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Results of a Pilot Intervention in Food Shelves to Improve Healthy Eating and Cooking Skills Among Adults Experiencing Food Insecurity

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Abstract

Since the start of the 2007 economic downturn, reliance on emergency food assistance suppliers (e.g., food pantries, also known as food shelves) has increased. Many food shelves strive to provide effective nutrition programs to serve their clients, even while they are faced with a scarcity of resources. Rigorous evaluation of the impact of such programming on dietary outcomes is, therefore, warranted. The aim of this study was to evaluate the effectiveness of a pilot cooking and nutrition education intervention among food shelf clients. A six-session class was conducted with 63 participants in four food shelves in Minneapolis and St. Paul, MN. Diet was assessed through a 24-hour recall from which a Healthy Eating Index (HEI) score was created. Cooking skills were assessed by survey. Average HEI scores increased from 50.9 at baseline to 58.5 post-intervention ($p = 0.01$, $n = 43$). Participants demonstrated improved cooking skills scores post-intervention (35.9 vs. 33.1 at baseline, $p = 0.002$, $n = 45$). Future research is needed to advance our understanding of how best to improve client nutrition knowledge and cooking skills. This study provides some evidence that improvements in diet and skills can be demonstrated with minimal intervention.

Keywords

Food insecurity; intervention; nutrition education; cooking skills

INTRODUCTION

According to estimates from the United States Department of Agriculture (USDA), about 1 in 7 U.S. households experiences food insecurity, meaning that at some time during the last

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Originality statement

This work has not been published elsewhere and has not been submitted simultaneously for publication elsewhere.

year they did not have enough food to meet the needs of all household members because of insufficient money or other resources.[1] Families experiencing food insecurity often rely on emergency food suppliers, including food shelves (also known as food pantries), to provide food for at-home consumption. In Minnesota, over 8,500 households per day relied on food shelves as a source of meals in 2012 – an increase of 59% since the economic downturn of 2007 began.[2]

In general, food insecurity has been associated with low overall diet quality.[3–5] For those who rely on emergency food assistance, diets are more likely to be high in fat,[6] low in fruits and vegetables, milk, dairy, and micronutrients.[7,8] Poor diet, compounded with other exposures related to constrained financial resources, may contribute to high rates of obesity among food shelf clients.[9,10] Putting together a balanced meal may be difficult when foods available at food shelves are limited, and foods received may be unfamiliar, undesirable, and may not be culturally appropriate.[11,12]

Small-scale studies have indicated that food shelf programming for cooking and making low-cost meals is feasible and much desired by clients.[13,14] Previous interventions aiming to improve dietary outcomes in low-income settings have often incorporated elements of nutrition education and cooking,[15–17] some of which have resulted in moderate improvements in dietary outcomes.[18,19] Food shelves have not been a common venue for rigorous evaluation of nutrition programming, but two recent interventions – one focused on promoting a plant-based diet, and the other, opening a new food shelf – demonstrated the emergency food setting to be a promising intervention setting.[20,21]

The specific aim of the current study was to evaluate whether a six-week cooking and nutrition education class conducted at four food shelves in Minneapolis and St. Paul, MN (the Twin Cities) resulted in improvements in diet and cooking skills among food shelf clients in a pilot study. Through this work, we hoped to contribute to the small but growing body of intervention research in the emergency food setting, and lay the groundwork for future large-scale interventions in this setting.

METHODS

Sample and study design

The study was approved by the Institutional Review Board at *[removed for blinding]* and was conducted at four food shelves in the Twin Cities metropolitan area between May and November of 2013. The study was a pilot study with no control group, which used pre and post comparisons to evaluate a six-week cooking and nutrition education class (the intervention). The intervention was evaluated through pre-intervention assessments (T1), post-intervention assessments (T2), and, for the purposes of assessing feasibility, follow up assessments after 30 days (T3).

Food shelves were eligible to serve as intervention sites if they had a basic kitchen, adequate room for class activities, and space for childcare. Participants were approached while at food shelf visits and asked if they would like to participate in the intervention and a corresponding research study. Flyers were also displayed at the food shelves, encouraging

interested participants to call. Verbal informed consent was obtained by one of two trained study staff members.

