

SNAP, Young Children's Health, and Family Food Security and Healthcare Access



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Introduction: The Supplemental Nutrition Assistance Program (SNAP) is the largest nutrition assistance program in the U.S. This study's objective was to examine the associations between SNAP participation and young children's health and development, caregiver health, and family economic hardships.

Methods: Cross-sectional data from 2006 to 2016 were analyzed in 2017 for families with children aged <3 years in 5 cities. Generalized estimating equations and logistic regression were used to evaluate the associations of SNAP participation with child and caregiver health outcomes and food insecurity, forgone health care, and health cost sacrifices. Nonparticipants that were likely to be eligible for SNAP were compared with SNAP participants and analyses adjusted for covariates including Consumer Price Index for food to control for site-specific food prices.

Results: The adjusted odds of fair or poor child health status (AOR=0.92, 95% CI=0.86, 0.98), developmental risk (AOR=0.82, 95% CI=0.69, 0.96), underweight, and obesity in children were lower among SNAP participants than among nonparticipants. In addition, food insecurity in households and among children, and health cost sacrifices were lower among SNAP participants than among nonparticipants.

Conclusions: Participation in SNAP is associated with reduced household and child food insecurity, lower odds of poor health and growth and developmental risk among infants and toddlers, and reduced hardships because of healthcare costs for their families. Improved SNAP participation and increased SNAP benefits that match the regional cost of food may be effective preventive health strategies for promoting the well-being of families with young children.

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INTRODUCTION

Food insecurity, the inability to afford enough food for a healthy and active life, is a significant public health issue in the U.S.¹ In 2016, 12.3% of the population—including 3.1 million children—experienced food insecurity in the U.S.¹ This problem disproportionately affects families with young children—16.6% with children aged <6 years were food insecure.¹ Even when experienced at the mildest levels, food insecurity threatens the present and future physical and mental health as well as the academic achievement of children.^{2–4} In early life, food insecurity also acts as a physiologic stressor, putting children at a higher risk of developing Type 2 diabetes and other chronic diseases as adults.⁴

The Supplemental Nutrition Assistance Program (SNAP), which provides financial means to purchase food prepared and eaten at home, is the largest child nutrition program in the U.S. Almost half of the participants are children (45%). SNAP is a countercyclical strategy designed to respond rapidly when need rises. Currently, SNAP reaches approximately 45 million people⁵ and primarily serves families with children, people with disabilities, and seniors.¹ Approximately 3 in 10 income-eligible people do not participate in SNAP.⁶

Prior research has shown that SNAP participation is associated with decreased household and child food insecurity,^{7–11} improved birth outcomes,¹² and reduced risk of anemia, obesity, and poor health.¹³

Research on SNAP and diet quality has been mixed. Some studies have shown more optimal diet quality with SNAP participation than without participation.¹⁴ By contrast, other studies have revealed worse diet quality for children participating in SNAP than for children from higher income households who did not participate, but there was no difference in diet quality compared with income-eligible children not participating in SNAP.¹⁵

School-aged children in SNAP-participating households achieve better math and reading scores¹⁶ and miss fewer school days¹⁷ than those in eligible, nonparticipating households. Moreover, participation in SNAP in childhood has been associated with a lower risk of metabolic syndrome in adulthood and an increased likelihood that women are economically self-sufficient.¹⁸ However, SNAP's benefit purchasing power and associations with health outcomes differ according to temporal and regional variations in food costs.¹⁹ Previous research has demonstrated lower odds of child food insecurity and higher SNAP purchasing power in regions where food costs are low, compared with regions with high food costs.¹⁷ Qualitative research has supported such findings with a deeper understanding of the competing family

expenses and the coping strategies parents use to manage limited food resources and protect children from food shortages.²⁰

Despite these studies, SNAP's effectiveness in promoting health has been called into question as some participants are food insecure and overweight.²¹ However, individuals experiencing adverse conditions, including food insecurity and overweight, may self-select into SNAP, giving rise to negative selection bias and the misperception that these conditions are attributable to SNAP participation.²² Several researchers have found SNAP participation decreased food insecurity, particularly child food insecurity, and other adverse health conditions.^{8,10,23}

To date, few studies have examined SNAP's role among families with young children comprehensively. The objective of this study is to illuminate the role of SNAP among families with young children in terms of its relationship with child health, growth, and development and caregiver health, as well as the household's food security and ability to afford healthcare and other basic needs. The hypothesis is that among families with young children, SNAP is associated with better caregiver and child health, child development, food security, and fewer strains from competing expenses.

