Household Supplemental Nutrition Assistance Program Participation is Associated With Higher Fruit and Vegetable Consumption

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ABSTRACT

Objective: Examine whether differences were present by Supplemental Nutrition Assistance Program (SNAP) participation in dietary patterns, achievement of dietary recommendations, and food security for children (aged 7–18 years) receiving free/reduced-price school meals.

Methods: Cross-sectional study. Caregiver–child dyads at a pediatric clinic completed validated surveys. Food security, dietary patterns, and achievement of dietary recommendations were compared between child SNAP participants/nonparticipants.

Results: Among 205 caregivers, 128 (62.4%) reported SNAP participation. Percentages of child SNAP participants/nonparticipants meeting recommendations were largely nonsignificantly different and overwhelmingly low. Supplemental Nutrition Assistance Program participants reported higher mean daily servings of vegetables ($P = 0.01$) and fruits ($P = 0.01$) than nonparticipants. Caregiver-reported household food security was not significantly different between SNAP participants and nonparticipants ($P = 0.44$).

Conclusions and Implications: In this study, child-reported fruit/vegetable intakes were significantly higher among SNAP participants than nonparticipants, suggesting child SNAP participants may experience small but noteworthy benefits related to fruit/vegetable consumption. Additional supports are needed to achieve dietary recommendations.

Key Words: Supplemental Nutrition Assistance Program, child, dietary habits, food security (*J Nutr Educ Behav.* 2021;53:1060–1065.)

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INTRODUCTION

The Supplemental Nutrition Assistance Program (SNAP) is the largest nutrition assistance program in the US. More than 42 million people, nearly half (44%) aged under 18 years, received benefits exceeding \$63 billion in 2017.^{1,2} Although consistent evidence supports SNAP's critical role

in addressing hunger and food insecurity among participants of all ages,^{3,4} less is known about dietary patterns of children and adolescents in households receiving SNAP.⁵ Because of limited restrictions on eligible food items, public health advocates have expressed concerns that SNAP is too often used to purchase calorie-dense, nutrient-poor foods

that promote obesity and chronic disease.^{6,7} In fact, an association exists between SNAP participation and poor diet quality among adults.^{5,8–10} Given consistent evidence that adults receiving SNAP struggle more than income-eligible nonparticipants to meet dietary guidelines,⁵ it should be questioned whether, and to what degree, these associations exist among youth with low income.

Although evidence is limited, prior research has shown no significant difference by SNAP participation in fruit, vegetable, macronutrient, or energy intakes in children with low income.^{5,7} However, young participants have reported higher consumption of sugar-sweetened beverages, processed meats, and high-fat dairy than nonparticipants with low income.⁷ Given SNAP's reach and potential influence on dietary patterns of children with low income, who are disproportionately impacted by obesity and diet-related chronic conditions,^{11–14} there is a need for

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research to focus on young participants. In a sample of children at a large pediatric clinic in a low-income, urban area, researchers in the current study examined dietary intakes and whether differences were present by SNAP participation in food security, achievement of dietary recommendations, and dietary patterns of children, with particular focus on fruit and vegetable consumption.

METHODS

This cross-sectional study took place in Flint, MI, where approximately 60% of children live below the poverty line,¹⁵ and the low-income city struggles with inadequate transportation options and insufficient full-service grocery stores.^{16,17} Researchers analyzed a subset of self-reported baseline data from a convenience sample of caregiver–child dyads (1/ household) who presented at a large pediatric clinic that primarily serves children with low income receiving Medicaid. For the current study, researchers restricted inclusion to children enrolled in free or reduced-price school meals (generally restricted to households with incomes less than 130% to 185% of the federal poverty level¹⁸) to achieve comparative samples of children with low income. Participation in SNAP and free or reduced-price school meals was based on caregivers' self-reported participation or nonparticipation in each. Methods of the complete dataset are described in an earlier article examining a subset exclusively of Flint, MI, children in the context of a new produce prescription program.¹⁹ Therefore, an abridged version is provided here alongside nuances of the current study, which specifically examined children with low income from greater Flint, MI, on the basis of SNAP participation.

