson Foundation Healthy Eating Research Nutrition Guidelines that were published during data collection. Participants also mentioned distributing meal kits of fresh ingredients ready to cook like Blue Apron; increased use of "nudge" strategies (i.e., strategies that

use positive reinforcement and indirect suggestion to influence decision-making and behavior) throughout the system; additional partnerships with hospitals and other health organizations; as well as streamlining networks (i.e., reducing the number of pantries that a food bank works with to better focus resources and efforts). However, a few participants pointed out that without any structural change many of the challenges identified would continue to impede efforts to distribute healthier inventory.

Participants felt that better coordination is needed to engage clients, pantries, and food and beverage donors to increase both the supply and demand of healthier foods. Participants described demand-side initiatives such as nutrition education, nudge programs, and better data to understand client needs and preferences. Participants also felt that food and beverage donor stakeholders were amenable to these efforts.

The importance of coordinating with the government on a variety of issues was also noted. Participants recommended changing regulations to better coordinate with food and beverage donors; developing policies that make it easier for agricultural donors to donate; and providing liability protection to donors. And, because charitable food has become a regular food acquisition strategy for food insecure households, participants also felt that the government could better support the charitable food system with financial resources and inventory. Although recent trade mitigation had inundated food banks with fresh produce and meat, it had also challenged storage and distribution capacity. Moreover, participants highlighted that regularly donated foods from the government do not necessarily align with the goals of nutrition-focused food banking.

Finally, although participants expressed hope that nutrition would continue to be a focus for the system, they expressed concern that other issues may overshadow these efforts. One participant felt that as next steps in became more difficult, the natural tendency would be to look for a new cause. Additionally, several participants talked about the increased focus on addressing the underlying causes of hunger. They described the charitable food system as a key touchpoint where vulnerable populations could be connected to social services above and beyond the supplemental nutrition received at a food pantry. Others anticipated that the pressures exerted on the system by the coronavirus pandemic would detract from nutrition efforts.

Discussion

Taken together, the findings from the quantitative and qualitative analyses highlight the significant progress food banks have made in the last decade to adopt nutrition-focused strategies and distribute healthier foods. Nearly half of food banks reported having a formal nutrition policy and a similar number reported having a nutrition tracking system. This represents formidable

growth, as previous work found less than a quarter of food banks had a policy or ranking system.[10] This improvement was also evident in the interviews, as national stakeholders described clear momentum in shifting attitudes as well as inventories. Data from Feeding America reinforce this point: produce distribution has grown from 5.7% of foods sourced and distributed in 2009 to nearly 36% of all foods sourced and distributed in 2019.[35,36] However, our results also suggest that the growth of nutrition focused food banking is uneven across the system.

Moreover, the system is still rife with unhealthy inventory. National survey respondents reported that an average of 25% of their food bank's inventory was comprised of soda, sugar-sweetened beverages, candy, salty snacks, and sweet snacks. Findings from the interviews helps to explain the simultaneous growth in nutrition-focused food banking strategies while maintaining a sizable percentage of unhealthy inventory. Although all interviewees readily supported initiatives to increase the amount of healthy food (e.g., fruits, vegetables, leans meats) distributed, perspectives diverged on how to manage the unhealthy items flowing through the system. Furthermore, key informants described feeling unclear about the end goal for nutritional quality goals of foods distributed at food banks. In alignment with MyPlate recommendations, previous communication materials from Feeding America indicate a distribution goal of 50% fresh produce by 2025.[37] However, nutrition messaging from Feeding America centers on increased distribution of healthier foods rather than decreasing unhealthy food items in inventories. This ambiguity presents a challenge for food banks working to reduce unhealthy inventory.

The survey findings indicate that the adoption of nutrition focused food bank strategies is associated with lower proportions of unhealthy foods and beverages in a food bank's inventory, suggesting that these strategies may be a useful tool in reducing soda, sugar-sweetened beverages, candy, and sweet and salty snacks. Conversely, strategy adoption was not associated with the fresh produce inventory. This finding makes sense given the general momentum in the charitable food system toward increased distribution of fresh produce described by interviewees in the qualitative study. While these findings have important implications for identifying effective strategies to improve nutritional quality of food distribution at food banks, more rigorous evaluations of these strategies are needed. Efforts to establish more standardized systems of nutrition tracking[19] may provide more robust measures of nutritional quality of inventory which will facilitate future evaluation efforts.