METHODS

Study Sample

Children's HealthWatch is an ongoing five-city study in clinical settings investigating associations between economic hardships, public assistance programs, and health of young children and their caregivers.²⁴

Data for this study were collected between January 2006 and December 2016 with a cross-sectional survey of caregivers of young children in Baltimore (Maryland), Boston (Massachusetts), Little Rock (Arkansas), Minneapolis (Minnesota), and Philadelphia (Pennsylvania). As published previously, the participants were caregivers of children aged <3 years seeking medical care in emergency rooms or hospital-based primary care clinics.²⁴ The caregivers were included if they spoke English, Spanish, or Somali (Minneapolis only); they had state residency; and the details of the child's household were known. The caregivers of critically ill or injured children were excluded, as were those previously interviewed within 6 months of this study. Research assistants verbally interviewed caregivers face to face in private settings.

The weights and lengths of the children (height of those aged >2 years) were taken from medical records. IRB approval was obtained at each study site before data collection and renewed annually.

Of 49,227 caregivers approached between January 2006 and December 2016, 5,222 (10.6%) were ineligible for the study, and 4,010 (9.1% of eligible) refused or were unable to complete the interview. To ensure roughly comparable household incomes across all groups and to address potential selection bias, the analytic sample was restricted to children with public or no health insurance and households participating in at least one means-tested assistance program. In addition, caregiver-child pairs who

