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Trends in Household and Child Food Insecurity Among Families with Young Children from 2007 to 2013

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Introduction

Household food insecurity, defined as limited or uncertain access to enough food for all household members to live active and healthy lives, has been linked in the United States to negative health outcomes in all age groups.¹⁻⁵ Households with children, especially those with children under age 6 years,⁶ are more likely to experience food insecurity than households without children.⁷

In spite of well-described efforts of parents to buffer their children's experience of food insecurity,⁸⁻¹⁰ Children's HealthWatch research has shown that children under the age of three living in food-insecure households are more likely to be at risk for developmental delays,¹¹ iron deficiency anemia,¹² and other adverse health outcomes including fair/poor health and hospitalizations^{13,14} when compared to demographically similar children living in food-secure households. Children whose caregivers report child food insecurity—disruption in the frequency or size of meals for children—are at even higher risk of these negative health outcomes compared to children either in food-secure households or in families with household, but not child, food insecurity.¹⁵

The Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program, is both the United States' largest nutrition program and the largest *child* nutrition program, reaching an average of 20.5 million children each month.¹⁶ An estimated one-half of all children in the United States will have lived in a household participating in SNAP at some point during their childhood.^{17,18}

The Thrifty Food Plan (TFP) is used as the basis for calculating the maximum SNAP benefit and is based on the cost of a minimally nutritionally adequate 'market basket' of foods. Although in most regions of the United States the household SNAP allotment even at the maximum benefit level, does not provide the resources necessary to meet the national standards established in the TFP,^{19,20} SNAP participation has still been associated with lower food insecurity at the household and child levels, when comparing participant families with eligible non-participants.²¹⁻

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The Great Recession (December 2007-June 2009) was associated with dramatic increases nationally in both household and child food insecurity.²⁵ In response to the Great Recession, the United States Congress passed the American Recovery and Reinvestment Act (ARRA) in April 2009, which included an average increase of 13.6% in SNAP benefits for all participant households.²⁶ This 2009 SNAP boost was designed not only to stimulate the economy through increased food

expenditures but also to decrease food insecurity for households facing increased hardships during the Great Recession and its aftermath.²⁶ Prior to the ARRA boost, SNAP benefit levels were recalculated annually based on food price inflation in the TFP. During the ARRA period, SNAP benefit amounts were not adjusted for inflation and remained at fixed amounts.²⁷

National data suggest the ARRA boost to SNAP benefits had its intended effect. Food insecurity, which had risen sharply, stabilized in 2009 among low-income SNAP-households.²⁶ However, in the months after the 2009 SNAP benefit boost, food costs rose steadily, eroding the purchasing power of the benefit.²⁸ In April 2009, the average monthly cost of the TFP for a family of four with young children was \$509.70;²⁹ when the boost in benefits was rolled back in November 2013, the average monthly cost of the TFP for a family of the same size was \$556.30.³⁰

A United States Department of Agriculture (USDA) study, in a sample not selected for households with children, illustrated the impact of the decline in the food purchasing power of SNAP benefits, especially for those not receiving the maximum benefit.²⁷ From 2009 to 2011, food insecurity among households participating in SNAP increased as the inflation-adjusted value of SNAP decreased.²⁷ Despite the officially declared end of the Great Recession in June 2009 and the stabilizing effects of the ARRA boost to SNAP benefits, household and child food insecurity in 2014 remained elevated above pre-recession levels among U.S. households overall.³¹

Little is known about SNAP's association with food insecurity while the ARRA boost was in effect during and after the Great Recession among households with children between birth and three years, the critical period when physical and cognitive development are particularly vulnerable to nutritional deprivation. Because households with young children have higher rates of food insecurity nationally than adult only households and households with only older children, the Great Recession and ARRA period may have had a rapidly detectable impact on the food security of these households.⁶

The aim of this study is to compare the rates of household food insecurity and child food insecurity among SNAP-participating and SNAP-eligible but not participating households with children under age three years during and immediately following the Great Recession. We hypothesize that rates of household food insecurity and child food insecurity were lower among SNAP-participant households compared to SNAP-eligible, non-participant households. This paper first analyzes food insecurity trends from 2007 to 2013, separately for household food insecurity and child food insecurity and stratified by participation in SNAP.

It subsequently examines the association between SNAP participation and food insecurity over from 2007 to 2013.