Following approval from Michigan State University Institutional Review Board, caregivers whose children were patients at the partnering clinic, were aged between 7 and 18 years, and spoke English were invited to participate in the study. From August 2018 through March 2019, dyads were approached, consented/assented (written), and

completed initial surveys during their pediatric office visit. Caregiver–child dyads separately provided demographic information, including self-reported age and sex and caregiver-reported race/ethnicity from a list which included African American, Asian American, Caucasian, Hispanic, Native American/American Indian, or other (specify). Survey questions assessed dietary patterns and food security. A digital survey platform (Michigan State University Qualtrics) was used to collect all data.

Caregivers completed the US Household Food Security Module: Six-Item Short Form to measure household food security and hunger.²⁰ The sum of affirmative responses (often, sometimes, yes, almost every month, some months but not every month) was considered the household's raw score. This raw score determined food security status (0–1, high/marginal food security; 2–4, low food security; 5–6, very low food security). Researchers created a dichotomous summary score for analysis (0–1, high/marginal food security; 2–6, low/very low food security).

The Block Kids Food Screener (BKFS), having previously demonstrated good relative validity for children and adolescents,²¹ was used to measure dietary patterns of the children (aged 7–18 years). The 41-item BKFS assessed both the frequency and quantity in which foods and beverages were consumed during the previous week. Although self-administered, a registered dietitian was present throughout survey completion and available to help children. For analysis, daily servings of vegetables, fruits, dairy, protein sources, whole grains, fiber, and added sugars were recorded from the sample of children using data extracted from the BKFS. Children's intakes were compared against the recommendations from the US Department of Agriculture's MyPlate²² and the American Heart Association^{23,24} to determine the achievement of dietary recommendations. Dietary recommendations for vegetables, fruits, dairy, protein sources, and whole grains were based on the USDA's MyPlate. Dietary recommendations for fiber and added sugars were based on

the American Heart Association guidelines for children.

When available, weight and height were recorded through medical chart review by a trained research assistant. Weight and height measurements were used to calculate body mass index. Body mass index percentiles by sex and age served as indicators of overweight and obesity.²⁵ A body mass index in the 85th to < 95th percentile was classified as overweight, whereas $\geq$ 95th percentile corresponded to the obese category.

Descriptive statistical analysis included frequencies with percentages. In addition, the chi-square test of independence was used to assess differences in the proportion of key demographics, background characteristics, or outcomes by group. Independent t tests were used to examine differences in mean daily servings of vegetables, whole fruit, total fruit, fiber, dairy, protein sources, whole grains, and added sugar between groups. An α of 0.05 was used to determine statistical significance. Data were analyzed using SPSS software (version 25, IBM Corporation, 2017).

RESULTS

Of the 205 caregivers who reported their child was enrolled in free/reduced-price school meals, 128 (62.4%) indicated their household received SNAP benefits. Compared with caregivers whose household did not receive SNAP (nonparticipants), caregivers whose household received SNAP (participants) were younger ($P=0.006$) with more household members aged under 18 years ($P<0.001$). Caregiver-reported household food security was not significantly different between participants (47.7% high/marginal; 52.3% low/very low) and nonparticipants (53.2% high/marginal; 46.8% low/very low; $P=0.44$). Similarly, there were no significant differences between participants and nonparticipants in relation to caregiver-reported race/ethnicity, sex, education, or resident city, nor child age, sex, or weight status (Table 1). Overall, the majority of children in the sample were classified as overweight or obese (60.1%).

Table 1. Sociodemographic Characteristics of Caregivers and Children with Low Income Presenting at a Large Pediatric Clinic