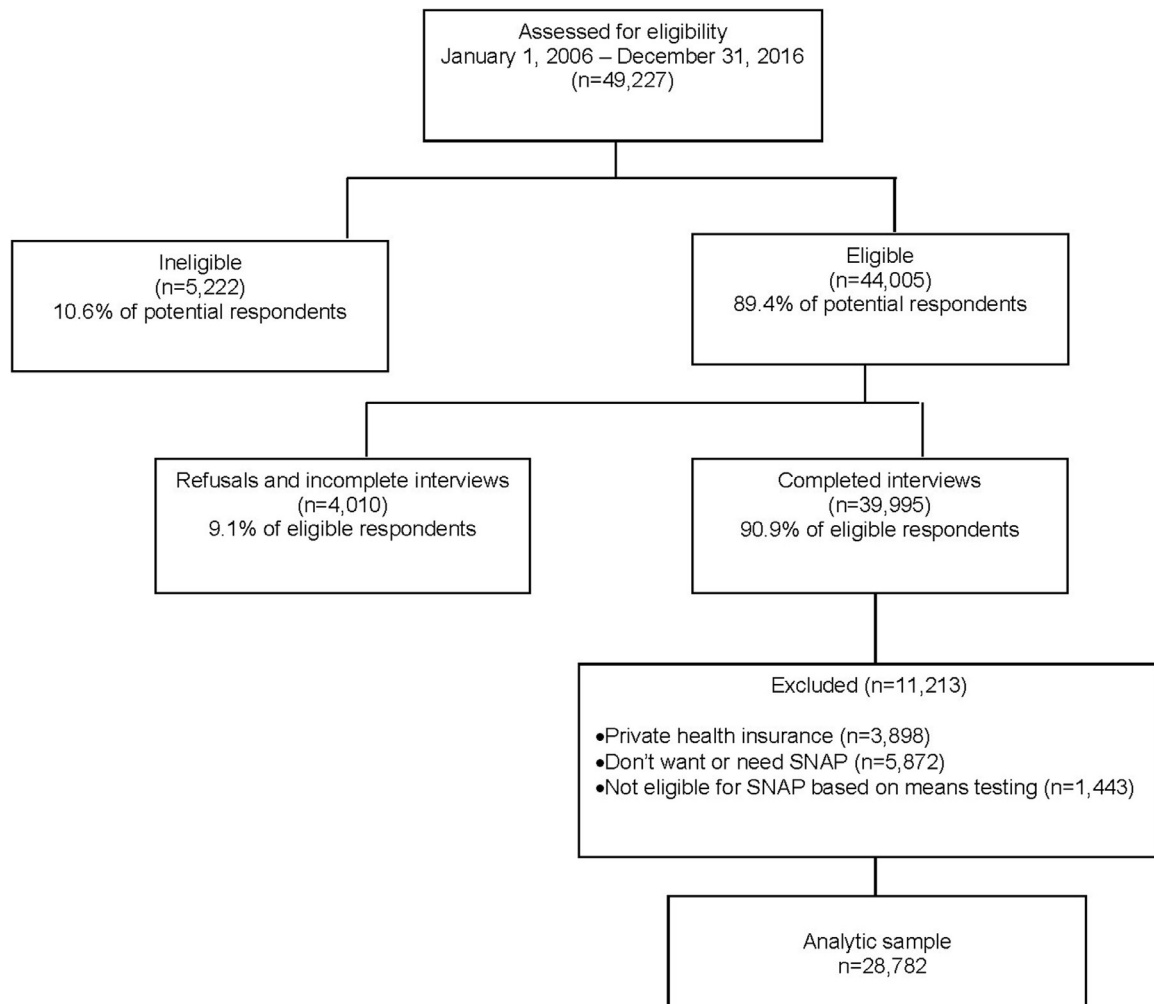


Figure 1. Description of analytic sample: data collected in Baltimore, Boston, Minneapolis, Little Rock, and Philadelphia from 2006 to 2016.

SNAP, Supplemental Nutrition Assistance Program.

did not participate in SNAP because the caregiver responded that they did not want or need it were excluded. This left a final sample of 28,782 caregiver–child pairs with current SNAP or other public benefit participation (Figure 1).

Measures

The caregivers provided information on their age, ethnicity, marital and employment status, and educational attainment. Information was also provided on the country of origin of the child's biological mother, the number of people in the household, details of the child's health insurance, birth weight, and whether the child was breastfed. A total of 94% of the caregivers were mothers. The age of the caregiver was analyzed as a dichotomous variable (<22 years, ≥22 years), because SNAP bars people aged <22 years from receiving SNAP independently if they live with their parents. The child's age, sex, and anthropometric parameters were obtained from medical records.

The metropolitan Consumer Price Index (CPI)²⁵ provides data on prices of goods and services purchased by households in urban

areas. For this study, the CPI for food by month and year was extracted for each of the metropolitan areas in which the study sites were located for all years of this study. Survey month and year were matched with CPI for food for the corresponding month and year.

The health status question from the National Health and Nutrition Examination Survey (NHANES) is frequently used in pediatric research to simplify analysis. A study on the reliability of health status question from NHANES found that dichotomization helped to improve the reliability of self-rated health measures, particularly among low-income populations.²⁶ In this study, the caregivers were asked to rate their own health (fair, poor, good, or excellent) using NHANES. The responses were categorized into 2 groups: excellent/good versus fair/poor. All female caregivers were screened for depressive symptoms using the Kemper scale, a three-item screen.²⁷ Positive answers to ≥2 questions on the scale were considered a positive screen.

The caregivers were also asked to rate their child's general health (fair, poor, good, or excellent) using an adapted version of the single-validated health status question from NHANES and oral

health (fair, poor, good, or excellent) using a question adapted from the Pediatric Oral Health Quality of Life survey. The weight-for-age percentiles and weight-for-length/height percentiles were calculated using the U.S. National Center for Health Statistics/Centers for Disease Control and Prevention standards. The children were assessed to be at risk of being underweight if their weight-for-age was <5th percentile or weight-for-length/height was <10th percentile. The risk of obesity was defined as weight-for-age >90th percentile as recommended by Gamliel and colleagues.²⁸

The risk of developmental problems in children was measured using the Parents' Evaluation of Developmental Status, which meets the standards set by the American Academy of Pediatrics for developmental screening tests for young children. Only children aged ≥ 4 months were assessed due better sensitivity and specificity values. The risk of developmental problems was assessed by using the recommended scoring system based on 2 or more concerns.²⁹ The caregivers were asked to provide a history of their child's hospitalizations, excluding hospitalization at birth.