As some national stakeholder interviewees mentioned, health promotion is not the sole mission of the charitable food system and the potential for impact on client health is minimal because the supplemental assistance provided by the charitable food system makes up a small percentage of clients' overall diet. Despite this reticence, recent research indicates that pantries can be influential

food environments for clients and have positive effects on diet-related outcomes including produce consumption.[38] Moreover, previous studies indicate that food pantry clients want the ability to select their own food items with preference for more culturally relevant foods and fresh foods such as produce, protein, and dairy products.[39–41] As most food banks are removed from those receiving the food, creating participatory channels for clients to express their needs and preferences may help better inform inventory decisions.

Quantitative results also show that greater reliance on food and beverage donation was significantly associated with higher levels of unhealthy inventory. This is an important finding given that nearly 60% of food bank inventory comes from donations on average. Fear of losing donors is a frequently cited barrier to turning down unhealthy donations.[16,18,42] However, responses to other items in the survey not analyzed for this study indicate that these fears may be unfounded. A majority of food banks with formal or informal nutrition policies reported that donations levels remained relatively stable or even increased after implementing nutrition-focused strategies with most local and national donors responding positively or neutrally.[26] Even so, food banks may still prefer to turn down unwanted, unhealthy donations as they still incur transportation, storage, distribution or disposal costs for these items. Future research detailing the costs associated with processing unwanted food and beverage donations may provide the economic argument for food banks to decline undesirable donations.

The findings of this study also suggest that waste diversion continues to be a salient component of the charitable food system. Stakeholder perspectives on food banks as a strategy for waste diversion were polarized.[43] Some charitable foodbank stakeholders viewed waste diversion to the charitable food system as a "win-win" situation wherein corporate donors avoid disposal costs and landfill tipping fees while cultivating good corporate citizenship and allowing food banks to remain cost efficient.[44] Opponents of food waste diversion for human consumption argue that it is an essential indignity to the recipients of this food.[43] Moreover, reliance on corporate donations means that food assistance is limited to unsaleable products.[44]

Food bank location in the U.S. was also significantly related to inventory quality. National stakeholders corroborated this finding describing uneven progress in the nutrition-focus food banking movement across the country. This finding aligns with prior research in which food bank leaders have identified regional difficulty in sourcing fresh fruits and vegetables where the high cost of transportation and high risk of product deterioration can prohibit food banks from sourcing fresh produce outside of their region.[45] Conversely, food banks in areas with ample agricultural sectors and long growing seasons, like California, have been successfully connect to regional agricultural producers.[21] In combination with shrinking donation streams, limited resources present an ongoing challenge for food banks in meeting their clients

caloric and nutritional needs.[46,47] While, food bank leaders have described multiple strategies to increase sourcing of fresh produce,[45] these findings suggest that food banks located outside of agriculturally rich regions may need additional support in these efforts.

The political conservativeness of the service area appears important: more conservative areas had lower mean percentages of healthy food and higher mean percentages of unhealthy foods. The U.S. is increasingly polarized along cultural lines that not only align with political affiliation but also geographic region, race, ethnicity, class, gender, and education level.[48,49] Given how profoundly food is embedded in culture,[50] it follows that partisanship divide may extend into food bank operations. The direction of the associations found here align with previous work which connected the promotion of healthy foods and nutrition to more left-leaning, liberal entities.[51,52] Advocates of nutrition-focused food banking may want to consider these philosophical differences when developing strategies to support food banks increasing the distribution of healthier foods.

Limitations and Strengths

The current study has several limitations. First, all data are cross-sectional and therefore cannot be interpreted as demonstrating causation. Second, the inventory nutritional quality values are self-reported and, as such, is subject to recall and social desirability bias. Unfortunately, no single nutrition tracking system is sufficiently implemented at the time of this study to provide reliable, quantitative information about the nutritional quality of food bank inventory.[26] Additionally, the inventory measure did not capture other categories of food and beverage at food banks (e.g., dairy, protein and grains) as well as other types of fruits and vegetables (e.g., canned, frozen fruits and vegetables). A more comprehensive inventory measure could provide deeper insight on the overall healthfulness of food bank inventory. Third, participants in the national stakeholder key informant interviews consisted of a small subsample of actors within the charitable food system limiting the generalizability of these findings. Fourth, researcher perspective may have also biased the results of the qualitative study; however, using multiple sources of data and employing a mixed methods approach served to triangulate findings and offset this concern. Key strengths of the study are that the survey data were from a national sample and the sociodemographic context for each food bank was considered in the analyses.