Assessments occurred in person or through a phone call. This flexibility and accommodation was necessary because some participants did not have access to working phones or were difficult to reach; meanwhile, others did not have time to complete a face-to-face assessment at the time of informed consent. T3 assessment took place only by phone, primarily to assess the feasibility of collecting follow-up data collection in what may be a transient population. Participants received a $15 gift card upon completion of each assessment.

Participants were eligible to participate in the study if they were at least 18 years old, were able to speak and read English, and had lived in a household that had visited one of the participating food shelf to obtain food in the last 30 days. Only one member of each household participated in the research study, though a number of domestic partners also attended the classes.

Intervention

The intervention occurred through a Cooking Matters® course led by University of Minnesota Extension staff and local volunteers as part of a collaboration with Share Our Strength's national No Kid Hungry Campaign. The program offers a six-week curriculum designed for low-income families. In a typical 2-hour class, a volunteer chef would demonstrate 1–2 recipes (e.g., chicken and tofu stir fry with brown rice). Participants would then follow the same recipes and enjoy a meal together at the end of the class. Nutrition education comprised an additional 30–40 minutes of each session, addressing a range of nutrition-related themes (e.g., reading food labels, understanding different kinds of fats). At the end of each class, participants were given key ingredients to take home to try the featured recipes. Participants who attended 4 out of six classes received incentives (e.g., chef's knife, recipe book) at the end of the course. The curriculum was adaptable for participants from diverse backgrounds, and discussions about the balance of culturally relevant and American meals were incorporated throughout the course. The classes took place between June and October of 2013.

Measures

Dietary intake was assessed from 24-hour recalls collected over the telephone or in person using Nutrition Data Systems for Research (NDSR) nutrient calculation software. NDSR is a computer based software application that allows for direct entry of dietary data in a standardized fashion.[22] Trained study staff employed the multiple-pass interview technique to prompt for complete food recall and descriptions,[23] consulting a standardized Food Amounts Booklet to estimate food amounts consumed. NDSR has previously been used in assessing diet quality of food shelf clients and is appropriate for low-literacy populations.[10] Participants were asked to report all foods and beverages they had consumed from midnight to midnight the previous day. The assessments took placed unannounced, either face-to-face after recruitment, or during an unscheduled phone call. In previous studies, no statistically significant differences have been detected for key dietary indicators between telephone and face-to-face interview administration of dietary recalls.[22,24,25]

Cooking skills were assessed by a 9-item questionnaire (detailed in Table 4) capturing basic cooking self-efficacy, new foods self-efficacy, meal preparation, and meal planning. Four Likert-scale response options to the cooking skills and new food self-efficacy ranged from "very confident," to "not confident at all." Five response options to the meal preparation and meal planning questions ranged from "always," to "never." The validity and test-retest reliability of the self-efficacy and meal preparation questions have previously demonstrated adequacy as single-item questions,[26] and meal planning questions have been associated with healthier dietary intake.[27] We calculated Cronbach's alpha for total cooking skills and each of the sub-constructs. Only total cooking skills demonstrated adequate internal reliability (Cronbach's alpha = 0.68).

Data analysis—Based on dietary recall data, a Healthy Eating Index (HEI) 2010 was created in SAS v. 9.3, comprised of 12 individual nutritional components (e.g., whole grains, dairy) summed to create an index with a range of 0–100.[28] The HEI is a publically-available tool used by the U.S. Department of Agriculture to measure the degree to which a diet conforms to federal dietary guidelines.[29] A higher HEI score indicates a more balanced and healthful diet. A cooking skills score summed the 9 items (range 9 to 45), reverse coding the item on preparing convenience foods. Of the 63 participants who completed the T1 assessment, 45 completed T2.

Preliminary analyses compared differences between those who completed follow up and the 18 participants who did not, finding that those who completed both assessments were, on average, slightly older; the two groups did not show any other differences. Two participants at T2 reported fasting, and these participants were excluded from the analysis of the HEI only. Mean change in diet and cooking skills from T1 to T2 was assessed using a paired t-test with each individual serving as his or her own control. Changes between T1 and T3 were assessed for exploratory purposes and to examine longer-term intervention effects. We used an "intent to treat" analysis plan in which changes were assessed between T1 and T2 regardless of the number of classes participants had attended; 4 participants did not attend any classes.