The U.S. Household Food Security Survey Module, comprising 10 household-focused questions and 8 child-specific questions, is an 18-question scale that assesses food security over the past 12 months.¹ The households were determined to be food insecure if they could not consistently afford sufficient food for active, healthy lives for all household members, and if this condition resulted from constrained resources. To align with national reporting on food security, which considers marginal food security as food secure (determined by ≤ 2 affirmed questions), 2 levels of food insecurity were identified: (1) household food insecurity—responses to ≥ 3 household questions as sometimes or often true versus never true and (2) child food insecurity—responses to ≥ 2 child-specific questions as sometimes or often true versus never true.

The caregivers were also asked if the index child or other household members had unmet needs for health services or prescriptions, owing to the inability to afford care. Health cost sacrifice data were obtained by asking caregivers if the cost of medical care or prescriptions made it extremely difficult to afford other basic needs, such as food, housing, or utilities. The caregivers were asked whether their household participated in SNAP at the time of the interview and if they did, the monthly benefits received. The caregivers from households that did not participate in SNAP were asked for the reason from a list of options.

The caregivers who reported being ineligible or did not want or need SNAP were excluded from the analysis. Thus, the no-SNAP group comprised those likely eligible for SNAP given participation in other means-tested programs but reported not receiving it for a different reason. The predictor was current SNAP participation, as defined by 2 mutually exclusive groups: (1) SNAP (participants at the time of interview) and (2) no SNAP (SNAP nonparticipants with likely eligibility based on participation in other means-tested benefits).

Caregivers were also asked whether their household currently participated in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) or the Temporary Assistance for Needy Families; received energy assistance, Supplemental Security Income, or subsidized childcare; or had a housing subsidy; all of which require income eligibility. To help minimize selection bias, households participating in one or more programs, but not SNAP for reasons other than choosing not to participate, formed the reference group deemed likely eligible for SNAP.

The covariates were selected based on significant association with SNAP participation as well as associations with health and hardship outcomes. Given the high proportion of families that participated in WIC in the sample (84.1%), WIC was included as a covariate to evaluate the associations of SNAP participation with outcomes independent of WIC participation. For similar reasons, CPI for food was included as a covariate to account for geographic variations in food costs and changing food prices over time.

Statistical Analysis

Descriptive statistics for demographics and public assistance participation were generated for the overall sample and stratified by SNAP participation. The groups were compared using chi-squared analysis and ANOVA. Similar analyses were performed for economic hardship and caregiver and child health outcomes. Generalized estimating equation logistic regression models were fit to evaluate the association between SNAP participation and all outcomes. Effect estimates and robust SEs using SNAP participation as the reference group were obtained using generalized estimating equations to account for clustering by site. For all models, AORs are reported with corresponding 95% CIs. Final models were adjusted for the following: mother's place of birth, race/ethnicity, age, and positive screen for depressive symptoms; caregiver's marital status, educational attainment, and employment; child's age and whether the child was ever breastfed; the number of children in the household; survey year and month; WIC participation; and CPI for food. All analyses were performed in 2017 using a two-tailed significance level of 0.05 with SAS, version 9.3.

RESULTS

Almost 7 of 10 (68.5%) caregivers were aged ≥ 22 years. On average, there were 2.4 (SD=1.4) children aged <18 years in the households. More than half (55.4%) of the caregivers were black; 28%, Latinx; 13.3%, white; and 3.3%, of other ethnicities. A greater proportion of mothers in the SNAP group were born in the U.S. than in the no-SNAP group (85.0% vs 71.2%). However, more caregivers in the no-SNAP group were married or partnered than in the SNAP group (40.4% vs 29.2%). In addition, more caregivers had education beyond high school (34.5% vs 29.6%); were employed (47.0% vs 34.3%); and had others in the household who were employed (66.2% vs 46.7%) in the no-SNAP group than in the SNAP group. More mothers screened positive for depressive symptoms (26.5% vs 21.4%) in the SNAP group than in the no-SNAP group. All comparisons were significant at $p < 0.001$. Index children's low birth weight status did not differ between the groups (Table 1).

