Fruit and Vegetable, Fat, and Sugar-Sweetened Beverage Intake among Low-Income Mothers
Living in Neighborhoods with Supplemental Nutrition Assistance Program Education

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INTRODUCTION

The United States Department of Agriculture (USDA) Supplemental Nutrition Assistance Program – Education (SNAP-Ed) is the most widespread program designed to promote and possibly change behaviors in support of healthy lifestyles among low-income populations in the United States. SNAP-Ed nutrition and physical activity interventions are aimed at persons within households with income at or below 185% Federal Poverty Level, who are defined by the USDA as “SNAP eligible,” which in Federal Fiscal Year (FFY) 2014 exceeded 46.5 million.¹ Mothers are a primary target population for such interventions, since they are the person from SNAP households most likely to be responsible for the purchase of food, preparation of meals, and serve as role models for children’s eating habits.²

SNAP-Ed interventions can range from individual or group-based to community or public health approaches in line with the recommendations and restrictions outlined in annual guidance issued by the USDA. While the stated goal of SNAP-Ed is to “improve the likelihood that persons eligible for SNAP will make healthy food choices within a limited budget and choose physically active lifestyles consistent with the current Dietary Guidelines for Americans,”² interventions in California are mostly or entirely nutrition focused. In fact, when the USDA has initiated studies to test the effectiveness of SNAP-Ed, the selected interventions have only addressed dietary behaviors, with fruit and vegetable consumption serving as the primary outcome variable. These highly-controlled, high-dose interventions have found increased fruit and vegetable consumption due to SNAP-Ed.^{3,4}

Observational studies designed to test associations between SNAP-Ed and increased fruit and vegetable intake would offer greater generalizability of the efficacy of such interventions. However, assessment of the independent variable would be problematic since most SNAP-Ed participants would not know when asked whether a particular intervention they participated in was SNAP-Ed affiliated; service providers are not required and do not explicitly identify their interventions as SNAP-Ed.

The ecological study design addresses this problem by comparing summary statistics of outcome measures from individuals within groups in relation to exposures available at the same aggregate level.⁵ This approach has been used to show that incidence of human immunodeficiency virus (HIV) decreased over time within 81 cities with needle exchange programs and increased within 52 cities without such programs,⁶ and to demonstrate relationships between increased body mass index (calculated from self-reported height and weight) and living closer to fast-food restaurants and convenience stores.⁷

One study that used the ecological research approach to evaluate SNAP-Ed found that low-income California adults living in census tracts with higher levels of SNAP-Ed intervention reach, defined as the number of SNAP-Ed recipients over the number of SNAP-Ed eligible persons, reported an increased frequency in eating fruits and vegetables.⁸ One strength of this study over previous research was that the independent variable was based on the diverse types and intensities of SNAP-Ed interventions implemented throughout California. This study also found frequency of eating fast-food and levels of SNAP-Ed reach negatively related, suggesting

that such interventions increase the intake of fruits and vegetables and reduce the intake of unhealthful foods.

Reducing the consumption of unhealthful beverages in addition to unhealthful foods is a focus of SNAP-Ed interventions in California. The statewide “Rethink Your Drink” campaign provides educational messages and materials for recognizing beverages with added sugar, and the link between sugar-sweetened beverages and health risks.⁹ In FFY 2014, California SNAP-Ed service providers reported that 16% of the over half million SNAP-Ed recipients participated in direct education interventions that included Rethink Your Drink messages and materials (E. Talmage, unpublished data, 2015).

