Few changes in food security and dietary intake from short-term participation in the Supplemental Nutrition Assistance Program among low-income Massachusetts adults

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Few changes in food security and dietary intake from short-term participation in the Supplemental Nutrition Assistance Program among low-income Massachusetts adults

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Abstract

Objective—To examine if short-term participation in the Supplemental Nutrition Assistance Program (SNAP) affects food security and dietary quality among low-income adults recruited from a Massachusetts-wide emergency food hotline.

Methods—A three-month, longitudinal study was conducted among 107 adults recruited at the time of SNAP application assistance. Outcomes included household food security (10-item USDA Food Security Survey Module), dietary intake (e.g. grains, fruits) and diet quality (modified Alternate Healthy Eating Index). Data were analyzed using paired t-tests and multivariable linear regression.

Results—SNAP participation was not associated with improved household food security over three months (*P*=0.25). Compared to nonparticipants, SNAP participants increased refined grain

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The authors have no conflicts of interest to declare.

Notes: The study protocol was approved by the Harvard School of Public Health Institutional Review Board with expedited review

intake by 1.1 serving/day (P=0.02), from baseline to follow-up. No associations were observed with other foods, nutrients, or dietary quality.

Conclusion and Implications—Policies that simultaneously improve household food security and dietary quality should be implemented to support the health of low-income Americans participating in this crucial program.

Keywords

Supplemental Nutrition Assistance Program; food security; diet quality; Alternate Healthy Eating Index

INTRODUCTION

Food insecurity is a household-level condition of not having or not being able to acquire "enough food to meet the needs of all their members because…of insufficient money or other resources for food."[1] In 2011, the national prevalence of food insecurity was 14.9%. The Supplemental Nutrition Assistance Program (SNAP) is the largest of 15 federal nutrition assistance programs that aims to alleviate food insecurity and improve the nutritional intake of low-income individuals. Approximately 44.7 million individuals received SNAP benefits in 2011.[2] SNAP benefits can be used to purchase most foods, with the exception of alcohol, supplements, and prepared foods.

Previous studies have suggested that SNAP participation generally improves food security among its beneficiaries[3–7]. Other studies have also examined associations between SNAP participation and dietary intake with mixed results. A comprehensive review of 17 studies did not support overall differences in total energy or nutrient intake between SNAP adult participants and nonparticipants.[8] These studies have primarily been cross-sectional, which are limited by the potential for unmeasured confounding and the inability to examine how SNAP participation influenced food security and dietary intake over time.

The objective of this study was to examine the longitudinal effect of SNAP participation on household food security and dietary intake of low-income Massachusetts adults over a three-month period. In Massachusetts, the prevalence of food insecurity was 11.9%, with 813,000 individuals receiving SNAP benefits.[1,9] These results may help nutrition educators, researchers, and policymakers to make policy recommendations and design interventions to improve the health of program participants.

METHODS

Participants and Recruitment

The study protocol was approved by the Harvard School of Public Health Institutional Review Board with expedited review. A convenience sample of Massachusetts adults was recruited from the Project Bread FoodSource Hotline by Hotline counselors. Inclusion criteria included being 18 years or older, English-speaking, and receiving SNAP application assistance from the Hotline. If these criteria were met, callers were provided a brief study description by the Hotline counselors, and asked whether they would be interested in receiving more information.

The 188 adults who expressed interest in the study then received an introductory call from the researchers in the week following their call to the Hotline. Referrals for the study were evenly spread across the weeks of the month. In the introductory call, individuals were provided details regarding the study procedures and the incentive of a $40 grocery store gift

card upon study completion, and were asked to provide verbal consent to participate in the study. From the initial pool, 142 individuals consented to participate in the study (76% response rate). Data were collected from May to December 2011.

Data collection and measures

Two questionnaires and four 24-hour dietary recalls were administered over the telephone to study participants. One questionnaire and two 24-hour dietary recalls[10] were conducted at baseline, and again at follow-up three months later. The baseline questionnaire assessed the participant's age, gender, race/ethnicity, height, weight, household food security over the previous month[11], and current participation in SNAP and the Special Supplemental Nutrition Assistance Program for Women, Infants and Children (WIC). The follow-up questionnaire assessed the participant's household size, marital status, educational attainment, employment of household members, household income, general health, household food security over the previous month[11], and current participation in SNAP and WIC.

Household food security was assessed using the 10-item U.S. Adult Food Security Survey Module.[11] A food security score ranging from 0 to 10 was created with higher scores indicating lower food security. The score was also classified as: 0–2, high food security; 3–5, marginal food security; 6–8, low food security; 9–10, very low food security.

