

Submitted Article

Effects of the 2013 SNAP Benefit Cut on Food Security

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Abstract *Effects of the 2013 Supplemental Nutrition Assistance Program (SNAP) benefit cut on food security is examined by employing the annual Current Population Survey Food Security Supplement 2012–2014. Food security measured in December 2014 is compared with the corresponding statistics for December 2012 using difference-in-differences methods. Results confirm that reduced SNAP benefits significantly threatened the food security of SNAP households.*

Key words: American Recovery and Reinvestment Act of 2009, ARRA Expiration, food security, Current Population Survey Food Security Supplement, CPS-FSS, Supplemental Nutrition Assistance Program, SNAP.

JEL codes: D12, I32, J18.

Effective April 1, 2009, the American Recovery and Reinvestment Act (ARRA) temporarily increased Supplemental Nutrition Assistance Program (SNAP) benefits by an average of 16% in response to the economic downturn. On November 1, 2013, this temporary boost by ARRA expired, and SNAP benefits reverted to pre-ARRA levels (Dean and Rosenbaum 2013). This resulted in a cut in SNAP allotment for the first time in the program's history. The 2009 ARRA increased the maximum SNAP benefits for a household of four by \$80 per month, whereas the 2013 ARRA sunset caused the same size family to lose \$36 per month in benefits. Considering that the inflation in food prices had cut the real value of the ARRA SNAP bonus by half from 2009 to 2011 (Nord 2013), the cutbacks in SNAP benefits in 2013 might have added to the hardships of the low-income households.

Given that SNAP accounts for approximately 50% of the food-at-home spending for low-income households (Beatty and Tuttle 2014), it is crucial to evaluate the impact of the first and largest benefit cut, which has affected all

SNAP participants. Furthermore, SNAP benefits have been instrumental in reducing material hardship among SNAP participants (Shaefer and Gutierrez 2013). With the growing importance of SNAP for many low-income households, the reduction to SNAP benefits in 2013 was predicted to worsen food security among SNAP participants (Rosenbaum and Keith-Jennings 2013). Yet, there is no research dedicated towards understanding the effect that the SNAP benefit cut has on food security.

Using the Current Population Survey Food Security Supplement (CPS-FSS) 2012–2014, we examine the effects that the 2013 SNAP cut has on food security. The CPS-FSS is an annual supplement to the monthly Current Population Survey and collects data on SNAP participation, food expenditures, and the food security status of U.S. households in December of each year. We compare the twelve-month food security measure in 2014 with the corresponding statistics for 2012 using difference-in-differences estimation. We find that reduced SNAP benefits significantly threaten food security for SNAP-participating households. In addition, we also investigate the effects on food-at-home spending, SNAP benefit amount, as well as likelihood of running short on food to uncover any related changes with benefit reduction.

To the best of our knowledge, this is the first research paper to quantify the effects of the 2013 SNAP benefit cut on food security. Our results indicate that the prevalence of food insecurity increased by 7.6% for households that participated in SNAP for all months during the previous year (“High Intensity treatment group”) compared to the other low-income households. For the same SNAP households, the likelihood of very low food security increased by 14% after the 2013 SNAP benefit cut relative to the other low-income households.¹ Households who reported any SNAP receipt during the previous twelve months (“Any SNAP treatment group”) showed a 6.8% rise in food insecurity, and a 9.2% rise in very low food security compared to the change in food security for non-SNAP households. However, we found no effect on the prevalence of food insecurity of households with an income below 185% of the federal poverty line (“SNAP eligible treatment group”).

Literature Review²

Identifying a causal relationship between SNAP receipt and food security is confounded by the selection of more needy households into SNAP. Households that participate in SNAP can differ from those that do not in unobservable ways. Ratcliffe, McKernan, and Zhang (2011) control for the endogeneity of SNAP participation by using an instrumental variables approach, exploiting different eligibility rules, and including outreach spending across the states. These authors find that the receipt of SNAP benefits reduces the likelihood of being food insecure by 30% and very low food insecure by 20%.

¹Very low food security is a severe range of food insecurity in which the food intake of some household members is reduced below levels considered appropriate (Nord 2013). A more detailed description of food security measure is available in the Data and Measures section.

²We restrict the literature review mainly to the impact of SNAP benefit changes on food security of SNAP participants. However, there exists a larger body of literature that examines the effect of SNAP on food security, for example, Jolliffe et al. (2005), Yen et al. (2008), Mykerezzi and Mills (2010), and Gundersen, Kreider, and Pepper (2011).

A recent body of literature has taken advantage of the “natural experiment” of the ARRA SNAP enhancements to uncover the effects of changes in SNAP benefits. Using the CPS-FSS, Nord and Prell (2011) compare food spending and food security in December 2009 with those in December 2008. To provide an estimate of changes attributable to ARRA, these authors employ a difference-in-differences (DID) approach. Making use of the gross income limit for SNAP eligibility, they compare treatment group with incomes below 130% of the federal poverty line with a control group with incomes above 150%, but below 250%, of the poverty line. Following the benefit boost, Nord and Prell find that food expenditures increased by 5.4%, and the prevalence of food insecurity declined by 2.2 percentage points for SNAP-eligible households. On the other hand, food expenditures increased by a smaller percentage and food security did not improve among households with incomes just above the income-eligibility range. When comparing SNAP households with non-participating households, the authors find larger estimates.

Using the Consumer Expenditure Survey, Beatty and Tuttle (2014) investigate several SNAP benefit increases from 2007 to 2010 (including the largest increase in 2009 ARRA). These authors’ results indicate that the rise in SNAP benefits allowed households to increase food-at-home expenditures and the share of total expenditures allocated to food-at-home. Beatty and Tuttle also employ a DID strategy and conclude that a \$1 increase in SNAP benefits leads to an \$0.48 increase in food expenditures.