The objective of the present ecological study of low-income mothers is to examine levels of reach of SNAP-Ed interventions across California census tracts in relation to dietary intake and overall diet quality. Specifically, consumption of fruits and vegetables; high-fat, fast-food type foods: and sugar-sweetened beverages, overall and for purchases from fast-food restaurants, were hypothesized to significantly correlate with levels of SNAP-Ed intervention reach. Scores for the Healthy Eating Index-2010 (HEI-2010),¹⁰ a valid and reliable measure of diet quality in accordance with the recommendations of the *Dietary Guidelines for Americans, 2010*,¹¹ were also examined in relation to SNAP-Ed intervention reach. Higher levels of SNAP-Ed reach and HEI-2010 scores would provide empirical evidence that such interventions are related to overall dietary behaviors, and not only to the intake of selected types of healthful and unhealthful items.

METHODS

Sample and Recruitment

The study population represented the target population for SNAP-Ed interventions – mothers (or primary caregivers) of children. The sampling frame was the California Department of Social Services, Medi-Cal Eligibility Data System (MEDS), a database that is updated quarterly with the names, contact information, and limited demographics such as age for persons from households receiving SNAP throughout California. The sampling procedures involved the random selection of households with at least one adult female and one child between the ages of 5 and 17 years from the 17 largest California local health departments (LHDs).

Recruitment procedures began with letters of introduction sent to mothers, or addressed to the youngest adult female in households with more than one adult female, as identified in the MEDS database. This step was taken to increase the chance that the letters would be received by mothers with children younger than 18 years. Next, telephone calls were conducted to confirm study eligibility, interest in participation, primary language, and contact information. Mothers were offered a \$10 incentive to participate in a telephone survey scheduled for later date. This study was reviewed and approved by the California Health and Human Services Agency, Committee for the Protection of Human Subjects.

Survey

The Automated Self-administered 24-hour Recall (ASA24)¹² was used to assess dietary behaviors. Trained interviewers from the organization that developed the ASA24 with the National Cancer Institute (NCI) used the web-based system to administer the dietary assessment by telephone in English or Spanish. Prior to the ASA24 interview, mothers who expressed interest in survey participation during the initial screening and recruitment telephone calls were

sent measuring cups and spoons and a “Size Up Your Portion: A Guide to Food Serving Sizes” booklet. During the subsequent telephone survey the interviewers referenced the cups, spoons, and portion-size images from the booklet to assist mothers in selecting the precise amount of each food and beverage they recalled consuming for each meal during the past 24 hours. Information such as cooking methods, added items such as condiments, and place of purchase, were also recorded when applicable.

The ASA24 does not include demographic questions; survey participants’ race/ethnicity, highest level of education, and age were recorded on a separate instrument. Interviews were conducted from April through October 2014. The response rate was 60.5% (AAPOR RR4).¹³

Outcome Measures

The four dietary outcome variables of this study as derived from the ASA24 interviews are (1) cups of fruits (whole and 100% juice) and vegetables; (2) cups of sugar-sweetened beverages, full or low sugar; (3) calories from high-fat, fast-food type foods; and (4) HEI-2010 scores. The first two variables were created by examining the frequencies of the ASA24 codes for whole fruits and 100% juice, total vegetables, and beverages sweetened with sugar, and then converting and summing the associated quantities to cups. Seventy-five high-fat food items frequently purchased from fast-food settings were identified in the ASA24 database by the study senior nutritionist (second author) and included battered/breaded and/or fried vegetables (onions, okra, mushrooms, white potatoes), battered/breaded and/or fried fish, seafood, and chicken prepared with the skin or without skin, including breaded chicken products (nuggets, patties, fingers); hamburgers including with cheese and/or bacon; egg sandwiches (muffin, bagel, biscuit) with

cheese, bacon, and/or sausages; and hotdogs or other processed meat products such as sausages and bacon. The calories of these items along with related condiments (dressing, mayonnaise, ketchup) were calculated based on the reported portion size and summed.