Methods

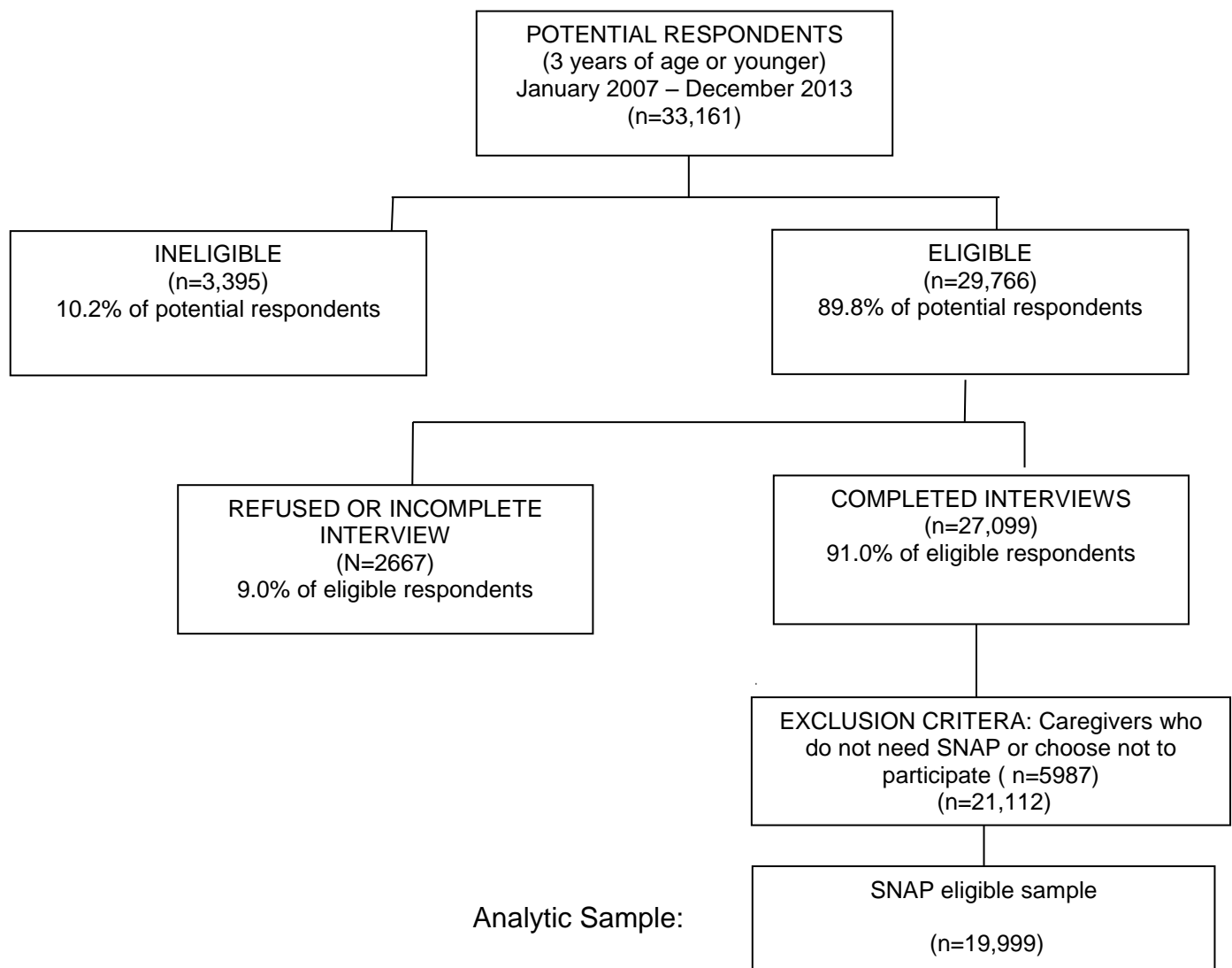
Design

The data for this study were collected from January 2007 through December 2013 by Children's HealthWatch from a cross-sectional survey of a multiethnic urban sample of caregivers accessing health care for a young child at teaching hospitals in five US cities (Baltimore, Boston, Little Rock, Minneapolis, and Philadelphia). Trained research assistants approached caregivers of children younger than 36 months seeking medical care for their children in emergency departments or primary care clinics during hours of peak usage^{32,33}. Eligibility criteria included speaking English, Spanish, or (in Minneapolis only) Somali; residency in state of interview; and knowledge of the child's household. Caregivers of critically ill or injured children were excluded, as were those who had been interviewed previously. Institutional review board approval was obtained at each site prior to data collection and renewed annually. After obtaining caregivers' informed consent, research assistants interviewed caregivers face-to-face in private settings, entering verbal responses onto laptop computers. Data were transmitted securely to a central data analysis team.

Participants

Of the 33,161 caregivers approached, 3,395 (10%) were ineligible, and 2,667 (9% of eligible caregivers) refused or were unable to complete the interview. To ensure that caregivers had relatively similar interest in or need for SNAP, caregivers who reported that they did not need SNAP or chose not to participate were excluded (n= 5,987), leaving a final analytic sample of n=19,999 caregiver/child pairs (Figure 1).

