

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 whether 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 3-month, longitudinal study was conducted among 107 adults recruited at the time of SNAP application assistance. Outcomes included household food security (10-item US Department of Agriculture Food Security Survey Module), dietary intake (eg, grains, fruit) and diet quality (modified Alternate Healthy Eating Index). Data were analyzed using paired *t* tests and multivariable linear regression.

Results: Supplemental Nutrition Assistance Program participation was not associated with improved household food security over 3 months ($P = .25$). Compared with non-participants, SNAP participants increased refined grain intake by 1.1 serving/d ($P = .02$), 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.

Key Words: Supplemental Nutrition Assistance Program, food security, diet quality, Alternate Healthy Eating Index, food stamps (*J Nutr Educ Behav.* 2014;46:68-74.)

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 These 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 non-participants.⁸ These studies were primarily cross-sectional and were

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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 3-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 policy makers 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 Food-Source Hotline by Hotline counselors. Inclusion criteria included being ≥ 18 years of age and 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 after 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 4 24-hour dietary recalls were administered over

the telephone to study participants. One questionnaire and 2 24-hour dietary recalls¹⁰ were conducted at baseline and again at follow-up 3 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, and 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.

The researchers assessed household food security using the 10-item United States 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; and 9 or 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 $\leq 10:1$.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

The authors performed statistical analyses using Stata/IC 11.1 (StataCorp LP, College Station, TX, 2009). All statistical tests were 2-sided. Statistical significance was considered at $P < .05$. At baseline, no study participants were receiving SNAP benefits, although it was assumed that everyone had applied for SNAP. The researchers defined SNAP participants as individuals who received SNAP benefits at follow-up. Non-participants 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, of 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-square tests. Within-group changes in food security from baseline to follow-up were evaluated using paired *t* tests and chi-square 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, body mass index categories (calculated from self-reported height and weight), and change in SNAP participation. Complete data were 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 non-participants. 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 (ie, SNAP participants), and 43 participants (40%) did not qualify or chose not to participate in the program (ie, non-participants). The average length of SNAP participation was 2.8 months. There were few sociodemographic differences between SNAP participants and non-participants (Table 1). Non-participants reported better general health than SNAP participants ($P = .03$) and were more likely to have a household member working full-time at follow-up ($P < .001$). Nine percent of study participants received WIC at baseline; no difference in WIC participation was observed between SNAP participants and non-participants.

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

Table 1. Characteristics of Low-income Massachusetts Adults^a

	SNAP Participants (n = 64)		SNAP Non-participants (n = 43)		P
	n	%	n	%	
Age, y ^a					.06
18–30	3	5	9	21	
31–50	22	34	13	30	
51–65	28	44	17	40	
> 65	11	17	4	9	
Female ^a	50	78	30	70	.33
Race/ethnicity ^a					.86
White	47	73	32	78	
African American	10	16	5	12	
Latino/other/multi-race	7	11	4	10	
Weight status ^a					.10
Normal weight	17	27	18	42	
Overweight	23	37	17	40	
Obese	23	37	8	19	
Education level ^b					.78
< 12 y	7	11	5	12	
High school diploma or General Equivalency Diploma	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					.03
Excellent to very good	14	22	18	42	
Good	25	39	8	19	
Fair to poor	25	39	17	40	
Full-time employed ^b	13	20	24	56	< .001
Married or living with partner ^b	15	23	16	37	.12

SNAP indicates the Supplemental Nutrition Assistance Program.

^aMeasured during baseline; ^bMeasured during follow-up.

Note: Chi-square tests were used.

food security), mean food security scores were 4.8 ± 0.4 for SNAP participants and 5.4 ± 0.5 for non-participants ($P = .40$). There were statistically significant improvements in food security scores and categories at follow-up within both groups ($P < .01$). Compared with non-participants, SNAP participants had a 0.5-point improvement in food security, which was not statistically significant after multivariate adjustment ($P = .25$).

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 with the recommendations

from the 2010 Dietary Guidelines for Americans (Table 3). After the initiation of benefits, new SNAP participants consumed, on average, < 1 serving/d of whole grains, 2.1 servings/d of fruits and vegetables, > 4 servings/d of refined grains, and almost 1.5 servings/d of sugar-sweetened beverages and fruit juices. Compared with non-participants, SNAP participants had a significant increase in refined grains (1.1 serving/d; $P = .02$). After multivariate adjustment, SNAP participants and non-participants 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

Table 2. Changes in Food Security Levels at Baseline and Follow-up by Supplemental Nutrition Assistance Program (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 (mean ± SEM) ^b	4.8 ± 0.4		3.4 ± 0.4*		5.4 ± 0.5		4.0 ± 0.5*		−0.5	−1.4 to 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		

* $P < .05$ for within-group changes; ^aAdjusted for age category, sex, marital status, general health status, and weight status;

^bHigher scores indicate more severe experiences of household food insecurity.

Note: Within-group changes were examined using paired t tests. Effect of SNAP participation was evaluated using multivariate linear regression.

non-participants (22.8 vs 24.9 out of 87.5 points; $P = .17$) (Table 4). Compared with non-participants, 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 ($\beta = -0.9$; 95% CI, -1.7 to 0.0) for SNAP participants compared with non-participants.