Dietary intake was assessed using the National Cancer Institute's Automated Self-Administered 24-hour Recall (ASA24) system, a web tool for administering dietary recalls using the Automated Multiple Pass Method.[10] Data from the ASA24 Individual Foods and Nutrient files were used to identify foods and nutrients of interest. For example, whole grains included any grain foods with carbohydrate to fiber ratio ≤10:1.[12] For foods and food groups, servings were estimated by calculating the grams of intake and applying common serving sizes. Overall dietary quality was assessed using a modified Alternate Healthy Eating Index (mAHEI). The AHEI was developed to predict adult chronic disease risk with a maximum score of 87.5 points.[13] The trans fat component was excluded because data were unavailable in the ASA24 files. The mAHEI total scores were rescaled to 87.5 points for comparability with other studies.

For study participants who reported receiving SNAP benefits at follow-up, they were asked their opinions on strategies that might help them to eat better: 1) providing incentives or more benefits for healthier foods, such as fruits and vegetables; 2) banning or restricting unhealthy foods, such as soda; and 3) providing more nutrition education classes or cooking classes.

Data Analysis

Statistical analyses were performed using Stata/IC 11.1 (StataCorp LP, College Station, TX). All statistical tests were two-sided. Statistical significance was considered at $P<0.05$. At baseline, no study participants were receiving SNAP benefits, although it was assumed that everyone had applied for SNAP. SNAP participants were defined as individuals who received SNAP benefits at follow-up. Nonparticipants were individuals who did not receive SNAP benefits at follow-up.

Of the 142 study participants who completed the baseline survey, 108 individuals completed the baseline and follow-up questionnaires (76% retention rate). Those who were lost to follow-up (n=34) were excluded because their SNAP status at follow-up was unknown. They were more likely to be younger, non-White, normal weight, of lower household food security, and with lower dietary quality scores at baseline. One participant received SNAP at

baseline and was excluded from the analysis. The analytical sample consisted of 107 low-income adults.

Characteristics of study participants by SNAP participation were compared using chi-squared tests and univariate regression models. Within-group changes in food security from baseline to follow-up were evaluated using paired t-tests and chi-squared tests. To assess the effect of SNAP participation, multivariable linear regression models were fit for follow-up food security scores, adjusting for baseline food security. Multivariable models included age categories, gender, marital status, self-reported health status, BMI categories (calculated from self-reported height and weight), and change in SNAP participation. Complete data was available for these variables.

With the exception of macronutrients, all dietary variables were adjusted for total energy using the residual method and standardized to the gender-specific mean energy intake at baseline and follow-up.[14] Macronutrients were converted to nutrient densities. Consumption levels from the recalls were averaged to estimate mean intake at baseline and follow-up, respectively. Means and standard deviations of foods, nutrients and mAHEI scores were estimated at baseline and follow-up for SNAP participants and nonparticipants. Total standard deviations were partitioned to obtain the correct between-person standard deviations.[15] Within-group dietary changes from baseline to follow-up were estimated using paired t-tests. To assess the effect of SNAP participation, multivariable linear regression models were fit for follow-up diet, adjusting for baseline diet and food security using the previously described model. Normality of the residuals was assessed using quantile-quantile plots.

RESULTS

Among the 107 study participants, the mean age was 49.0 ± 1.2 years; the majority were female (75%) and White (75%). At follow-up, 64 study participants (60%) received SNAP benefits (i.e. SNAP participants), and 43 participants (40%) did not qualify or chose not to participate in the program (i.e. nonparticipants). The average length of SNAP participation was 2.8 months. There were few sociodemographic differences between SNAP participants and nonparticipants (Table 1). Nonparticipants reported better general health than SNAP participants (P=0.03), and were more likely to have a household member working full-time at follow-up ($P<0.001$). Nine percent of study participants received WIC at baseline; no difference in WIC participation was observed between SNAP participants and nonparticipants.

Changes in household food security, dietary intake, and dietary quality

At baseline, 52% of all participants reported low or very low household food security (Table 2). Ranging from 0 (high food security) to 10 (very low food security), mean food security scores were 4.8 ± 0.4 for SNAP participants and 5.4 ± 0.5 for nonparticipants (P=0.40). There were statistically significant improvements in food security scores and categories at follow-up within both groups. Compared to nonparticipants, SNAP participants had a 0.5-point improvement in food security, which was not statistically significant after multivariate adjustment (P=0.25).