HEI-2010 scores (theoretical range of 0 to 100) were calculated from published scoring procedures.¹⁰ The HEI-2010 does not represent a mutually exclusive outcome for this study since the 12 dietary components on which overall scores are calculated include total fruit, whole fruit, and total vegetables, as well as calories from solid fats and added sugars, including those obtained from sugar-sweetened beverages. HEI-2010 was selected as a distinct outcome because it represents a measure of overall diet quality in accordance with the recommendations of the *Dietary Guidelines for Americans, 2010*.¹¹

Demographics

To assess race/ethnicity, mothers were asked the following questions on the supplemental questionnaire: “What is your race? You may choose more than one. Are you American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, or White?” and “Are you Hispanic, Latina, or of Spanish origin?” Highest level of education was measured by asking, “What is the highest level of school you have completed or the highest degree you have received? Mothers were presented with the following response options: “8th grade or less,” “9th to 12th grade,” “high school graduate or GED completed,” “some vocational, trade, or business school but no diploma,” “completed a vocational, trade, or business school program,” “some college credit but no degree,” “college graduate,” or “post graduate or

professional degree.” Mothers’ age was calculated as the difference between interview and birth dates, or for those who refused to provide a date of birth, from the question, “What is your age?”

Analytic Database

ASA24 data were obtained from 6,915 mothers (Figure 1). Ninety respondents were subsequently excluded with partial interviews or who reported fasting during the previous 24 hours. Total caloric intake above three standard deviations from the mean (4,500 calories; n=70 mothers) were considered improbable high values and excluded from analysis. Because caloric intake was skewed to the right and no transformations allowed for clear lower cut points, 600 calories was used, as recommended by the NCI based on the NHANES dataset,¹⁴ as the criterion to remove 400 records.

The addresses provided by the remaining 6,355 mothers (or zip codes for 13 mothers without a full address) were geocoded to 2,907 census tracts. SNAP-Ed intervention reach was then calculated within each census tract as a proportion based on the total number of unduplicated SNAP-Ed direct education participants divided by the number of SNAP-Ed eligible persons for FFY 2014.

The numerators for calculating SNAP-Ed intervention reach were based on the numbers of SNAP-Ed participants age five through 59 years receiving direct education as reported in the USDA Education and Administrative Reporting System (EARS) by LHD staff and their subcontractors who implemented SNAP-Ed in California in FFY 2014. Direct education is defined as a structured nutrition education lesson(s) provided by an instructor for at least 15

minutes. Minors were included in the numerator because many SNAP-Ed interventions aimed at children and teenagers include materials and messages for their parents.

EARS data do contain duplicated counts of SNAP-Ed participants, due in part because different agencies within a LHD may enter information on the same SNAP-Ed participants, or because attendees of multi-session interventions are entered more than once. Staff from the Nutrition Education and Obesity Prevention Branch, California Department of Public Health, implement various processes to identify and remove duplicate SNAP-Ed participant counts. These include retaining only the information for participants of the first event for ongoing interventions with the same name, and identifying redundant entries after sorting interventions by site name within cities.

The denominators for calculating SNAP-Ed intervention reach – the numbers of SNAP-Ed eligible persons age six through 65 years within each of the 2,907 census tracts – was based on standardized procedures using data from the United States Census and American Community Survey.¹⁵

The distribution of SNAP-Ed intervention reach across the 2,907 census tracts was highly skewed to the right of its mean of .061 (skewness = 7.73). Given this distribution, and for ease of interpretability of the study findings, categorical variables were created representing levels of intervention reach. The distribution of the data also limited the options for the number of categories. Initially a “high” then a “moderate” reach variable were developed with cut off points for each dichotomous variable determined to ensure that sufficient statistical power was available

to compare with a referent group. Specifically, proportions $> .25$ were coded as “high” reach and values $> .10$ and $\leq .25$ were classified as “moderate” reach.

A total of 475 and 487 mothers lived in high and moderate reach groups respectively. Mothers from “low” reach census tracts ($n=1,394$) were grouped with the 3,999 mothers from no reach census tracts to represent the referent group for the analyses because less than 10% of the SNAP-Ed population having participated in a SNAP-Ed intervention was considered too low to have a measurable effect.