Table 3. Changes in Dietary Intake at Baseline and Follow-up by Supplemental Nutrition Assistance Program (SNAP) Participation Groups

	Received SNAP (n = 64)		Did Not Receive SNAP (n = 43)		Effect of SNAP Participation ^a	
	Baseline (Mean ± SD)	Follow-up (Mean ± SD)	Baseline (Mean ± SD)	Follow-up (Mean ± SD)	Change	95% CI
Foods and food groups (in servings/d)						
High-fat dairy	0.5 ± 0.4	0.7 ± 0.7	0.5 ± 0.6	0.8 ± 0.0	0.0	−0.4 to 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 to 0.2
Fruits	0.9 ± 0.7	0.9 ± 0.7	1.0 ± 1.0	1.1 ± 0.7	−0.2	−0.7 to 0.3
Vegetables	1.0 ± 0.0	1.2 ± 0.9	1.2 ± 1.1	0.7 ± 0.3	0.4	−0.1 to 0.9
Processed meat	0.2 ± 0.1	0.2 ± 0.0	0.2 ± 0.0	0.2 ± 0.2	−0.1	−0.2 to 0.1
Whole grains	0.8 ± 0.0	0.6 ± 0.3	0.8 ± 0.3	0.9 ± 0.6	−0.2	−0.6 to 0.1
Refined grains	3.7 ± 0.7	4.2 ± 1.3	3.5 ± 0.0	3.5 ± 1.0	1.1*	0.2 to 2.0
Salty snacks	0.2 ± 0.1	0.2 ± 0.2	0.3 ± 0.0	0.2 ± 0.0	0.0	−0.1 to 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 to 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 to 0.3
Nutrients						
Total energy, kcal	1,356 ± 509	1,486 ± 434	1,345 ± 405	1,514 ± 478	−1	−249 to 247
Carbohydrates (% energy)	49.1 ± 6.7	48.6 ± 4.5	48.4 ± 0.0	50.6 ± 7.0	−0.9	−5.2 to 3.5
Protein (% energy)	16.4 ± 1.8	16.9 ± 1.8	16.5 ± 0.0	16.8 ± 3.6	−0.5	−2.6 to 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 to 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 to 1.6
Cholesterol, mg/d	188 ± 69	216 ± 0	205 ± 93	220 ± 70	−4	−54 to 47
Dietary fiber, g/d	10.2 ± 1.8	11.1 ± 2.8	11.5 ± 3.9	11.3 ± 3.5	−0.4	−2.3 to 1.6
Folate, mg/d	272 ± 0	291 ± 58	292 ± 79	302 ± 61	10	−42 to 61
Sodium, mg/d	2,259 ± 223	2,528 ± 357*	2,451 ± 488	2,395 ± 427	181	−108 to 470
Potassium, mg/d	1,758 ± 290	2,014 ± 443*	1,845 ± 342	2,030 ± 394	68	−216 to 351
Calcium, mg/d	597 ± 219	683 ± 275*	632 ± 152	745 ± 135	−14	−165 to 137
Iron, mg/d	10.7 ± 0.0	10.5 ± 0.6	10.7 ± 3.1	11.5 ± 1.6	−0.7	−2.2 to 0.8

* $P < .05$ for within-group changes; ^aAdjusted for age category, sex, marital status, general health status, weight status, and baseline food security.

Note: Effect of SNAP participation was evaluated using multivariate linear regression.

Table 4. Changes in Modified Alternate Healthy Eating Index at Baseline and Follow-up by Supplemental Nutrition Assistance Program (SNAP) Participation Groups

	Maximum Score	Maximum Criteria	Received SNAP (n = 64)		Did Not Receive SNAP (n = 43)		Effect of SNAP Participation ^a	
			Baseline (Mean ± SD)	Follow-up (Mean ± SD)	Baseline (Mean ± SD)	Follow-up (Mean ± SD)	Change	95% CI
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 to 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 to 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 to 0.0
White: red meat	10	≥ 4:1	2.8 ± 1.3	2.1 ± 0.6	2.9 ± 0.0	2.1 ± 0.0	−0.3	−1.3 to 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 to 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 to 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 to 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 to 0.3
Total score	87.5 ^b	–	22.8 ± 4.5	22.1 ± 6.3	24.9 ± 6.9	21.8 ± 5.9	−0.3	−3.5 to 2.9

M indicates men; W, women.

* $P < .05$ for within-group changes; ^aAdjusted for age category, sex, marital status, general health status, weight status, and baseline food security; ^bMaximum score rescaled to 87.5 points for comparability with other studies.

Note: Effect of SNAP participation was evaluated using multivariate linear regression.

Strategies to Improve Diets of SNAP Participants

At the end of the study, 3 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 (eg, fruits and vegetables) and providing more cooking or nutrition education classes would help SNAP participants to eat better (data not shown). A total of 59% of SNAP participants agreed that restricting unhealthy foods (eg, 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 with non-participants. Although there were significant improvements in food security among SNAP participants from baseline to follow-up, the same

average change was observed among non-participants. This might be attributed to temporal factors or higher full-time employment rates in non-participant 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 insecurity completely.

Although one might hypothesize that the provision of SNAP benefits would result in the purchase and consumption of healthy foods (ie, fruits, vegetables, whole grains), there was no substantial improvement in dietary quality among SNAP participants over the 3-month period. Rather, there was a significant increase in refined grains (eg, 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 difference in dietary intake by adults' SNAP participation status.^{8,18} The low mAHEI scores in the participants are comparable to 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 United States Department of Agriculture 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}

The study was limited primarily by the non-experimental 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 Because SNAP participants and non-participants were observed simultaneously, a comparison of the 2 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 1-unit change in food security scores and significant differences in most dietary outcomes.⁷ The CIs for the results also excluded substantial improvements in dietary intake. Because this pilot study was 1 of the first studies to observe 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 because of 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 Finally, 2 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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Spring 2014 Journal Club: *Labels, Media, and Marketing*

The spring 2014 journal club will start on January 27 at 1:00 pm ET. If you are an SNEB member and would like to register for all 10 sessions, contact Rachel (rdaeger@sneb.org).

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