Among all study participants, baseline consumption of fruits, vegetables and whole grains was low, and consumption of refined grains, sweets and bakery desserts, and sugar-sweetened beverages was high, compared to the recommendations from the 2010 Dietary Guidelines for Americans (Table 3). After the initiation of benefits, new SNAP participants consumed, on average, <1 serving/day of whole grains, 2.1 servings/day of fruits and vegetables, >4 servings/day of refined grains, and almost 1.5 servings/day of sugar-

sweetened beverages and fruit juices. Compared to nonparticipants, SNAP participants had a significant increase in refined grains (1.1 serving/day, *P*=0.02). After multivariate adjustment, SNAP participants and nonparticipants did not differ in their intakes of total energy, macronutrients, or micronutrients from baseline to follow-up.

Baseline mAHEI scores were low for SNAP participants and nonparticipants (22.8 vs. 24.9 out of 87.5 points, *P=0.17*) (Table 4). Compared to nonparticipants, there was no difference in the change in mAHEI total scores from baseline to follow-up among SNAP participants. However, there was a statistically significant difference in the change in the nuts and soy protein score (β= −0.9, 95% CI −1.7, 0.0) for SNAP participants compared to nonparticipants.

Strategies to improve diets of SNAP participants

At the end of the study, three questions were administered to new SNAP participants to assess their opinion on various strategies to improve their dietary behaviors. Approximately 86% of SNAP participants agreed that providing incentives to purchase healthy foods (e.g. fruits and vegetables) and providing more cooking or nutrition education classes would help SNAP participants to eat better (data not shown). Fifty-nine percent of SNAP participants agreed that restricting unhealthy foods (e.g. soda) would help SNAP participants to eat better.

DISCUSSION

In a convenience sample of low-income Massachusetts adults, short- term participation in SNAP did not significantly influence household food security or improve dietary quality, when new SNAP participants were compared to nonparticipants. Although there were significant improvements in food security among SNAP participants from baseline to follow-up, the same average change was observed among nonparticipants. This might be attributed to temporal factors or higher full-time employment rates in nonparticipant households. Nevertheless, a substantial proportion of SNAP participants reported marginal, low or very low food security at follow-up, which suggests that SNAP may improve food security among beneficiaries, but not eliminate food *in*security completely.

Although one might hypothesize that the provision of SNAP benefits would result in the purchase and consumption of healthy foods (i.e. fruits, vegetables, whole grains), there was no substantial improvement in dietary quality among SNAP participants over the three-month period. Rather, there was a significant increase in refined grains (e.g. breads, cakes, pasta, rice). High intakes of refined grains may increase risks of weight gain and type 2 diabetes over time, especially in conjunction with high intakes of sugary beverages.[16,17] The findings of this study are similar to previous studies showing little differences in dietary intake by adults' SNAP participation status.[8,18] The low mAHEI scores in the participants are comparable with the lowest AHEI quintile from the original report relating low AHEI scores to chronic health outcomes.[13] Despite the program's attempts to promote better nutrition[19], there were few improvements in dietary quality among SNAP participants over the study period.

The findings of this study demonstrate that the vast majority of recent SNAP participants supported the provision of incentives for healthier foods and more nutrition education or cooking classes. The majority of program participants also supported restricting the purchase of unhealthy foods, such as sodas, with SNAP benefits. Although the USDA rejected New York City's proposal to restrict the purchase of sugar-sweetened beverages using SNAP benefits, public health advocates, researchers, and even some SNAP participants have indicated support for such restrictions.[20–23]

Strengths and Limitations

The study is limited primarily by the nonexperimental design, which makes it difficult to attribute the results solely to the effects of SNAP participation. However, longitudinal studies may be less vulnerable to self-selection bias than cross-sectional analyses, because all study participants had sought SNAP application assistance at baseline.[5] Since SNAP participants and nonparticipants were followed simultaneously, a comparison of the two groups may also help account for underlying changes in food security or dietary intake that may have occurred over the study period. The sample size was relatively small and was recruited from a telephone hotline. This may have excluded individuals without regular telephone access, who may have the lowest incomes and the poorest dietary quality. Thus, the sample may not be representative of low-income Massachusetts adults or of the general SNAP population. However, sample size and power calculations suggest that our study was adequately powered to detect a one-unit change in food security scores and significant differences in most dietary outcomes.[7] The confidence intervals for the results also excluded substantial improvements in dietary intake. Because this pilot study was one of the first studies to follow low-income adults from the time of SNAP application, results can help inform future longitudinal studies of SNAP-eligible individuals to better understand the cycles of food insecurity, public assistance, dietary intake, and health outcomes of this vulnerable population.