Figure 1. Description of Analytic Sample Selection



Measures

The Children's HealthWatch survey included the following variables:

Demographics—Caregivers provided information on their age, self-identified race/ethnicity, country of origin, marital and employment status, and highest level of education attained. The child's age and sex were obtained from medical records.

SNAP Participation—The independent SNAP variable was categorical—SNAP participation compared to non-participation (No SNAP), among those who were likely income eligible. Caregivers were asked whether their household currently participates in SNAP and reasons for non-participation. Inclusion criteria for the likely income-eligible “No SNAP” group included participation in at least one other means-tested program, other than SNAP, including: Temporary Assistance for Needy Families (TANF), Low Income Home Energy Assistance Program (LIHEAP), subsidized housing, child care subsidy, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), or Supplemental Security Income (SSI), and a response other than ‘no need/chose not to participate’ as a reason for not participating in SNAP.

Food Insecurity—The U.S. Food Security Survey Module (FSSM)^{34,35} is an 18-question scale developed by the USDA and considered the “gold standard” in assessment of household food security. Households categorized as household but not child food insecure (HFI) had at least three affirmative responses to the 10 non-child-specific questions. Households categorized as household and child food insecure (CFI) gave affirmative responses to at least two of the eight child-specific questions in addition to at least three affirmative responses on non-child-specific questions.

Outcome measure —The dependent measure is a three-level food security variable constructed from household and child food security status. Categories are: food secure (FS), household but not child food insecure (HFI) and household and child food insecure (CFI).

Predictor measures – The predictors are SNAP participation and the year in which the caregiver's responses to the survey were collected. Responses were grouped by year in aggregate.

Statistical Analysis

Sample characteristics are presented by year and by SNAP participation, with bivariate associations tested through chi-square tests (for categorical characteristics) or ANOVA (for measurement characteristics).

To understand whether the prevalence of food insecurity and the association between SNAP receipt and food insecurity were changing over time, we first examined changes in food insecurity over the study period, separately for HFI and CFI and stratified by SNAP receipt. Tests for linear trends in food insecurity were performed using multinomial logistic regression analysis to determine if significant trends over time existed in HFI and CFI when stratifying by SNAP participation. We subsequently examined whether the effect of SNAP participation on food insecurity was changing over time, through multinomial logistic regression models with terms for the interaction between SNAP participation and year, and controlling for site and survey year, caregiver's race/ethnicity, foreign-born status, and age, education, marital status, and employment status and child's age, gender, health insurance status, and participation in WIC.

We then examined the association between SNAP participation and food insecurity using multinomial logistic regression analysis. This analysis examined the association between SNAP participation and food insecurity pooling data across all years, adjusting for the covariates listed above. These main effect models adjusted for year but assumed that the association between SNAP and food insecurity remained constant over time.

All analyses were conducted using two-sided statistical tests and a significance level of 0.05, using the SAS software (version 9.3; SAS Institute, Cary NC).

Results

Sample Characteristics

The mean age of caregivers was 26 years (s.d. 5.8 years); 56% were Black Non-Hispanic, 27% Hispanic, 14% White Non-Hispanic, 3% other racial categories. Eighty-one percent of caregivers were US born; 37% married; 37% employed; 29% had less than a high school education. The mean age of children was 13 months (s.d. 9.9 months); 46% were female; 4% were privately insured and 99.6% of children were US born. Most (84%) of the children participated in WIC (Table 1a and 1b). Over the entire study interval, 71% of the households participated in SNAP and 29% were likely eligible, but not participating in SNAP. The most prevalent

reasons reported for not participating in SNAP among households participating in other means-tested programs included: perceived ineligibility because of income, SSI, foster care pay, or child support; lack of information about SNAP; and being a teen parent and therefore too young to be the listed head of household for SNAP.