RESULTS

In total, 63 participants enrolled in the study; 71% (n=45) completed both T1 and T2 measures, and 80% of those participating at T2 also completed T3 assessments (n = 36).

Demographic and socioeconomic characteristics of the 45 participants who completed T1 and T2 assessments are presented in Table 1. Participants in the study were 87% female and the mean age was 42. Participants came from diverse backgrounds, representative of the region, and twelve participants (27%) were born outside the US. Just under half (44%) had any post-secondary education, and most (76%) were not employed. Over half (62%) relied on Supplemental Nutrition Assistance Program (SNAP) benefits and Women Infants and Children (WIC).

Attendance information is presented in Table 2. Participants attended an average of 3.8 classes (range 0=6). In the Cooking Matters® curriculum, participants who attend four of

the six classes “graduate”; using this same standard, the graduation rate for participants who completed the evaluation assessments was 62%.

HEI component scores for T1 and T2 are presented in Table 3. Mean scores were particularly low (< 40% of maximum score) for whole fruits, greens and beans, whole grains, seafood and plant protein, and fatty acids.

Table 4 shows the frequency of cooking skills at T1 and T2. More than half of participants felt very confident about preparing a simple recipe and tasting new foods at baseline, but participants felt less confident about other cooking skills at baseline. Nearly one quarter used convenience foods “always” or “most of the time.” Participants were more likely to regularly plan dinners (53%) than lunches (29%) or cook meals ahead of time to eat throughout the week (24%).

T2 changes

Mean HEI and cooking skills scores and changes in these scores from T1 to T2 are presented in Table 5. Mean HEI scores were 50.9 at baseline, and increased to 58.5 at T2 ($p = 0.01$). Cooking mean scores were 33.1 at baseline, and increased to 35.9 at T2 ($p = 0.002$).

T3 changes

Paired t-tests comparing HEI scores and cooking skills scores from baseline to T3 (n – 36) indicated that HEI mean scores had returned to baseline levels at T3 with only an 0.18 point increase in scores from T1 ($p = 0.95$), but that there was a sustained mean increase of 2.97 points in cooking skills scores from baseline to T3 ($p = 0.003$).

DISCUSSION

Among participants in this sample, diet quality was low, averaging 50.9 out of 100 at baseline.[30] This is consistent with previous literature, which has found HEI scores in a similar range among adults.[10,28] On average, participant HEI scores had increased by the end of the intervention. This is important because HEI scores have demonstrated significant relationships with cardiovascular disease, overweight and obesity.[31,32] Cooking skill scores also increased at the end of the intervention. Among participants who were followed for one month after the intervention, HEI scores were not sustained, but elevated cooking scores were.

Our results showing improvement in dietary outcomes are consistent with several other studies conducted in the emergency food setting. In a recent randomized study, participants who were assigned to use a new, choice-based food shelf and who had access to a range of services like the Cooking Matters® program demonstrated less food insecurity and greater fruit and vegetable consumption as assessed by self-reported survey.[21] Another cooking-based intervention among food shelf clients resulted in positive changes in food security, shopping and dietary outcomes, and a reduction in body mass index at the end of the intervention.[20]

Similar nutrition education-based interventions targeting low-income women in the Minneapolis and St. Paul, MN have resulted in positive changes in knowledge, attitudes, and behavior.[17,33] Rustad and Smith used hands-on, skill-building activities to improve a variety of dietary indicators. Similarly, our study shows that experiential learning may be a powerful tool for increasing knowledge and diet-related behaviors. Key differences in our study were that participants received no monetary incentive for participating in the intervention activities, but instead, the intervention included childcare provisions and reimbursements for transportation.