Although this study could not assess SNAP benefit amounts due to consent issues, data about benefit levels would help to determine whether a dose-response relationship exists between SNAP participation and dietary intake. Enrollment in SNAP-Ed, the nutrition education component of SNAP that has been shown to improve food security, was also not assessed.[24] Lastly, two 24-hour recalls collected at each time point may not reflect usual dietary intake of the study participants.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Recent policies have attempted to improve the nutritional standards of federal nutrition assistance programs, such as WIC and the National School Breakfast and Lunch Programs.[25,26] Emerging evidence suggests that WIC's revised food package has had favorable effects on the local food environment and the diets of WIC participants.[27,28] Despite an emphasis to promote nutrition in SNAP[19], similar policies have not yet been implemented. Prolonged consumption of low-quality diets has major implications for SNAP participants' health and health care costs. Therefore, policies, programs, and nutrition education initiatives that improve the nutritional impact of SNAP should be implemented to broaden the program's influence on the diets and well-being of low-income Americans.

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Table 1

Characteristics of low-income Massachusetts adults[a]

	SNAP participants (n=64)		SNAP nonparticipants (n=43)		P
	N	%	N	%	
Age[a]					*0.06*
18–30	3	5	9	21	
31–50	22	34	13	30	
51–65	28	44	17	40	
>65 years	11	17	4	9	
Female[a]	50	78	30	70	*0.33*
Race/Ethnicity[a]					*0.86*
White	47	73	32	78	
African American	10	16	5	12	
Latino/ Other/ Multi-race	7	11	4	10	
Weight status[a]					*0.10*
Normal weight	17	27	18	42	
Overweight	23	37	17	40	
Obese	23	37	8	19	
Education level[b]					
<12 years	7	11	5	12	
High school diploma or GED	21	33	11	26	
Some college or Associate's degree	19	30	12	28	
College graduate or higher	17	27	15	35	
General health status[b]					*0.03*
Excellent - Very good	14	22	18	42	
Good	25	39	8	19	
Fair - Poor	25	39	17	40	
Full-time employed[b]	13	20	24	56	*<0.001*

	SNAP participants (n=64)		SNAP nonparticipants (n=43)		P
	N	%	N	%	
Married or living with partner[b]	15	23	16	37	*0.12*

[a]Measured during baseline

[b]Measured during follow-up

Table 2

Changes in food security levels at baseline and follow-up by SNAP participation groups

	Received SNAP (n=64)				Did not receive SNAP (n=43)				Effect of SNAP participation[a]	
	Baseline		Follow-up		Baseline		Follow-up		Change	95% CI
	N	%	N	%	N	%	N	%		
Food security score[b] (Mean ± SE)	4.8 ± 0.4		3.4 ± 0.4*		5.4 ± 0.5		4.0 ± 0.5*		−0.5	−1.4, 0.4
Food security status (indicators)										
High food security (0)	7	11	11	17*	6	14	6*	14*		
Marginal food security (1–2)	11	17	20	31	5	12	9	21		
Low food security (3–5)	15	23	16	25	7	16	13	30		
Very low food security (6–10)	31	48	17	26	25	58	15	35		

[a] Adjusted for age category, sex, marital status, general health status, and weight status.