In the SNAP group, the average monthly per-person SNAP benefit was \$92.10 and the average monthly per household benefit was \$379. In the no-SNAP compared with the SNAP group, 87.8% vs 82.8% participated in WIC, 9.9% vs 38.5% received Temporary Assistance for Needy Families, 15.1% vs 23.9% received energy assistance, 15.9% vs 19.8% had Supplemental Security

Table 1. Sample Demographics by SNAP Participation during 2006–2016 in Baltimore, Boston, Minneapolis, Little Rock, and Philadelphia

Sample demographics	Total (N=28,782)	No SNAP participation (n=7,731)	SNAP participation (n=21,051)	p-value
Child's age, months, mean (SD)	12.8 (9.9)	11.9 (9.7)	13.2 (10.0)	<0.001
Number of children in the household, mean (SD)	2.4 (1.4)	2.2 (1.3)	2.4 (1.4)	<0.001
Average SNAP benefit per person (\$) (n=19,269), mean (SD)	92.1 (43.9)		92.1 (43.9)	
Sites				
Baltimore	5,594 (19.4)	1,118 (14.5)	4,476 (21.3)	<0.001
Boston	6,202 (21.5)	1,874 (24.2)	4,328 (20.6)	
Little Rock	5,755 (20.0)	1,822 (23.6)	3,933 (18.7)	
Minneapolis	3,940 (13.7)	1,294 (16.7)	2,646 (12.6)	
Philadelphia	7,291 (25.3)	1,623 (21.0)	5,668 (26.9)	
Caregiver's age, years				
<22	8,963 (31.5)	2,903 (38.3)	6,060 (29.1)	<0.001
≥22	19,478 (68.5)	4,686 (61.7)	14,792 (70.9)	
Low birthweight (<2,500 grams)	4,339 (15.4)	1,174 (15.6)	3,165 (15.3)	0.55
Child ever breastfed	16,583 (57.8)	4,854 (63.1)	11,729 (55.8)	<0.001
Mother's place of origin				
U.S. (including Puerto Rico)	23,355 (81.3)	5,482 (71.2)	17,873 (85.0)	<0.001
Foreign-born	5,366 (18.7)	2,220 (28.8)	3,146 (15.0)	
Maternal depressive symptoms				
Positive screen	6,937 (25.1)	1,572 (21.4)	5,365 (26.5)	<0.001
Race/ethnicity				
Latinx	7,976 (28.0)	2,404 (31.3)	5,572 (26.7)	<0.001
Black, non-Latinx	15,804 (55.4)	3,794 (49.5)	12,010 (57.6)	
White, non-Latinx	3,808 (13.3)	1,226 (16.0)	2,582 (12.4)	
Other	948 (3.3)	248 (3.2)	700 (3.4)	
Marital status				
Married or partnered	9,247 (32.2)	3,115 (40.4)	6,132 (29.2)	<0.001
Education				
Some high school or less	8,161 (28.4)	2,169 (28.2)	5,992 (28.5)	<0.001
High school graduate	11,647 (40.6)	2,873 (37.3)	8,774 (41.8)	
Tech school/college/master's	8,884 (31.0)	2,661 (34.5)	6,223 (29.6)	
Caregiver employment status				
Currently employed	10,837 (37.7)	3,633 (47.0)	7,204 (34.3)	<0.001
Currently unemployed	17,922 (62.3)	4,093 (53.0)	13,829 (65.7)	
Others employed in the household	14,620 (51.9)	4,967 (66.2)	9,653 (46.7)	<0.001
Current public assistance participation				
TANF	8,837 (30.9)	765 (9.9)	8,072 (38.5)	<0.001
WIC	24,155 (84.1)	6,776 (87.8)	17,379 (82.8)	<0.001
Energy assistance	6,193 (21.5)	1,169 (15.1)	5,024 (23.9)	<0.001
SSI	5,395 (18.7)	1,232 (15.9)	4,163 (19.8)	<0.001
Child care subsidy	4,937 (17.2)	1,019 (13.2)	3,918 (18.6)	<0.001
Housing subsidy	6,544 (23.2)	1,287 (17.1)	5,257 (25.5)	<0.001

Note: Boldface indicates statistical significance ($p<0.05$).