Data Analysis

Mothers’ responses to the race/ethnicity questions were coded into four categories: Latina (“Hispanic, Latina, or of Spanish origin”); White, Non-Hispanic; African American, Non-Hispanic; or Other. Four categories were also created for highest level of education: Less than high school graduate; high school graduate; vocational schooling or some college courses; or college graduate. Descriptive statistics for these variables and age are presented in Table 1. The distributions of the demographic variables are also shown in Table 1 by levels of SNAP-Ed intervention reach. Although not a primary research question of this study, statistical tests (chi square for race/ethnicity and education and one-way ANOVA for age) were performed because support for the null hypotheses would suggest that SNAP-Ed interventions are equitably distributed to low-income mothers regardless of race/ethnicity, age, or education.

Unfortunately, a number of ASA24 interviews concluded without administration of the supplemental questionnaire, resulting in race/ethnicity, age, and education not recorded for 8.2%,

8.1%, and 5.8% of mothers, respectively. Missing data were handled in the analyses of the independent and outcome variables as follows: The proportions for valid versus missing responses for each demographic were examined by levels of SNAP-Ed intervention reach using chi square tests. In these cases, support for the null hypotheses would suggest that the lost demographic information was random. For the analyses to test the central research questions of this study, missing data were included in the series of dummy variables for the covariates of race/ethnicity and education.

Separate linear regression models were developed for each outcome variable by using two dummy variables for SNAP-Ed reach: moderate reach (no/low reach = 0; moderate reach = 1; and high reach = 0) and high reach (no/low reach = 0; moderate reach = 0; and high reach = 1), thus making no/low reach the reference group. For race/ethnicity, dummy variables for Latina, African American, Other, and missing cases were compare with the reference group representing Whites. For education, mothers with vocational or college education served as the reference group for dummy variables for less than high school education, high school graduate, and missing cases.

Table 2 presents the unadjusted means for the dietary intake variables and HEI-2010 scores, as well as constant for each regression model representing the adjusted mean for the no/low SNAP-Ed reach group. Beta coefficients indicate the magnitude of change for the outcome measures for the moderate and high SNAP-Ed reach groups.

Models for cups of fruits and vegetables, calories from high-fat foods, and cups of sugar-sweetened beverages were repeated but only for the items purchased from fast-food restaurants using the same covariates. HEI-2010 scores were computed using SAS code (Version 9.3; SAS Institute Inc., Cary, NC). All descriptive and inferential statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 20.0 (Armonk, NY: IBM Corp.). The criterion for statistical significance was set at 0.05.

RESULTS

The sample of SNAP mothers was 42.6% Latina, 25.5% White, and 17.6% African American (Table 1). The mean age of mothers was 37.5 (SD = 8.1). One-fifth (19.8%) of the sample reported education to be less than a high school graduate. Highest level of education included vocational or some college course work but not a college degree for 38.4% of the sample; 12.6% of mothers were college graduates. Non-significant differences between valid and missing data indicate that lost demographic information is random. The distribution of valid responses to the race/ethnicity, age, and education items also did not significantly differ by no/low, moderate, and high SNAP-Ed reach levels, suggesting the equitable availability of such interventions for low-income mothers in the selected 17 California LHDs.

Overall, SNAP mothers reported eating a mean of 3.04 cups of fruits and vegetables, consuming 100.2 calories from high-fat, fast-food type foods, and drinking 1.18 cups of sugar-sweetened beverages during the previous 24 hours (Table 2). Reported consumption of fruits and vegetables and sugar-sweetened beverages from fast-food restaurants was limited, 0.091 and 0.122 cups,

respectively. Mothers consumed on average 30.8 calories from high-fat, fast-food restaurant purchases. The mean HEI-2010 score for the sample was 54.1.