[b] Higher scores indicate more severe experiences of household food insecurity

* P<0.05 for within-group changes

Table 3

Changes in dietary intake at baseline and follow-up by SNAP participation groups

	Received SNAP (n=64)		Did not receive SNAP (n=43)		Effect of SNAP participation[a]	
	Baseline	Follow-up	Baseline	Follow-up	Change	95% CI
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Foods and food groups (in servings/day)						
High-fat dairy	0.5 ± 0.4	0.7 ± 0.7	0.5 ± 0.6	0.8 ± 0.0	0.0	−0.4, 0.4
Low-fat dairy	0.3 ± 0.4	0.4 ± 0.6	0.4 ± 0.6	0.4 ± 0.5	0.0	−0.3, 0.2
Fruits	0.9 ± 0.7	0.9 ± 0.7	1.0 ± 1.0	1.1 ± 0.7	−0.2	−0.7, 0.3
Vegetables	1.0 ± 0.0	1.2 ± 0.9	1.2 ± 1.1	0.7 ± 0.3	0.4	−0.1, 0.9
Processed meat	0.2 ± 0.1	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.2	−0.1	−0.2, 0.1
Whole grains	0.8 ± 0.0	0.6 ± 0.3	0.8 ± 0.3	0.9 ± 0.6	−0.2	−0.6, 0.1
Refined grains	3.7 ± 0.7	4.2 ± 1.3	3.5 ± 0.0	3.5 ± 1.0	1.1*	0.2, 2.0
Salty snacks	0.2 ± 0.1	0.2 ± 0.2	0.3 ± 0.0	0.2 ± 0.0	0.0	−0.1, 0.1
Sweets and bakery desserts	0.7 ± 0.4	0.9 ± 0.1	0.7 ± 0.0	0.5 ± 0.3	0.4	−0.1, 1.0
Sugar-sweetened beverages	1.0 ± 0.8	0.8 ± 1.0	0.8 ± 0.7	1.0 ± 1.1	−0.3	−0.9, 0.3
Nutrients						
Total energy, kcal	1356 ± 509	1486 ± 434	1345 ± 405	1514 ± 478	−1	−249, 247
Carbohydrates (% energy)	49.1 ± 6.7	48.6 ± 4.5	48.4 ± 0.0	50.6 ± 7.0	−0.9	−5.2, 3.5
Protein (% energy)	16.4 ± 1.8	16.9 ± 1.8	16.5 ± 0.0	16.8 ± 3.6	−0.5	−2.6, 1.6
Total fat (% energy)	36.4 ± 5.4	36.5 ± 3.5	37.0 ± 9.7	34.1 ± 7.8	1.9	−2.1, 5.8
Saturated fat (% energy)	11.6 ± 1.1	11.5 ± 1.9	10.7 ± 2.4	11.0 ± 3.1	−0.1	−1.8, 1.6
Cholesterol, mg/day	188 ± 69	216 ± 0	205 ± 93	220 ± 70	−4	−54, 47
Dietary fiber, g/day	10.2 ± 1.8	11.1 ± 2.8	11.5 ± 3.9	11.3 ± 3.5	−0.4	−2.3, 1.6
Folate, mg/day	272 ± 0	291 ± 58	292 ± 79	302 ± 61	10	−42, 61
Sodium, mg/day	2259 ± 223	2528 ± 357*	2451 ± 488	2395 ± 427	181	−108, 470
Potassium, mg/day	1758 ± 290	2014 ± 443*	1845 ± 342	2030 ± 394	68	−216, 351
Calcium, mg/day	597 ± 219	683 ± 275*	632 ± 152	745 ± 135	−14	−165, 137
Iron, mg/day	10.7 ± 0.0	10.5 ± 0.6	10.7 ± 3.1	11.5 ± 1.6	−0.7	−2.2, 0.8

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[a]Adjusted for age category, sex, marital status, general health status, weight status, and baseline food security.

*P<0.05 for within-group changes

Table 4

Changes in the modified Alternate Healthy Eating Index at baseline and follow-up by SNAP participation groups

	Max score	Max criteria	Received SNAP (n=64)		Did not receive SNAP (n=43)		Effect of SNAP participation[a]	
			Baseline	Follow-up	Baseline	Follow-up	Change	95% CI
			Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD		
Vegetables	10	5 servings/d	2.0 ± 0.6	2.4 ± 1.7	2.1 ± 1.3	1.4 ± 0.6	0.7	−0.2, 1.6
Fruits	10	4 servings/d	1.8 ± 1.4	1.9 ± 1.2	2.0 ± 1.7	2.1 ± 1.5	−0.4	−1.2, 0.5
Nuts and soy protein	10	1 serving/d	1.5 ± 0.9	0.8 ± 0.0*	2.8 ± 2.3	1.9 ± 2.2	−0.9*	−1.7, 0.0
White : Red Meat	10	4:01	2.8 ± 1.3	2.1 ± 0.6	2.9 ± 0.0	2.1 ± 0.0	−0.3	−1.3, 0.8
Cereal Fiber	10	15 g/d	0.9 ± 0.0	1.1 ± 0.0	0.8 ± 0.0	0.7 ± 0.0	0.4	−0.3, 1.1
Polyunsaturated : Saturated Fat	10	≥1	6.6 ± 1.0	6.5 ± 1.3	7.1 ± 1.3	6.2 ± 1.0*	0.4	−0.6, 1.4
Multivitamin use	7.5	Use at both recalls	4.5 ± 2.1	4.7 ± 2.1	4.4 ± 1.9	4.6 ± 1.7	0.0	−0.8, 0.7
Alcohol	10	M: 1.5–2.5 drinks/d; W: 0.5–1.5 drinks/d	0.4 ± 1.3	0.2 ± 0.0	0.3 ± 0.0	0.3 ± 1.1	−0.1	−0.6, 0.3
Total score	87.5	-	22.8 ± 4.5	22.1 ± 6.3	24.9 ± 6.9	21.8 ± 5.9	−0.3	−3.5, 2.9

[a] Adjusted for age category, sex, marital status, general health status, weight status, and baseline food security.

* P<0.05 for within-group changes; M, men; W, women