Conclusion

The charitable food system is in flux. The focus on client health has increased as a growing body of evidence has emphasized the connection between food insecurity, diet, and chronic diseases. At the same time, heightened demand on

food banks during the coronavirus pandemic,[8,53] draws even more attention to the relationship between the charitable food system and client health. Supporting the capacity of food banks to source and distribute healthier inventory includes improved metrics, continuing to shift philosophies, and identifying means of sustainable operation. This study advances our understanding of the relationship between nutrition-focused food banking strategies and inventory quality. The findings of this study are timely and relevant for promoting health among a vulnerable population. Ultimately, shifting the food environment within food banks as well as within the charitable food system more broadly can help alleviate systematic disparities in health outcomes faced by food-insecure individuals.

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Author contributions

SER, MF, and MBS collected the data. SER wrote the first draft with contributions from MF, MBS, and MLP. All authors reviewed and commented on subsequent drafts of the manuscript.

References

1. Coleman-Jensen A, Rabbitt M, Gregory C, Singh A. *Household food security in the United States in 2016*. U.S. Department of Agriculture, Economic Research Service. 2017. https://www.ers.usda.gov/webdocs/publications/84973/err-237.pdf?v=42979
2. Hanson KL, Connor LM. Food insecurity and dietary quality in US adults and children: a systematic review. *Am J Clin Nutr*. 2014;100(2):684–692. doi:10.3945/ajcn.114.084525.
3. Leung CW, Epel ES, Ritchie LD, Crawford PB, Laraia BA. Food insecurity is inversely associated with diet quality of lower-income adults. *J Acad Nutr Diet*. 2014;114 (12):1943–1953.e2. doi:10.1016/j.jand.2014.06.353.

4. Seligman HK, Bindman AB, Vittinghoff E, Kanaya AM, Kushel MB. Food insecurity is associated with diabetes mellitus: results from the national health examination and nutrition examination survey (NHANES) 1999–2002. *J Gen Intern Med*. 2007;22 (7):1018–1023. doi:10.1007/s11606-007-0192-6.
5. Seligman HK, Davis TC, Schillinger D, Wolf MS. Food insecurity is associated with hypoglycemia and poor diabetes self-management in a low-income sample with diabetes. *J Health Care Poor Underserved*. 2010;21(4):1227. doi:10.1353/hpu.2010.0921.
6. Gundersen C, Ziliak JP. Food insecurity and health outcomes. *Health Affairs*. 2015;34 (11):1830–1839. doi:10.1377/hlthaff.2015.0645.
7. United States Department of Agriculture Food and Nutrition Service. Supplemental nutrition assistance program (SNAP). https://www.fns.usda.gov/snap/supplemental-nutrition-assistance-program Accessed February 12, 2021.
8. Morello P. COVID means a new normal for food banks. Hunger Blog. Published May 4, 2020. https://www.feedingamerica.org/hunger-blog/covid-19-means-new-normal Accessed May 12, 2020.
9. Weinfield N, Mills G, Borger C, et al. *Hunger in America 2014: a national report*. Feeding America; 2014.
10. Campbell E, Ross M, Webb KL. Improving the nutritional quality of emergency food: a study of food bank organizational culture, capacity, and practices. *J Hunger Environ Nutr*. 2013;8(3):261–280. doi:10.1080/19320248.2013.816991.
11. Caruso C. Emergency food system: soup kitchens and food pantries. In: Thompson PB, Kaplan DM, eds. *Encyclopedia of Food and Agricultural Ethics*. Netherlands: Springer; 2013:1–8. 10.1007/9789400761674_3902.. 10.1007/9789400761674_3902.
12. Echevarria S, Santos R, Waxman E, Engelhard E, Vecchio D. Chicago, IL: Feeding America; 2012. Food Banks: Hunger's New Staple https://www.feedingamerica.org/sites/default/files/research/hungers-new-staple/hungers-new-staple-full-report.pdf.
13. Elmes MB, Mendoza-Abarca K, Hersh R. Food banking, ethical sensemaking, and social innovation in an era of growing hunger in the United States. *J Manage Inquiry*. 2016;25 (2):122–138. doi:10.1177/1056492615589651.
14. America F. How do food banks work? Published 2021. https://www.feedingamerica.org/our-work/food-bank-network Accessed February 12, 2021.
15. United States Department of Agriculture Food and Nutrition Service. TEFAP fact sheet. Published January 6, 2020. https://www.fns.usda.gov/tefap/tefap-fact-sheet Accessed February 12, 2021.
16. Campbell E, Webb KL, Ross M, Crawford P. *Nutrition-focused food banking*. 2015. http://nam.edu/wp-content/uploads/2015/06/Foodbanking
17. Wetherill MS, White KC, Seligman HK. Nutrition-focused food banking in the United States: a qualitative study of healthy food distribution initiatives. *J Acad Nutr Diet*. 2019;119(10):1653–1665. doi:10.1016/j.jand.2019.04.023.
18. Handforth B, Hennink M, Schwartz MB. A qualitative study of nutrition-based initiatives at selected food banks in the Feeding America network. *J Acad Nutr Diet*. 2013;113 (3):411–415. doi:10.1016/j.jand.2012.11.001.
19. Schwartz M, Levi R, Lott M, Arm K, Seligman H. *Healthy eating research nutrition guidelines for the charitable food system*. Healthy Eating Research. 2020. http://healthyeatingresearch.org
20. Feeding America. Feeding America's food to encourage background. Presented at: July 2015. http://hungerandhealth.feedingamerica.org/wp-content/uploads/legacy/mp/files/tool_and_resources/files/f2e-background-detail.v1.pdf Accessed January 13, 2019.