Table 1a: Baseline Characteristics of Study Sample by Year

Characteristic	Response	Over all	Year: 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013	p-value
	No. (%)	19,999	2573 (12.9%)	2752 (13.8%)	2991 (15.0%)	3009 (15.1%)	3128 (15.6%)	2655 (13.3%)	2891 (14.5%)	
Site	Baltimore	3701 (18.5%)	376 (14.6%)	463 (16.8%)	515 (17.2%)	560 (18.6%)	632 (20.2%)	525 (19.8%)	630 (21.8%)	
	Boston	4417 (22.1%)	588 (22.9%)	706 (25.7%)	649 (21.7%)	482 (16.0%)	589 (18.8%)	746 (28.1%)	657 (22.7%)	
	Little Rock	4026 (20.1%)	459 (17.8%)	451 (16.4%)	762 (25.5%)	569 (18.9%)	668 (21.4%)	573 (21.6%)	544 (18.8%)	<.001
	Minneapolis	2917 (14.6%)	501 (19.5%)	652 (23.7%)	425 (14.2%)	317 (10.5%)	463 (14.8%)	260 (9.8%)	299 (10.3%)	
	Philadelphia	4938 (24.7%)	649 (25.2%)	480 (17.4%)	640 (21.4%)	1081 (35.9%)	776 (24.8%)	551 (20.8%)	761 (26.3%)	
Child Gender	F	9285 (46.4%)	1240 (48.2%)	1265 (46.0%)	1435 (48.0%)	1310 (43.5%)	1519 (48.6%)	1226 (46.2%)	1290 (44.6%)	<.001
Child Age Mos	N Mean (Std Dev)	19999 12.9 (9.9)	2573 12.3 (9.6)	2752 11.8 (9.8)	2991 12.5 (9.9)	3009 13.1 (9.9)	3128 13.4 (10.0)	2655 13.2 (9.9)	2891 13.6 (10.1)	<.001
Child Insurance	Public	18473 (92.8%)	2364 (92.7%)	2510 (92.3%)	2745 (92.0%)	2799 (93.2%)	2912 (93.3%)	2483 (93.8%)	2660 (92.3%)	
	No insurance	642 (3.2%)	69 (2.7%)	106 (3.9%)	117 (3.9%)	94 (3.1%)	100 (3.2%)	74 (2.8%)	82 (2.8%)	0.009
	Private	794 (4.0%)	118 (4.6%)	104 (3.8%)	122 (4.1%)	111 (3.7%)	109 (3.5%)	91 (3.4%)	139 (4.8%)	
Mother US Born	Yes	16189 (81.1%)	2045 (79.5%)	2203 (80.2%)	2476 (83.0%)	2557 (85.1%)	2533 (81.1%)	2102 (79.4%)	2273 (78.7%)	<.001
Mother Ethnicity	Hispanic	5311 (26.8%)	702 (27.3%)	626 (22.9%)	638 (21.6%)	875 (29.3%)	848 (27.5%)	730 (27.7%)	892 (31.1%)	

	Black/Non-Hispanic	1109 2 (55.9 %)	1390 (54.1%)	1630 (59.7%)	1756 (59.4%)	1608 (53.8%)	1742 (56.4%)	1454 (55.1%)	1512 (52.8%)	< .001
	White/Non-Hispanic	2765 (13.9 %)	399 (15.5%)	377 (13.8%)	456 (15.4%)	417 (14.0%)	396 (12.8%)	352 (13.3%)	368 (12.8%)	
	Other	667 (3.4 %)	76 (3.0%)	98 (3.6%)	106 (3.6%)	88 (2.9%)	103 (3.3%)	104 (3.9%)	92 (3.2%)	
Married/ Partnered	Yes	7415 (37.2 %)	956 (37.2%)	1044 (38.0%)	1059 (35.5%)	1109 (37.0%)	1247 (39.9%)	1100 (41.5%)	900 (31.2%)	< .001
Caregiver Education	Less than high school	5716 (28.7 %)	844 (32.9%)	839 (30.6%)	816 (27.5%)	858 (28.6%)	858 (27.5%)	730 (27.5%)	771 (26.7%)	
	High school	7897 (39.6 %)	1071 (41.8%)	1167 (42.6%)	1182 (39.8%)	1213 (40.4%)	1215 (38.9%)	995 (37.5%)	1054 (36.5%)	< .001
	More than high school	6323 (31.7 %)	648 (25.3%)	733 (26.8%)	969 (32.7%)	932 (31.0%)	1052 (33.7%)	926 (34.9%)	1063 (36.8%)	
Mother Age	N Mean (Std Dev) years	1870 1 25.9 (5.8)	2433 25.8 (5.9)	2595 25.6 (5.9)	2842 25.6 (5.6)	2823 25.5 (5.6)	2922 26.1 (5.8)	2436 26.4 (5.6)	2650 26.6 (5.8)	< .001
Caregiver Employment	Yes	7479 (37.4 %)	1003 (39.0%)	1033 (37.6%)	1090 (36.4%)	1062 (35.3%)	1181 (37.8%)	958 (36.1%)	1152 (39.8%)	0.004
SNAP ^a	Receives SNAP	1423 6 (71.2 %)	1634 (63.5%)	1848 (67.2%)	2084 (69.7%)	2143 (71.2%)	2316 (74.0%)	2010 (75.7%)	2201 (76.1%)	< .001
WIC ^b	Yes	1664 6 (83.5 %)	2191 (85.7%)	2335 (85.0%)	2496 (83.6%)	2493 (83.2%)	2584 (83.1%)	2213 (83.7%)	2334 (80.9%)	< .001

Abbreviations: ^a SNAP, Supplemental Nutrition Assistance Program.