Caregivers	Overall, n = 205	SNAP Participants, n = 128	SNAP Nonparticipants, n = 77	P ^a
Age, mean ± SD	40.78 ± 10.47 (range, 20–79)	39.10 ± 9.04 (range, 20–66)	43.57 ± 12.05 (range, 27–79)	0.006*
Household members aged < 18 years, mean ± SD	2.48 ± 1.35 (range, 1–9)	2.74 ± 1.37 (range, 1–9)	2.05 ± 1.21 (range, 1–6)	< 0.001*
Race/ethnicity				0.15
African American	133 (64.9%)	87 (68%)	46 (60%)	
Caucasian	57 (28%)	35 (27%)	22 (29%)	
Other	15 (7%)	6 (5%)	9 (12%)	
Sex				0.13
Female	195 (95%)	124 (97%)	71 (92%)	
Male	10 (5%)	4 (3%)	6 (8%)	
Education				0.10
High school degree or less	62 (32%)	43 (36%)	19 (25%)	
Some college/trade school/associate's degree	85 (43%)	54 (45%)	31 (41%)	
Bachelor's degree	31 (16%)	14 (12%)	17 (22%)	
Graduate/professional degree	18 (9%)	9 (8%)	9 (12%)	
City of Flint				0.49
Yes	152 (74%)	97 (76%)	55 (71%)	
No	53 (26%)	31 (24%)	22 (29%)	
Children	Overall, n = 205	SNAP Participants, n = 128	SNAP Nonparticipants, n = 77	P
Age, mean ± SD	12.99 ± 2.69 (range, 7–18)	12.83 ± 2.64 (range, 7–18)	13.26 ± 2.76 (range, 8–18)	0.27
Sex				0.87
Female	113 (55%)	70 (55%)	43 (56%)	
Male	92 (45%)	58 (45%)	34 (44%)	
Child Weight Status	Overall, n = 188	SNAP Participants, n = 118	SNAP Nonparticipants, n = 70	P
BMI				0.60
10th to < 85th percentile	75 (40%)	50 (42%)	25 (36%)	
85th to < 95th percentile	35 (19%)	20 (17%)	15 (21%)	
≥ 95th percentile	78 (41%)	48 (41%)	30 (43%)	
BMI, males				0.24
10th to < 85th percentile	35 (41%)	24 (46%)	11 (33%)	
85th to < 95th percentile	16 (19%)	7 (13%)	9 (27%)	
≥ 95th percentile	34 (40%)	21 (40%)	13 (39%)	
BMI, females				0.86
10th to < 85th percentile	40 (39%)	26 (39%)	14 (38%)	
85th to < 95th percentile	19 (18%)	13 (20%)	6 (16%)	
≥ 95th percentile	44 (43%)	27 (41%)	17 (46%)	

BMI indicates body mass index; SNAP, *Supplemental Nutrition Assistance Program*.

^aComparison of means was analyzed using independent t tests, whereas a comparison of percentages was analyzed using the chi-square test of independence.

*Statistically significant at $P < 0.05$.

Notes: BMI percentiles given for sex and age (overall); 85th to < 95th percentile, overweight; ≥ 95th percentile, obese.

In total, 200 children (124 participants, 76 nonparticipants) completed the entire BKFS. None met dietary recommendations for whole grains. Fewer than 10% of all children met minimum

recommendations for vegetables, dairy, or fiber (Table 2). Dietary recommendations for vegetables, fruits, dairy, protein sources, and whole grains were based on the USDA's MyPlate. Dietary recommendations

for fiber and added sugar were based on the American Heart Association guidelines for children.

The percentage of children who met minimum dietary recommendations was not significantly different

Table 2. Child Achievement of Dietary Recommendations by Supplemental Nutrition Assistance Program (SNAP) Participation

Dietary Intakes	Dietary Recommendations, Aged 9–18 years ^a	Percentage Meeting at Least Minimum Dietary Recommendation			<i>P</i> ^b
		Overall, n = 200	SNAP Participants, n = 124	SNAP Nonparticipants, n = 76	
Vegetables, cups	2–3 cups per d	13 (7%)	11 (9%)	2 (3%)	0.08
Total fruits, cups	1.5–2 cups per d	78 (39%)	54 (44%)	24 (32%)	0.09
Whole fruits, cups	1.5–2 cups per d	23 (12%)	17 (14%)	6 (8%)	0.21
Dairy, cups	3 cups per d	14 (7%)	9 (7%)	5 (7%)	0.86
Protein sources, oz	5–6.5 oz per d	28 (14%)	23 (19%)	5 (7%)	0.02 ^c
Whole grains, oz	2.4 oz per d	0 (0%)	0 (0%)	0 (0%)	N/A
Fiber, g	26–38 g per d	8 (4%)	7 (6%)	1 (1%)	0.13 ^d
Added sugar, g	≤ 25 g per d	183 (91.5%)	113 (91.1%)	70 (92%)	0.81

N/A indicates not available.