SNAP, Supplemental Nutrition Assistance Program; SSI, Supplemental Security Income; TANF, Temporary Assistance for Needy Families; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

Income, 13.2% vs 18.6% had child care subsidy, and 17.1% vs 25.5% had housing subsidy. All comparisons were significant at $p<0.001$.

Compared with young children in the no-SNAP group, children in the SNAP group had lower odds of being at

risk for underweight (AOR=0.91, 95% CI=0.86, 0.96), being in fair/poor health (AOR=0.92, 95% CI=0.86, 0.98), being at developmental risk (AOR=0.82, 95% CI=0.69, 0.96), and marginally lower odds of being at risk for obesity (AOR=0.97, 95% CI=0.95, 1.00) (Table 2). There

Table 2. Adjusted Child and Caregiver Health Outcomes and Household Economic Hardship during 2006–2016 in Baltimore, Boston, Minneapolis, Little Rock, and Philadelphia

Outcomes	SNAP participation, AOR (95% CI) (n=28,782)
Health	
Caregiver's health	
Self-rated health, fair/poor	1.02 (0.96, 1.09)
Child's health	
Health, fair/poor	0.92 (0.86, 0.98)
Oral health, fair/poor	1.12 (0.91, 1.38)
Risk of being underweight	0.91 (0.86, 0.96)
Risk of being obese (weight-for-age >90th percentile)	0.97 (0.95, 1.00)
Developmental risk	0.82 (0.69, 0.96)
Lifetime hospitalizations	0.99 (0.92, 1.07)
Economic hardships	
Household hardships	
Food insecurity	0.72 (0.61, 0.85)
Forgone health care	0.95 (0.79, 1.14)
Health cost sacrifices	0.73 (0.69, 0.77)
Child hardships	
Food insecurity	0.67 (0.61, 0.74)
Forgone health care	0.90 (0.78, 1.04)

Note: reference group = no SNAP. GEE models account for clustering by site using exchangeable working correlation. The model was adjusted for the mother's place of birth and depressive symptoms, the caregiver's ethnicity, age (dichotomous), marital status, educational attainment, and employment. The model was also adjusted for the child's age, whether the child was ever breastfed, the number of children in the household, survey year and month, and WIC participation and metropolitan Consumer Price Index for food for each study site.

GEE, generalized estimating equation; SNAP, Supplemental Nutrition Assistance Program; WIC, Special Supplemental Nutrition Assistance Program for Women, Infants, and Children.

were no significant associations with the child's history of hospitalizations, child's fair/poor oral health, or caregiver's fair/poor health (Table 2).

Compared with the no-SNAP group, the SNAP group had lower odds of household food insecurity (AOR=0.72, 95% CI=0.61, 0.85), child food insecurity (AOR=0.67, 95% CI=0.61, 0.74), and health cost sacrifices (AOR=0.73, 95% CI=0.69, 0.77). There were no significant associations with forgone health care for other household members nor for the index child (Table 2).

DISCUSSION

When food prices and other factors are controlled, this study shows that SNAP participation is associated with improved physical health, growth, and development of young children. The findings also suggest that SNAP participation is associated with reductions in food insecurity and sacrificing other basic needs to afford health care for children and families. All states included in the

study had expanded Medicaid, which could affect healthcare costs for the latter years in this analysis. Results are consistent with previous research demonstrating that SNAP is important for protecting children's growth, health, and development.¹² In particular, a longitudinal study found that food security was improved among children after 6 months of participation in SNAP compared with pre-participation.⁸

However, the findings regarding the effect of participating in SNAP and childhood obesity have been mixed. One study found that in areas with high food costs, SNAP participation was positively associated with obesity. Conversely, SNAP participation was associated with reduced childhood obesity in areas with lower food costs.³⁰ The current study adds to this body of literature by focusing on health and economic outcomes among families with young children.