^b WIC, Special Supplemental Nutrition Assistance Program for Women, Infants, and Children

Table 1b: Baseline Characteristics of Study Sample by SNAP Participation

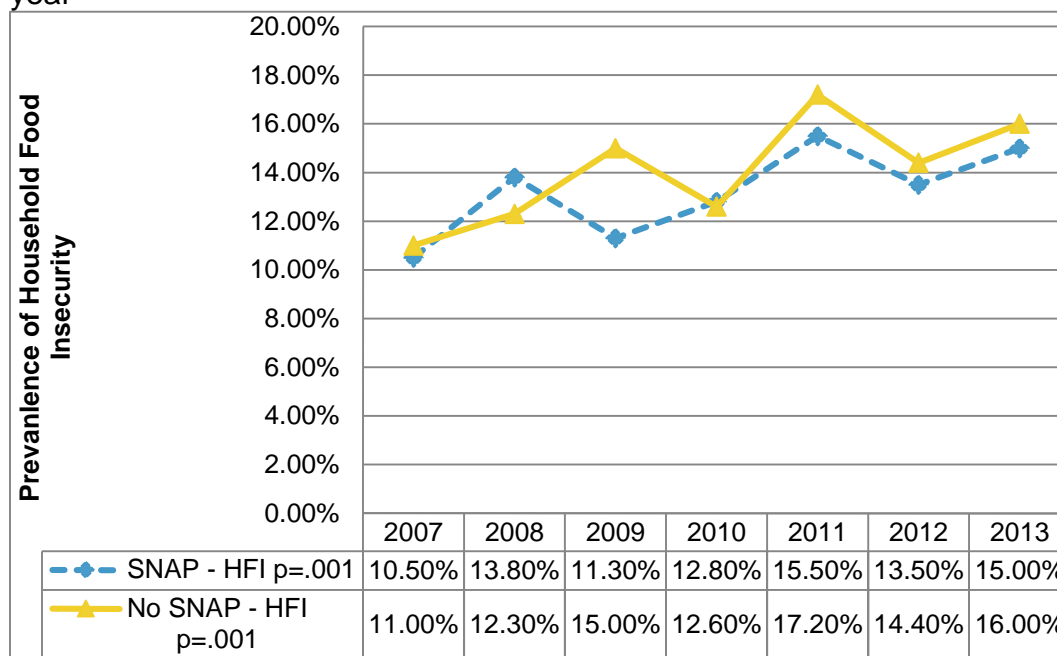
Characteristic	Response	Overall	No SNAP	SNAP	p-value
	No. (%)	19,999	5763 (28.8%)	14236 (71.2%)	
Site	Baltimore	3701 (18.5%)	788 (13.7%)	2913 (20.5%)	<.0001
	Boston	4417 (22.1%)	1351 (23.4%)	3066 (21.5%)	
	Little Rock	4026 (20.1%)	1340 (23.3%)	2686 (18.9%)	
	Minneapolis	2917 (14.6%)	1019 (17.7%)	1898 (13.3%)	
	Philadelphia	4938 (24.7%)	1265 (22.0%)	3673 (25.8%)	
Mother Place of Birth	US born	16189 (81.1%)	4142 (72.0%)	12047 (84.7%)	<.0001
Child Age Mos	N Mean (Std Dev) Median (25th, 75th)	19999 12.9 (9.9) 10.7 (4, 20)	5763 12.1 (9.7) 9.9 (4, 19)	14236 13.1 (10.0) 11.0 (5, 20)	<.0001
Mother Ethnicity	Hispanic	5311 (26.8%)	1685 (29.5%)	3626 (25.7%)	<.0001
	Black Non Hispanic	11092 (55.9%)	2860 (50.0%)	8232 (58.3%)	
	White Non Hispanic	2765 (13.9%)	969 (16.9%)	1796 (12.7%)	
	Other	667 (3.4%)	203 (3.6%)	464 (3.3%)	
Married/Partnered	Yes	7415 (37.2%)	2643 (46.0%)	4772 (33.6%)	<.0001
Caregiver Education	Less than high school	5716 (28.7%)	1560 (27.2%)	4156 (29.3%)	<.0001
	High school	7897 (39.6%)	2063 (35.9%)	5834 (41.1%)	
	More than high school	6323 (31.7%)	2122 (36.9%)	4201 (29.6%)	
Children in Household	N Mean (Std Dev) Median (25th, 75th)	19925 2.4 (1.4) 2.0 (1, 3)	5738 2.2 (1.3) 2.0 (1, 3)	14187 2.4 (1.4) 2.0 (1, 3)	<.0001
Caregiver Employment	Yes	7479 (37.4%)	2756 (47.8%)	4723 (33.2%)	<.0001
WIC	Yes	16646 (83.5%)	4899 (85.5%)	11747 (82.7%)	<.0001
Child Insurance	Public	18473 (92.8%)	4877 (85.1%)	13596 (95.9%)	<.0001