^aDietary recommendations for vegetables, fruits, dairy, protein sources, and whole grains were based on the recommendations from the US Department of Agriculture's MyPlate and recommendations for fiber and added sugar were based on the American Heart Association guidelines for children^{22–24}; ^bChi-square tests of independence were used for all inferential analyses; ^cStatistically significant at *P* < 0.05; ^dFisher Exact test because of low expected counts.

between participants and nonparticipants for most measures (Table 2). The percentage meeting recommendations for protein foods was significantly higher among participants (19%) than nonparticipants (7%) (*P* = 0.02). When further examining protein sources, there was a significant difference in the frequency of consumption of lunch meats (*P* = 0.01) between groups. Although not reaching statistical significance, a higher percentage of participants vs nonparticipants also consumed at least the minimum daily recommendations for vegetables (9% vs 3%; *P* = 0.08) and fruits (44% vs 32%; *P* = 0.09). Dietary recommendations for vegetables, fruits, dairy, protein sources, and whole grains were based on the USDA's MyPlate.

Participants reported significantly higher mean daily servings of vegetables (0.83 ± 0.75 vs 0.56 ± 0.69;

P = 0.01) and total fruits (1.67 ± 1.44 vs 1.18 ± 1.15; *P* = 0.01) than nonparticipants. Although not statistically significant, SNAP participants also reported higher intakes of whole fruits (*P* = 0.07) and fiber (*P* = 0.09). Mean daily servings of dairy, protein sources, whole grains, and added sugar were not significantly different (Table 3).

DISCUSSION

The current study compares consumption patterns of children with low income on the basis of household participation in SNAP to elucidate the role SNAP plays in influencing the dietary intake of youth. Although most children failed to meet dietary recommendations, young SNAP participants reported significantly greater consumption of fruits and vegetables when compared

with nonparticipants. All children were enrolled in free or reduced-price school meals, however, more than 90% failed to consume the minimum recommended daily servings of vegetables, dairy, whole grains, or fiber. Similarly, a majority did not meet recommendations for intake of protein foods (86.0%) or fruits (61.0%). This finding is consistent with prior research suggesting that diets of children with low income fail to meet recommendations.^{7,26,27} Of particular concern, many in this sample are Flint, MI, residents who continue to experience harmful effects of an ongoing drinking water crisis which can be exacerbated by hunger and poor nutrition.^{28–30} The current study indicates that considerable attention should be paid to the nutrient quality of foods offered to and consumed by children in Flint, MI, and similar low-income communities.

Table 3. Child-Reported Daily Dietary Intakes by Supplemental Nutrition Assistance Program (SNAP) Participation

Dietary Intakes	Overall, Mean ± SD	SNAP Participants, Mean ± SD	SNAP Nonparticipants, Mean ± SD	<i>P</i> ^a
Vegetables, cups	0.73 ± 0.74 (range, 0.03–5.66)	0.83 ± 0.75 (range, 0.03–4.12)	0.56 ± 0.69 (range, 0.04–5.66)	0.01 ^b
Total fruits, cups	1.48 ± 1.35 (range, 0.00–6.96)	1.67 ± 1.44 (range, 0.00–6.96)	1.18 ± 1.15 (range, 0.01–6.75)	0.01 ^b
Whole fruits, cups	0.66 ± 0.78 (range, 0.00–3.98)	0.74 ± 0.82 (range, 0.00–3.98)	0.54 ± 0.68 (range, 0.00–3.98)	0.07
Dairy, cups	1.26 ± 1.07 (range, 0.06–5.96)	1.27 ± 1.11 (range, 0.06–5.52)	1.25 ± 1.01 (range, 0.14–5.96)	0.90
Protein sources, oz	3.42 ± 4.71 (range, 0.28–35.93)	3.79 ± 5.00 (range, 0.46–30.18)	2.82 ± 4.16 (range, 0.28–35.93)	0.16
Whole grains, oz	0.46 ± 0.46 (range, 0.00–2.72)	0.47 ± 0.44 (range, 0.00–2.72)	0.46 ± 0.48 (range, 0.00–2.43)	0.83
Fiber, g	10.83 ± 9.07 (range, 0.59–82.19)	11.68 ± 8.69 (range, 0.59–61.16)	9.44 ± 9.57 (range, 1.89–82.19)	0.09
Added sugar, g	9.68 ± 8.71 (range, 0.19–44.69)	9.96 ± 8.55 (range, 0.19–40.31)	9.21 ± 9.01 (range, 0.76–44.69)	0.56

^aIndependent *t* tests were used for all inferential analyses; ^bStatistically significant at *P* < 0.05.