Share Our Strength's Cooking Matters® program is a national program with a wide reach in low income settings.[34] At the time this study was conducted, the program was routinely evaluated using a single retrospective pre/post survey asking participants at the end of the course to rate their dietary behaviors "before" and "now." One study of 53 participants compared retrospective pre/post results with a traditional pretest/posttest design and found similar results in eating behavior, general behavior, and shopping behavior across the two assessment techniques.[35] Other previous evaluations of the Cooking Matters® curriculum using both the retrospective pre/post assessments and focus groups have shown improvements in a number of outcomes, including nutrition knowledge, cooking skills, food safety and food budgeting, although many of these remain unpublished.[36–38] This study offers a rigorous addition to previous assessments of the impact of the program by using a traditional pre/post design, a multiple-pass 24-hour recall method to assess dietary outcomes, and a single USDA-based dietary summary score.

This study was designed to inform larger-scale efforts to intervene in the emergency food system. As a pilot study, the small sample size and lack of control group pose two major limitations. The small sample size meant that the study was not powered to detect differences in the subcomponents of the HEI. Without a comparison group, it is not possible to definitively attribute positive changes in diet and cooking skills to the intervention. Outcome measures, while validated, relied on self-report and therefore may have been subject to social desirability bias – particularly for the cooking skills outcomes. Additionally, the dietary outcome relied on only a single day of data, which may not have been representative of a participants' diet. Finally, this study did not seek to evaluate changes in food security. As there is some evidence to suggest that more complex food preparation practices are associated with greater future security,[39] additional intervention work targeting and measuring these outcomes is needed.

In this study, we assessed behavior change via a 24-hour recall method using a rigorous and validated NDSR measure. This differs from previous studies in food pantries which have captured more limited measures of diet.[20,21] Additionally, there was very little non-response to specific items among participants, as the assessments were conducted over the phone or in person to prompt and encourage responses. The study sample was diverse, and representative of the population frequenting food shelves in Minneapolis and St. Paul, MN. Retention rates were high, as 71% of the 63 participants who completed baseline also completed follow up, and 80% of those participants were followed for an additional month.

IMPLICATIONS FOR RESEARCH AND PRACTICE

This study provides further evidence that food shelf clients may benefit from structured cooking and nutrition education classes, and that positive changes in dietary behavior and cooking skills can occur with relatively minimal intervention. It also provides further evidence of the feasibility of conducting such programs within the food shelf setting.

While other studies with food shelf clients have begun to address broader issues related to food security, one additional avenue for intervention is in addressing the nutritional quality of the food provided at emergency food suppliers.[40] In future efforts targeting adults who rely on emergency food, a multi-level intervention approach addressing both emergency food quality and client skills may further increase dietary improvements.

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Table 1

Demographic and Socioeconomic Characteristics of Adults Enrolled in Intervention (n=45)

	N (%)
Gender	
Female	39 (87%)
Male	6 (13%)
Race	
White or Caucasian	15 (33%)
Black/African American	16 (36%)
Native American/Alaskan Native	5 (11%)
Asian	3 (7%)
Mixed, other or no answer	6 (13%)
Hispanic or Latino	
No	37 (82%)
Yes	6 (13%)
No answer	2 (4%)
Education level	
Less than high school	6 (13%)
High school graduate	19 (42%)
More than high school	20 (44%)
Born in US	
Yes	33 (73%)
No	12 (27%)
Years in USA if not born in USA	
Median (Min, Max)	13.5 (4, 39)
Number of household members	
Median (Min, Max)	4 (1, 11)
Currently employed	
No	34 (76%)
Yes	11 (24%)
Program participation	
SNAP/EBT[a]	28 (62%)
Also on WIC[b]	6 (13%)
Age	
Mean (SD)	42 (12.7)
Min, Max	19, 67

[a]Supplemental Nutrition Assistance Program/Emergency Benefits Transfer

[b]Women, Infants, and Children

Table 2

Distribution of Number of Classes Attended by Participants

Number of classes	T2 (n = 45) N (%)	T3 (n = 36) N (%)
0	4 (8.9%)	4 (11.1%)
1	6 (13.3%)	4 (11.1%)
2	3 (6.7%)	2 (5.6%)
3	4 (8.9%)	4 (11.1%)
4	8 (17.8%)	6 (16.7%)
5	6 (13.3%)	4 (11.1%)
6	14 (31.1%)	12 (33.3%)