Levels of self-reported intake did not differ between mothers from moderate versus no/low SNAP-Ed intervention reach census tracts. However, mothers from high SNAP-Ed reach compared with no/low SNAP-Ed reach census tracts reported eating significantly greater quantities of fruits and vegetables (0.304 cups), consuming 34.6 fewer calories from high-fat foods, and drinking 0.171 fewer cups of sugar-sweetened beverages. For items purchased at fast-food restaurants, higher SNAP-Ed reach was related to more cups of fruits and vegetables and fewer calories from high-fat foods, but was not associated with the number of reported cups of sugar-sweetened beverages.

The adjusted mean HEI-2010 score for mothers from no/low SNAP-Ed reach areas was 50.6; means for mothers from moderate and high SNAP-Ed reach census tracts were 49.4 and 51.9, respectively. The relationship between levels of SNAP-Ed intervention reach and overall diet quality as assessed by the HEI-2010 was not found to be statistically significant.

DISCUSSION

The central focus of SNAP-Ed in California, as communicated by the Nutrition Education and Obesity Prevention Branch, California Department of Public Health, to LHDs that implement and oversee related interventions, is knowledge transfer of the health benefits of fruits and vegetables; planning, purchasing, and preparing healthful snacks and meals; healthful recipes;

the recommended intake of fruits and vegetables per the USDA's MyPlate guidelines; and reducing the intake of saturated fats as well as sugar, overall and specifically from sugar-sweetened beverages.

Accordingly, support was found for the hypothesized relationship between SNAP-Ed and the reported consumption of fruits and vegetables among low-income mothers. Moreover, the 0.304 cup difference in fruit and vegetable intake for mothers from high versus no/low SNAP-Ed reach census tracts meets the criterion used by researchers to regard SNAP-Ed interventions as effective; that is, of having a measureable impact on health.^{5,6}

This finding is in line with experiments involving SNAP-Ed eligible adults,¹⁶⁻¹⁸ with intervention participants increasing intake of fruits and vegetables by 0.41 to 0.52 cups. These experimental outcomes came from highly-structured, multi-lesson or multi-workshop nutrition education interventions. In one study,¹⁶ for example, increased fruit and vegetable consumption was reported from those who had previously attended one or more 30-minute workshops conducted at farmers' markets consisting of instruction by a nutritionist or registered dietician, cooking demonstrations using seasonal fruits and vegetables, and the distribution of recipes and a \$2 coupon toward the purchase of fruits and vegetables. The finding for the current study, in contrast, was based on SNAP-Ed interventions delivered for at least 15 minutes, under conditions not as controlled as those found in experiments, by instructors with varying levels of education, training, experience, and skills. As such, the present and past⁸ ecological studies contribute to the literature by suggesting that different direct education SNAP-Ed interventions conducted in a number of settings by instructors with varying backgrounds can increase in fruit

and vegetable intake to levels that, although not as profound as those reported from experimental research, are conducive to improved health outcomes. Furthermore, such outcomes appear to be generalizable to low-income populations at a statewide level, including those from predominantly Spanish-speaking communities.

The current study also demonstrated relationships between SNAP-Ed and decreased intake of calories from high-fat, fast-food type foods and sugar-sweetened beverages. Furthermore, the study findings suggest that SNAP-Ed provides low-income mothers with the knowledge and skills to eat healthier when ordering from fast-food restaurants. Specifically, our correlational analyses found that mothers living in census tracts with higher levels of SNAP-Ed interventions ate greater quantities of fast-food restaurant-purchased fruits and vegetables and consumed fewer calories from high-fat foods from fast-food restaurants than mothers from census tracts with no or limited SNAP-Ed interventions.

Yet, HEI-2010 scores were not found to associate with levels of SNAP-Ed intervention reach. SNAP-Ed participants may be compensating for these changes in diet by preparing, ordering, and consuming more quantities of other types of foods such as full-fat dairy products or empty calorie refined grain snacks, side-dishes, or dessert items. As such, SNAP-Ed may be effective in altering consumption for certain types of foods and beverages, but not as a means of changing overall diet quality.