Previous literature, although limited, has demonstrated no significant difference by SNAP participation among children with low income in relation to fruit and vegetable intakes.⁷ Although mean daily intakes of fruits and vegetables were well below recommended levels for all children in the current study, those participating in SNAP reported significantly higher consumption. With its extensive reach, SNAP has the unique opportunity to positively influence intakes of high-nutrient fruits and vegetables among millions of children with low income. Furthermore, childhood and adolescence are recognized as critical periods for the development of dietary patterns that track into adulthood^{31–33}; therefore, SNAP's early influence could have lifelong implications. Future efforts should further investigate whether and to what degree SNAP participation impacts fruit and vegetable consumption patterns among children with low income and identify specific educational initiatives that may enhance any positive effects.

Child-reported intakes of protein foods were higher among SNAP participants than nonparticipants. However, these higher intakes were likely explained by the more frequent consumption of processed lunch meats among SNAP participants. This is consistent with previous research that suggests, when compared with young nonparticipants, SNAP participants consume more processed meats.⁷ This finding highlights the continued need to develop effective policies and educational programs that promote healthier food options among SNAP participants.

Children from lower socioeconomic backgrounds are disproportionately impacted by obesity and overweight,^{11,34,35} but SNAP's role in addressing such inequalities remains uncertain. Research suggests that SNAP participation among youth might help boys maintain a healthy weight,^{36–38} but, particularly among long-term recipients, may contribute to overweight or obesity in girls.^{36,37} Although the majority of children in the current study were classified as overweight or obese (60.1%), SNAP participation was not associated with higher rates of obesity or overweight.

This study has limitations. As the sample was relatively small and from 1 low-income, urban community, the findings may not be generalizable. The restriction of the sample to those receiving free and reduced-price school meals may have introduced a bias toward food assistance program participation and some homogeneity in the sample groups. Classification bias may also be present as it is unknown whether all SNAP nonparticipants were eligible to participate in SNAP. In addition, it is unclear why eligible households chose not to receive SNAP benefits, and authors acknowledge that unobserved selection bias in SNAP participation may have influenced study outcomes. Furthermore, there may have been selection bias; households that decided to participate in the study may have answered questions differently than those that opted out. However, characteristics were quite similar between the study population and the source population of primarily minority children with low income receiving public health insurance. Although recall bias may impact the BKFS's accuracy, a trained registered dietitian was present to assist children in a conscious effort to limit this effect. Finally, the cross-sectional design prevented researchers from investigating the impact of SNAP on young participants over time, and the study was underpowered to identify differences in minimum daily recommendations of vegetables or fruits and significant mean differences in whole fruits, fiber, and protein. However, this was an important preliminary study to compare dietary patterns and food insecurity among SNAP participants and nonparticipants.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Children in this study overwhelmingly failed to meet dietary recommendations; however, important differences in consumption patterns between young SNAP participants and nonparticipants were reported. Researchers found that child-reported intakes of fruits and vegetables were significantly higher among

children who participated in SNAP when compared with children receiving free or reduced-price school meals who did not participate in SNAP. This finding suggests that children who currently receive SNAP benefits may experience a small but noteworthy benefit in relation to intakes of fruits and vegetables. Findings further suggest that stronger support, such as tailored educational interventions or fruit and vegetable incentive programs, are necessary to encourage healthy food choices among youth with low income. Future research could assess the relationship between SNAP participation among children and long-term dietary patterns and weight and the effectiveness of innovative educational initiatives and incentive programs designed to increase child consumption of healthy foods, particularly fruits and vegetables.

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