Table 3

HEI Component Scores for T1 and T2 (N = 43)[a]

HEI component	Max score	Standard for maximum score	Standard for minimum score of zero	T1 scores (SD)	T2 scores (SD)
Total Fruits	5	≥0.8 cup equivalent/1000 kcal	No Fruit	2.1 (2.2)	2.4 (2.2)
Whole Fruits	5	≥0.4 cup equivalent/1000 kcal	No Whole Fruit	1.9 (2.3)	2.6 (2.3)
Total Vegetables	5	≥1.1 cup equivalent/1000 kcal	No Vegetables	2.8 (1.7)	3.7 (1.7)
Greens and Beans	5	≥0.2 cup equivalent/1000 kcal	No Dark Green Vegetables or Beans and Peas	1.3 (2.1)	1.9 (2.2)
Whole Grains	10	≥1.5 cup equivalent/1000 kcal	No Whole Grains	3.6 (4.2)	4.7 (4.6)
Dairy	10	≥1.3 cup equivalent/1000 kcal	No Dairy	5.1 (4.0)	5.3 (3.4)
Total Protein	5	≥2.5 cup equivalent/1000 kcal	No Protein Foods	4.4 (1.3)	4.3 (1.5)
Seafood and Plant Protein	5	≥0.8 cup equivalent/1000 kcal	No Seafood or Plant Proteins	1.2 (2.1)	1.7 (2.3)
Fatty Acid	10	(PUFAs + MUFAs)/SFAs >2.5	(PUFAs + MUFAs)/SFAs ≤1.2	3.2 (3.4)	4.6 (4.1)
Refined grains	10	≤1.8 oz equivalents/1000 kcal	≥4.3 oz equivalents/1000 kcal	6.5 (3.8)	7.4 (3.4)
Sodium	10	≤1.1 oz equivalents/1000 kcal	≥2.0 g per 1000 kcal	4.4 (3.5)	3.7 (3.8)
Empty kcals	20	≤19% of energy kcal	≥50% of energy	14.6 (5.5)	16.4 (4.1)

[a]HEI analyses excluded 2 participants who reported fasting during their T2 assessment

Table 4

Responses to Cooking Skills Items for T1 and T2 (N = 45)

Survey Item	***T1* *Frequency (%) reporting they were "very confident"***	***T2* *Frequency (%) reporting they were "very confident"***
How confident do you feel about being able to cook from basic ingredients?	22 (49%)	36 (80%)
How confident do you feel about following a simple recipe?	30 (67%)	39 (87%)
How confident do you feel about preparing and cooking new foods and recipes?	16 (36%)	26 (58%)
How confident do you feel about tasting foods you have not eaten before?	25 (56%)	21 (47%)
	Frequency (%) reporting "always" or "most of the time"	*Frequency (%) reporting "always" or "most of the time"*
How often do you prepare and cook a meal from basic ingredients? (i.e, "from scratch")	21 (47%)	32 (71%)
How often do you prepare convenience foods and ready-to-eat foods for a meal? (e.g. pre-packaged frozen dinners)?	11 (24%)	5 (11%)
How often do you plan in the morning what you will eat for dinner that night?	24 (53%)	25 (56%)
How often do you plan the day or night before what you will eat for lunch the next day?	13 (29%)	16 (36%)
How often do you prepare or cook dishes ahead of time to eat throughout the week?	11 (24%)	15 (33%)

Table 5

Paired T-Tests for Changes Over Time in HEI Total Score and Cooking Skills Scores

	From baseline to T2				From baseline to T3			
	N[a]	T1 score (SD)	T2 score (SD)	p-value	N	T1 score (SD)	T3 score (SD)	p-value
HEI Total score	43	50.9 (14.4)	58.5 (16.1)	0.01	36	52.3 (14.3)	52.5 (14.6)	0.95
Healthy cooking score	45	33.1 (4.7)	35.9 (4.2)	0.002	36	33.1 (4.7)	36.1 (3.6)	0.003

[a]HEI analyses excluded 2 participants who reported fasting during their T2 assessment