	No insurance	642 (3.2%)	274 (4.8%)	368 (2.6%)	
	Private	794 (4.0%)	581 (10.1%)	213 (1.5%)	

Trends analyses

In unadjusted analyses of data stratified by SNAP receipt, the prevalence of HFI and CFI fluctuated from 2007 to 2013, but the trend overall for both increased across the 7-year period (Figures 2 and 3). In the No SNAP group, the prevalence of HFI increased overall from 2007 to 2013 with some variation by year (Figure 2). Overall, comparing 2007 to 2013, the prevalence of CFI went from 8.6% to 13% in the SNAP group (Figure 2).

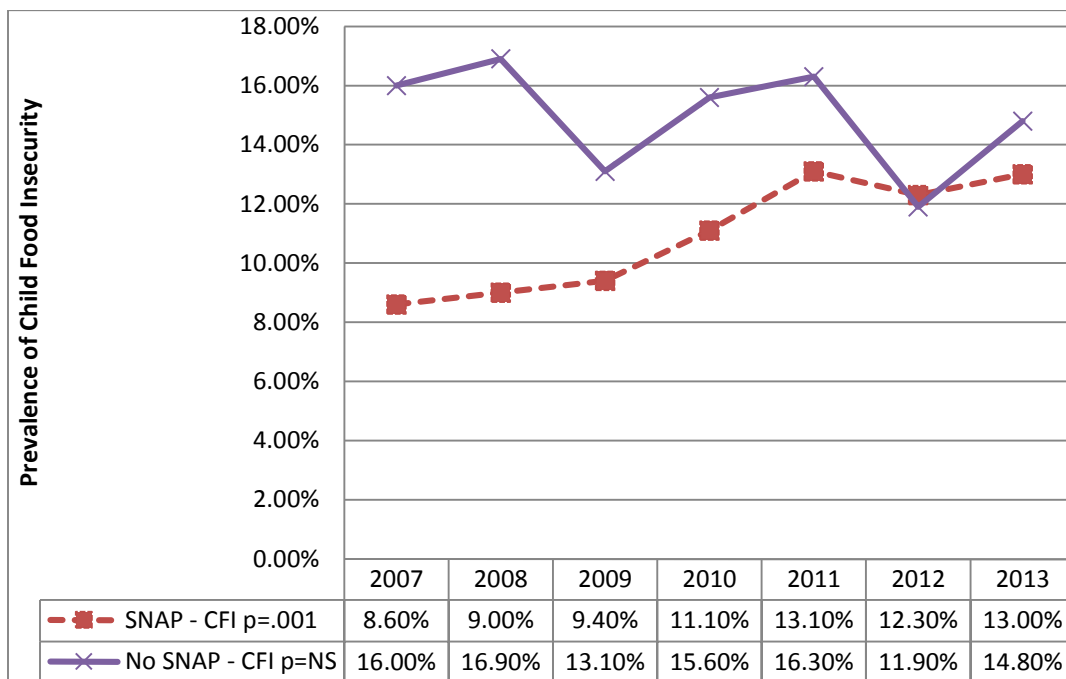
Figure 2. Prevalence of household food insecurity stratified by SNAP by year



In order to understand the changes in prevalence better, we conducted tests of trend. Tests for linear trend using multinomial logistic regression with data stratified by SNAP receipt showed that the odds of HFI increased over the 7-year study period similarly for the SNAP and No SNAP groups. Comparing food insecurity in 2013 vs. 2007, there were increased odds of HFI in the SNAP group (OR 1.59, 95% CI: 1.33, 1.89, p=0.001) and in the No SNAP group (OR 1.56, 95% CI: 1.19, 2.04, p<0.001).

We then assessed CFI. The prevalence of CFI within the SNAP group gradually increased from 8.6% in 2007 to 13.0% in 2013. Of note, however, the SNAP group started with lower rates of CFI in 2007 compared to those with the No SNAP group (8.6% v. 16.2%) and maintained a lower prevalence throughout most of the study period (Figure 3). Over the entire period from 2007-2013, the prevalence of CFI in the SNAP group remained lower than the No SNAP group in six of the seven study years. Tests for linear trend using multinomial regression over the seven year period showed that among SNAP participants, there were increased odds of CFI (OR 1.97, 95% CI: 1.63, 2.39, $p < 0.001$) from 2007-2013, with no significant trend in CFI over time in the No SNAP group (OR 0.88, 95% CI : 0.67, 1.14).