The strengths of this study include a representative sample of mothers from California SNAP households. In addition, the four outcomes measures were derived from detailed dietary

information from a 24-hour multiple-pass interview methodology that provided increased measurement sensitivity than available from previous studies using food frequency questionnaires. Number of cups of fruits and vegetables, for example, were based on the sum of cups of 100% fruit juice and identified portion sizes for each type of fruit and/or vegetable consumed at each meal or snack. These data were obtained by interviewers who received extensive training on the ASA24, which included assisting survey respondents in identifying applicable portion sizes by probes and by referring them to measuring cup and spoons and pictures in a portion-size booklet that had been previously sent to them. The quality of these data allow for improved precision to detect real differences across groups compared with traditional food frequency questionnaires. Finally, the majority of the sample was mothers from minority groups, and the statistical models allow for generalizing the findings to low-income mothers regardless of racial/ethnic background.

Limitations of the study include absence of physical activity to investigate caloric balance in relation to levels of SNAP-Ed interventions. Another major limitation is a presumed rather than verified level of exposure to SNAP-Ed. An ecological study represents the best approach to an evaluation of SNAP-Ed at the population level, but leaves unanswered questions such as which types and levels of direct education interventions are most effective. This study did not include and thereby cannot rule out the effects of other individual or community factors that could explain more healthful eating among mothers from high-reach census tracts, including other interventions or campaigns aimed at the SNAP-eligible population. Final, non-response bias should be considered when interpreting the results.

IMPLICATIONS FOR RESEARCH AND PRACTICE

In contrast to the ecological research design used in the current study, SNAP-Ed interventions are guided by the Social-Ecological Model (SEM),² which recognizes that multiple sectors of society beyond individuals, including environmental factors, influence eating behaviors as well as physical activity. The USDA's support for policy, systems, and environmental (PSE) approaches beginning in FFY 2013 have since allowed California and other states to place greater emphasis on environmental factors, including those in indoor (school, retail sites) and outdoor (farmers' markets) settings, as well as to support the development of wellness policies. Starting in FFY 2017, California LHDs are required to pair all traditional nutrition education strategies directed at individuals, families, or groups with PSE interventions to maximize the potential for positive behavior change. Thus, future studies should test whether such new or enhanced interventions are related to dietary quality outcomes.

This correlational study provides evidence that SNAP-Ed is effective at what it has been designed to do: Increase fruit and vegetable consumption and decrease intake of high-fat foods and sugar-sweetened beverages among low-income populations. However, the totality of these changes appears not to be sufficient to affect diet quality in this analysis. Perhaps the increased diffusion of PSE interventions in the United States, and specifically when combined with direct education as required in California beginning in FFY 2017, will be more effective than those interventions implemented in California in 2014 at improving overall diet quality. By including assessment of levels of physical activity, future studies may also find links between SNAP-Ed and caloric balance.

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438 These institutions are equal opportunity providers and employer.
439

Figure 1. Processes for developing analytic dataset.

488 Table 1. Demographic Characteristics of Mothers by Level of SNAP-Ed Intervention Reach, California 2014

	Level of SNAP-Ed Intervention				Difference Across Levels	
	Total	Reach			Valid v. Missing	Valid
		No/Low	Moderate	High	Responses (<i>P</i>)	Responses (<i>P</i>)
Number of Mothers, n (%)	6,355	5,393 (84.9)	487 (7.7)	475 (7.5)		
Race/Ethnicity						
Latina, n (%)	2,705 (42.6)	2,276 (84.1)	234 (8.7)	195 (7.2)		
White, n (%)	1,619 (25.5)	1,398 (86.3)	103 (6.4)	118 (7.3)		
African American, n (%)	1,117 (17.6)	940 (84.2)	87 (7.8)	90 (8.1)	.83	.12
Other, n (%)	394 (6.2)	333 (84.5)	26 (6.6)	35 (8.9)		
Missing, n (%)	520 (8.2)	446 (85.8)	37 (7.1)	37 (7.1)		
Age in Years						
Valid n (%)	5,840 (91.9)	4,951 (84.8)	450 (7.7)	439 (7.5)		
Missing, n (%)	515 (8.1)	442 (85.8)	37 (7.2)	36 (7.0)	.82	.42