21. Ross M, Campbell E, Webb KL. Recent trends in the nutritional quality of food banks' food and beverage inventory: case studies of six California food banks. *J Hunger Environ Nutr*. 2013;8(3):294–309. doi:10.1080/19320248.2013.816992.
22. Fisher A, Jayaraman S. The charity trap. In: *Big Hunger: The Unholy Alliance between Corporate America and Anti-Hunger Groups, Food, Health, and the Environment*. First MIT Press paperback edition. Cambridge, MA: The MIT Press; 2018.
23. Boehmer TK, Luke DA, Haire-Joshu DL, Bates HS, Brownson RC. Preventing childhood obesity through state policy. *Am J Prev Med*. 2008;34(4):333–340. doi:10.1016/j.amepre.2008.01.003.
24. Cawley J, Liu F. Correlates of state legislative action to prevent childhood obesity. *Obesity*. 2008;16(1):162–167. doi:10.1038/oby.2007.3.
25. Pomeranz JL, Siddiqi A, Bolanos GJ, Shor JA, Hamad R. Consolidated state political party control and the enactment of obesity-related policies in the United States. *Prev Med*. 2017;105:397–403. doi:10.1016/j.ypmed.2017.08.028.
26. Feldman M, Schwartz M. *A Tipping Point: Leveraging Opportunities to Improve Nutritional Quality of Food Bank Inventory*. Los Angeles, CA: MAZON; 2018.
27. *SurveyMonkey*. SurveyMonkey Inc. 2017. www.surveymonkey.com
28. Charity Navigator. About us. Published 2018. Accessed November 9, 2018. https://www.charitynavigator.org/index.cfm?bay=content.view&cpid=1653
29. U.S. Census Bureau. *American Community Survey: Information Guide* (Washington, D. C.). 2017.
30. MIT Election Data and Science Lab. County presidential election returns 2000-2016. Published online 2018. 10.7910/DVN/VOQCHQ
31. StataCorp. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP; 2015.
32. Sandelowski M. Whatever happened to qualitative description? *Res Nurs Health*. 2000;23(4):334–340. doi:10.1002/1098-240X(200008)23:4<334::AID-NUR9>3.0.CO;2-G.
33. SocioCultural Research Consultants, LLC. *Dedoose Version 8.1*. Los Angeles, CA: SocioCultural Research Consultants, LLC; 2018. Www.Dedoose.Com. www.dedoose.com
34. Rubin HJ, Rubin IS. *Qualitative Interviewing: The Art of Hearing Data*. Thousand Oaks, CA: SAGE; 2011.
35. Feeding America. *Feeding America 40 years of progress in the fight against hunger: 2019 annual report*. Feeding America; 2019. Accessed July 23, 2020. https://www.feedingamerica.org/sites/default/files/2019-12/2019%20Feeding%20America%20Annual%20Report.pdf
36. Yatzeck Farrell S, Seay J. *Advancing hope for a hunger free America: 2009 annual report*. Feeding America; 2009. Accessed July 23, 2020. https://www.feedingamerica.org/sites/default/files/about-us/financials/2009-feeding-america-annual-report.pdf
37. America F. Six regional produce cooperatives established. Published August 28, 2017. https://www.feedingamerica.org/about-us/press-room/produce-cooperatives Accessed August 10, 2020.
38. An R, Wang J, Liu J, Shen J, Loehmer E, McCaffrey J. A systematic review of food pantry-based interventions in the USA. *Public Health Nutr*. 2019;22(9):1704–1716. doi:10.1017/S1368980019000144.
39. Aragon MC, Armstrong Shultz J, Bush-Kaufman A, Barale K. Low-income respondents' perceptions about food retail and food pantry shopping environments. *J Hunger Environ Nutr*. 2019;14(1–2):110–127. doi:10.1080/19320248.2018.1434097.
40. Remley D, Franzen-Castle L, McCormack L, Eicher-Miller HA. Chronic health condition influences on client perceptions of limited or non-choice food pantries in low-income, rural communities. *Am J Health Behav*. 2019;43(1):105–118. doi:10.5993/AJHB.43.1.9.