Figure 3. Prevalence of child food insecurity stratified by SNAP by year



Trends in the effect of SNAP participation

To understand the impact of time on the associations between food insecurity and SNAP, we examined the interaction between SNAP participation and year on food insecurity. We found that the effect of SNAP on HFI did not change over time (p -value for the interaction term 0.60). However, the effect of SNAP on CFI did significantly change over the study period ($p = 0.002$). From the interaction model, SNAP was associated

with a 47% reduction in adjusted odds of CFI in 2007, but by 2013, SNAP was associated with only a 15% reduction in CFI. While still protective against HFI and CFI, the strength of the protective association of SNAP diminished over the study period.

Aggregate effects of SNAP participation

When examining data pooled over all years, of those in the SNAP group, 75.6% were food secure, 13.3% HFI, and 11.1% CFI compared with 71% food secure, 13.9% HFI, and 15.1% CFI in the No SNAP group (Table 2). In multivariable analysis controlling for potential demographic confounders and survey year, we found SNAP to be protective against both HFI and CFI. Households participating in SNAP were 17% less likely to experience HFI (AOR 0.83; 95% CI, 0.75, 0.91) and children in households participating in SNAP were 33% less likely to experience CFI (AOR 0.67; 95% CI, 0.60-0.74) than children in the No SNAP group (Table 3).

Table 2: Food Insecurity by SNAP Participation from 2007-2013

Outcome	No SNAP	SNAP Receipt
Food Secure	4080 (71.0%)	10746 (75.6%)
Household FI / Child Secure	800 (13.9%)	1892 (13.3%)
Child and HH FI	869 (15.1%)	1576 (11.1%)

Chi-square p-value <0.001

Table 3: Associations between SNAP Receipt and Food Insecurity Trends from 2007 to 2013.

Outcome	No SNAP N=5,763	SNAP Receipt N=14,236 AOR (95% CI)	p-value
Household Food Insecure / Child Secure (HFI)	1.00	0.83 (0.75, 0.91)	p<0.001
Child and Household Food Insecure (CFI)	1.00	0.67 (0.60, 0.74)	p<0.001

Adjusted for site, caregiver: race/ethnicity, US born, marital status, education, and employment, child's age, gender and public health insurance, mother's age, WIC receipt, and survey year.

Discussion

When examining trends over time, among low-income families with young children living in urban areas, HFI and CFI prevalence fluctuated from year to year. In 2008, prior to the ARRA boost in SNAP benefits, the prevalence of HFI was higher in the SNAP group than in the No SNAP group. Prevalence of HFI decreased in 2009 for the SNAP group following the ARRA boost. HFI increased overall in both the SNAP and No SNAP groups. After controlling for confounders of pooled data across all study years, however, participation in SNAP was associated with lower odds of Household Food Insecurity (HFI) and Child Food Insecurity (CFI). SNAP receipt had a stronger protective association over all years with CFI than HFI among households with a child under the age of three, consistent with the frequently noted pattern that caregivers prioritize protecting children from food insecurity.

Our findings mirror the overall increase in rates of food insecurity from nationally representative samples of households unselected for children's age receiving SNAP between 2009 and 2011.²⁷ In the current sample, among families with young children participating in SNAP, following the boost in benefit amounts that were implemented through ARRA in 2009, HFI temporarily decreased in an unadjusted analysis from 2008 to 2009. One potential explanation for the subsequent increase in HFI and CFI found in this analysis is the concomitant erosion of the real value of SNAP benefits caused by rising food prices,³⁶ consistent with

previous research showing SNAP participating households were differentially affected by food price inflation.²⁷ The increase in CFI among SNAP participating households in our study may also suggest that with food price and other inflation, SNAP loses some of its protective effect on households with young children.

Limitations

Several methodological considerations should be taken into account when interpreting these findings. This is a cross-sectional sentinel sample, which is neither random nor nationally representative, and characteristics of the sample vary over time, including a steady increase in SNAP participation. This study design can demonstrate associations, but not causation. There may also be shared method variance as caregivers reported both SNAP participation and food insecurity. Additionally, although important confounding variables were controlled in this analysis, other unmeasured confounders may be present including family history of trauma, retail food environment, and access to transportation.