Mean (SD)	37.5 (8.1)	37.5 (8.1)	37.1 (8.7)	37.2 (8.0)		
Education						
Less than High School Graduate, n (%)	1,256 (19.8)	1,048 (83.4)	112 (8.9)	96 (7.6)		
High School Graduate, n (%)	1,485 (23.4)	1,260 (84.8)	108 (7.3)	117 (7.9)		
Vocational or Some College, n (%)	2,442 (38.4)	2,082 (85.3)	182 (7.5)	178 (7.3)	.89	.45
College Graduate, n (%)	801 (12.6)	686 (85.6)	59 (7.4)	56 (7.0)		
Missing, n (%)	371 (5.8)	317 (85.4)	26 (7.0)	28 (7.5)		

489 SNAP-Ed indicates Supplemental Nutrition Assistance Program – Education.

490 Note. SNAP-Ed Intervention Reach represents the number of SNAP-Ed recipients divided by the SNAP-Ed eligible population per
 491 census tract: No/Low, 0 to ≤ 0.10 ; Moderate, > 0.10 to ≤ 0.25 ; High, > 0.25 to 1.0. Tests of significance across levels of SNAP-Ed
 492 Intervention Reach for valid versus missing responses are based on chi-square tests. Tests of significance for Race/Ethnicity and
 493 Education by SNAP-Ed Intervention Reach are based on chi-square tests, and one-way ANOVA for age.

494

495 Table 2. Intake of Fruits and Vegetables, High-Fat Foods, and Sugar-Sweetened Beverages During Past 24 Hours, Overall and for
 496 Purchases from Fast-Food Restaurants, among Mothers by Level of SNAP-Ed Intervention Reach, California 2014
 497

	Level of SNAP-Ed Intervention Reach					
	Unadjusted	Adjusted	Moderate	High	Moderate	High v.
		Mean			v. No/Low	No/Low
	Mean	(Constant)	<i>B</i> (SE)	<i>B</i> (SE)	(<i>P</i>)	(<i>P</i>)
Intake Overall						
Cups of Fruits and Vegetables	3.04	2.76	-0.164 (0.112)	0.304 (0.113)	.14	< .01
Calories From High-Fat Foods	100.2	101.7	-16.1 (13.4)	-34.6 (13.6)	.23	.01
Cups of Sugar-Sweetened Beverages	1.18	1.43	0.094 (0.086)	-0.171 (0.086)	.27	.05
Intake from Items Purchased from Fast-Food Restaurants						
Cups of Fruits and Vegetables	0.091	0.093	0.006 (0.015)	0.030 (0.015)	.67	.05
Calories From High-Fat Foods	30.8	31.9	-6.96 (6.09)	-13.3 (6.15)	.25	.03

Cups of Sugar-Sweetened Beverages	0.122	0.161	0.017 (0.025)	-0.036 (0.026)	.49	.16
Healthy Eating Index-2010	54.1	50.6	-1.23 (0.692)	1.28 (0.700)	.08	.07

498 SNAP-Ed indicates Supplemental Nutrition Assistance Program – Education.

499 Note. SNAP-Ed Intervention Reach represents the number of SNAP-Ed recipients divided by the SNAP-Ed eligible population per

500 census tract: No/Low, 0 to ≤ 0.10 ; Moderate, > 0.10 to ≤ 0.25 ; High, > 0.25 to 1.0. Outcome variables by levels of SNAP-Ed

501 Intervention Reach were tested using linear regression with race/ethnicity and education as covariates.

502