Many households that participate in SNAP struggle near the end of the month as their food supplies dwindle.³¹ In 2013, the Institute of Medicine concluded that the current SNAP benefit, calculated based on the Thrifty Food Plan for a national average of food prices, is inadequate to meet nutrient requirements and recommended that the calculation be revisited.^{19,32} Bronchetti et al.¹⁷ found that the regional costs of food and purchasing power of SNAP benefits were associated inversely with children's healthcare utilization and positively with their school attendance. Monthly metropolitan CPI for each study site was included in these analyses to address the issue of relative purchasing power in assessing whether SNAP participation was associated with indicators of child health and development.

Although decreased odds of food insecurity were demonstrated, even with adjustment for food prices over time, inadequacy of SNAP benefit limits the program's potential impact.³³ Therefore, increasing the value of SNAP and facilitating access to benefits could further decrease food insecurity and improve health outcomes. Basing the SNAP calculation on the market value of foods from the Low Cost Food Plan instead of the Thrifty Food Plan would increase purchasing power, bringing the calculation in line with the current dietary guidelines and potentially contributing to better health outcomes among SNAP participants.³²

There are also other approaches for increasing the value of SNAP benefits. The lower a household's net income after deductions, the larger their SNAP benefit.³⁴ Therefore, SNAP purchasing power could be increased for people at risk of health problems by expanding the medical expense deduction. Currently, only seniors and individuals receiving a disability benefit receive the deduction (healthcare costs >\$35/month). However, as demonstrated by decreased odds of health cost sacrifices

among families with young children that participate in SNAP, the program may help families afford not only food but also healthcare and other basic needs.

Limitations

The cross-sectional design of this study demonstrates association, not causation. These data are not nationally representative, although comparisons of the results with NHANES data show a similar demographic distribution of the study sample to low-income families with children in the U.S.³⁵

Several key measures in this study (household participation in SNAP and other programs) depend on reporting from caregivers, and thus are subject to reporting bias.²³ Although child and caregiver health status and developmental risk are self-reported measures, they have been validated in national surveys. Although families were excluded from the study if they expressed they did not wish to participate in SNAP, did not feel a need for SNAP, or were not eligible for the program, selection bias in SNAP participation remains a potential concern. In addition, because the data were from only 5 cities, it was not possible to develop instrumental variables that would effectively eliminate selection bias.

The reference group comprised households receiving another means-tested benefit but not SNAP, some of which have a higher income eligibility cut-off than SNAP, suggesting selection of these families as a reference group may introduce bias that reduces the chances detecting of the beneficial effects of SNAP. Families that were marginally food secure were categorized as food secure, which may also underestimate the benefits of SNAP.³

Adjusting for the CPI for food helped to account for regional differences in food prices over time. Controlling for maternal depressive symptoms helped to adjust for possible bias occurring in self-reported measures.

A preponderance of research evidence links food insecurity to poor health and associated increased healthcare costs, underscoring the need for proactive approaches to reduce food insecurity.^{4,36} Food insecurity was recently estimated to cost \$178 billion in direct and indirect health- and education-related costs for all ages in 2014 alone.³⁷ Moreover, food insecurity in early life may exert not only short-term but lifelong adverse effects.

CONCLUSIONS

In the U.S., SNAP supports population health from preconception through early life into adulthood. This study shows an association between SNAP participation and positive health outcomes among infants, toddlers, and their families. This study supports previous studies that show SNAP can be an effective program in reducing food insecurity.^{8–10,38} Improved SNAP participation and increased SNAP benefits

that match regional food costs may be effective for promoting family health and decreasing healthcare costs for households with young children.^{39,40}

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SAEdC conceptualized and designed the study in addition to analyzing the results. She also drafted and revised the manuscript. ARB-A supervised data collection at the Boston site and assisted in drafting, reviewing, and revising the manuscript. ARB-A, JTC, PHC, MMC, MMB, DBC, MTS, RS, and DAF contributed to the interpretation of the analyses. JTC obtained and prepared the CPI data. JTC, PHC, MMC, MMB, DBC, MTS, SMC, TCH, RS, and DAF critically reviewed and revised the manuscript. PHC, MMC, MMB, DBC, and MTS supervised data collection at their sites. SMC, TCH, and DAF assisted in conceptualizing and designing the study. SMC conducted the analysis and provided statistical expertise with TCH.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at <https://doi.org/10.1016/j.amepre.2019.04.027>.

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