Finally, other research documenting the self-selection effect into the SNAP program demonstrates that households self-select into the program when they become severely food insecure compared with income-eligible households not participating in SNAP. This adverse selection bias makes it difficult to find a relationship between SNAP participation and decreased food insecurity.³⁷ This study attempts to account for selection-bias in the sample by excluding households who claim they do not need or choose not to participate in SNAP and only including those who receive some other means-tested benefit. Furthermore, some of the households in the sample who were categorized as “likely eligible for but not participating in SNAP” may have in fact been over the income limit for the program in some states (gross income limits vary by state). This issue of potential misclassification, however, would have biased against demonstrating the protective SNAP effect found in this analysis.

In November 2013, the increase put in place under ARRA was removed from the benefit (known as the “ARRA rollback”). Because the ARRA rollback occurred only during the last two months of our data collection, we do not have an adequate number of observations from those two months to address whether the rollback affected our 2013 findings.

Conclusion

HFI increased over time in both the SNAP and “No SNAP” groups reflecting the impact of the Great Recession and its prolonged aftermath

on some of the most vulnerable members of society – young children under the age of three in low-income families. Such families have few surplus resources to tide them over even in good economic times, much less during economic downturns. Many must rely on public programs to pay for necessities including food and utilities. Though national data suggest SNAP overall helped to keep the rates of HFI and CFI lower than they would have been without such assistance, in this study SNAP could not prevent increases in HFI among families with very young children. The benefit was inadequate before the Great Recession and, though these data suggest the ARRA boost had at least a measurable positive impact on food security initially, the effect waned, perhaps because food price inflation eroded SNAP's purchasing power. Unlike HFI, CFI was higher among the No SNAP families during most of the study period than among the SNAP families; thus, SNAP seems to have had an important role in keeping rates of CFI lower than they would have been without SNAP. Nevertheless, our findings are consistent with the interpretation that the combination of the Great Recession and food price inflation, and perhaps other less well-described factors, had a demonstrable association with the food security of young children in low-income families.

Despite increases in both food prices and food insecurity, SNAP benefit amounts decreased for all SNAP participant households in November 2013 when the ARRA benefit boost expired. The rollback in SNAP benefits resulted in a loss of approximately 21 meals per month for a family of four, decreasing the benefit allotment from \$1.70 to less than \$1.40 per person per meal on average.³⁸ This rollback of SNAP reflects a legislative reallocation of funds to increase spending for Medicaid and jobs in education in addition to compromises made during the 2010 passage of the Child Nutrition Act. As part of the Child Nutrition Act, Congress accelerated the end of the ARRA boost to SNAP benefits in order to fund at a higher level than in previous years³⁹ improved quality of federal school meals. This strategy may have put many children who are too young to participate in school meals programs at increased risk of food insecurity. The rise in food insecurity rates among the SNAP and No SNAP groups in this study, despite the ARRA boost to benefits, suggest that future research will need to carefully assess the impact of the ARRA rollback on household and child food insecurity and correlated health outcomes in light of persistent child poverty⁴⁰ and continually rising food costs.⁴¹

The analyses for this paper demonstrate that even though SNAP's association with decreased food insecurity has eroded over time, SNAP participation continued to be correlated with lower rates of household and

child food insecurity when compared to “No SNAP” households. SNAP is a countercyclical program that thus seems to have had its intended effect during the past decade. These findings highlight the need for continued efforts by health providers and researchers to collect and analyze credible data, not just on individual families, but also on large samples of children, to inform political leaders in ongoing conversations of appropriate funding levels for SNAP and child nutrition programs.

These findings may also be used to support policies to increase the purchasing power of SNAP. One such policy solution is to switch the market basket of foods used to calculate the maximum SNAP benefit from the Thrifty Food Plan to the Low Cost Food Plan. This change has also been recommended by the Institute of Medicine.²⁰ The ARRA boost to SNAP benefits narrowed the gap between the true cost of a healthy diet and the SNAP allotment. By adopting the Low Cost Food Plan, SNAP benefit amounts would more accurately reflect the cost of foods needed to meet the USDA’s Dietary Guidelines for Americans.⁴² Many years of research by our research group and others^{20,43} suggest adequate benefit levels that match current prices of food and thus make sufficient, healthful food affordable could strengthen family food security and sustain family health.

Another approach to strengthening SNAP is to ensure that families raising children with disabilities are adequately supported. Research on food insecurity among families with young children receiving SSI shows increased risk for food insecurity, even when controlling for participation in SNAP.⁴⁴ Partially discounting SSI or other unearned income (as is done for earned income) in calculating eligibility for SNAP would better support families of children with disabilities. There is an inverse relationship between income and the amount of the SNAP benefit; in general, greater deductions result in higher benefits. Therefore, this income discount would acknowledge the increased needs and costs of families of children receiving SSI. Finally, from a health perspective, it is essential to preserve and strengthen SNAP so that it can continue to sustain food security among families with young children.

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