41. Verpy H, Smith C, Reicks M. Attitudes and behaviors of food donors and perceived needs and wants of food shelf clients. *J Nutr Educ Behav*. 2003;35(1):6–15. doi:10.1016/S1499-4046(06)60321-7.
42. Wetherill MS, White KC, Seligman H. Charitable food as prevention: food bank leadership perspectives on food banks as agents in population health. *Comm Develop*. 2019;50(1):92–107. doi:10.1080/15575330.2019.1570961.
43. McIntyre L, Patterson PB, Anderson LC, Mah CL. A great or heinous idea?: why food waste diversion renders policy discussants apoplectic. *Critical Public Health*. 2017;27(5):566–576. doi:10.1080/09581596.2016.1258455.
44. Tarasuk V, Eakin JM. Food assistance through "surplus" food: insights from an ethnographic study of food bank work. *Agric Hum Values*. 2005;22(2):177–186. doi:10.1007/s10460-004-8277-x.
45. Wetherill MS, White KC, Rivera C, Seligman HK. Challenges and opportunities to increasing fruit and vegetable distribution through the US charitable feeding network: increasing food systems recovery of edible fresh produce to build healthy food access. *J Hunger Environ Nutr*. 2019;14(5):593–612. doi:10.1080/19320248.2018.1484315.
46. Bazerghi C, McKay FH, Dunn M. The role of food banks in addressing food insecurity: a systematic review. *J Community Health*. 2016;41(4):732–740. doi:10.1007/s10900-015-0147-5.
47. Iafrati S. "We're not a bottomless pit": food banks' capacity to sustainably meet increasing demand. *Voluntary Sector Review*. 2018;9(1):39–53. doi:10.1332/204080518X15149744201978.
48. Baldassarri D, Gelman A. Partisans without constraint: political polarization and trends in American public opinion. *American Journal of Sociology*. 2008;114(2):408–446. doi:10.1086/590649.
49. Bishop B. *The Big Sort: Why the Clustering of like-Minded America Is Tearing Us Apart*. New York, NY: Houghton Mifflin Harcourt; 2009.
50. Parasecoli F. Eating power: food, culture, and politics. In: *Discourse, Culture and Organization: Inquiries into Relational Structures of Power*. Marttila T, ed. Cham, Switzerland: Springer International Publishing; 2019: 129–153. 10.1007/9783. 10.1007/9783319941233_6.319941233_6.
51. Finn SM. *Discriminating Taste: How Class Anxiety Created the American Food Revolution*. Camden, NJ: Rutgers University Press; 2017.
52. Nestle M. The supplemental nutrition assistance program (SNAP): history, politics, and public health implications. *Am J Public Health*. 2019;109(12):1631–1635. doi:10.2105/AJPH.2019.305361.
53. Hake M. The impact of the Coronavirus on Food Insecurity. Hunger and Health. Published March 31, 2020. https://hungerandhealth.feedingamerica.org/2020/03/impact-coronavirus-food-insecurity/ Accessed May 12, 2020.