Both Nord and Prell (2011) and Beatty and Tuttle (2014) focus on the effects of the 2009 ARRA SNAP enhancements. However, their analyses are likely biased by households that were induced to participate by the rise in benefits. The decrease in benefits would pose fewer issues with selection into the treatment group because fewer households likely drop out due to a decrease than would join due to an increase. Our study confirms that there is no significant difference in observable characteristics of SNAP-participating households before and after the expiration of ARRA.

Two studies have documented the effects of the SNAP benefit changes that occurred after ARRA. Nord (2013) notes that the gains from the ARRA SNAP benefit increase have been eroded as a result of the reduction in the real value of SNAP benefits due to inflation in food prices. Employing a DID strategy, and using the data from CPS-FSS 2009 and 2011, Nord compares changes in food spending and food security between SNAP households and non-SNAP households. This author suggests that the decline in real value of SNAP benefits resulted in a 16.5% increase in the number of SNAP households that had very low food security and a decline of 4.4% in median food spending by SNAP households.

Recently, Bruich (2014) found that a November 2013 SNAP benefit cut resulted in lowering households’ grocery store spending by \$0.37 for each \$1 decrease in SNAP benefits. Bruich quantifies the impact of the expiration of ARRA using scanner data from 400 grocery stores and the purchases of over 2.5 million households enrolled in SNAP. Results imply that there is an overall reduction in monthly SNAP household spending after the SNAP benefit cut.

Drawing from these studies, we can predict that a benefit cut in November 2013 may induce households to reduce their food expenditure and potentially affect food security. Our main contribution is to measure the changes in these outcomes before and after the ARRA sunset. The results in

this article are highly relevant to ongoing policy debate about SNAP generosity.

Data and Measures

We use data from the Food Security Supplement (CPS-FSS), an annual supplement to the Current Population Survey, conducted by the U.S. Census Bureau. The CPS-FSS data is collected every December and consists of information on household-level food security, food expenditures, and enrollment in food and nutrition assistance programs such as SNAP. Our primary analysis uses the CPS-FSS data for 2012 and 2014 to estimate the impact of the 2013 SNAP benefit cut. Comparative estimates on year-to-year changes in food security and SNAP participation are based on CPS-FSS data 2006–2015.³ After dropping observations with imputed income,⁴ we limit our analysis sample to low-income households with annual incomes below 250% of the poverty line, taking broad-based categorical eligibility into account.⁵ This approach reduces sample sizes to 16,707 households in 2012, and 15,986 households in 2014.

A primary aim of this study is to determine the prevalence of food insecurity. Food security for a household means access by all members at all times to enough food for an active, healthy life (USDA 2015). In the CPS-FSS, food security is measured by responses to a series of eighteen questions about food-related conditions and behaviors. The first ten questions are related to adult food security status, and the last eight questions are related to child food security status (Hamilton et al. 1997; Bickel et al. 2000; Nord et al. 2010). A complete list of the questions is presented in supplementary online appendix B. Each question is designed to measure some aspect of food insecurity and the frequency with which it manifests itself (Kreider et al. 2012). In this paper, we use a household-level food security measure that counts all eighteen questions for families without children (Q1–Q10) and families with children (Q11–Q18). The USDA's annual food security reports are based on food security conditions over the twelve-month period prior to the CPS-FSS survey. As the SNAP cut occurred in November 2013, we compare the twelve-month scale for 2012 with that for 2014. We also examine the prevalence of very low food security, which is a severe range of food insecurity that influences the eating patterns of some household members and reduces their food intake below accepted levels.

The food-at-home spending is the second outcome analyzed in this study. In the CPS-FSS, each household reports actual food spending during the previous week. To adjust for different food needs by households of various

³The CPS-FSS 2015 was released on September 16, 2016.

⁴The CPS monthly income/earnings/wages for non-respondents are imputed by allocating the income information of a respondent with similar broad-level attributes as those of a non-respondent, thereby leading to a bias in estimated results (Bollinger and Hirsch 2006; Hirsch and Schumacher 2004). Accordingly, in our analysis, 16% of the sample with imputed income was dropped. The results stayed similar after dropping the observations with imputed income. Specifically, current estimates in table 2 are, on average, 0.6 percentage points lower than the estimates with imputed income observations included.

⁵Broad-based categorical eligibility is a policy in which households may become eligible for SNAP because they qualify for non-cash Temporary Assistance for Needy Families (TANF) or State maintenance of effort (MOE) funded benefits (USDA 2016). There are varying income eligibility thresholds across states that convey broad-based categorical eligibility, though no state has a gross income limit above 200% of the federal poverty guidelines (Falk and Aussenberg 2014).

size and composition, each household's food spending is normalized by the cost of the Thrifty Food Plan (TFP) for that household.⁶ Lastly, we investigate the changes in value of monthly SNAP benefits, as well as the likelihood of running short of food, to explore the mechanism through which the SNAP cut affected participating households.

The CPS-FSS reports annual household income in categories. Following Nord and Prell (2011), we approximated income for each household at the median in each income category and divided it by the poverty threshold for that household.⁷ The poverty thresholds are used to adjust for the different composition and size of households.

Table 1 shows the descriptive statistics for the treatment group that received SNAP at any time during the previous year ("Any SNAP treatment group") and the control group that never received SNAP before and after the sunset of ARRA (2012 vs. 2014). Although both groups have income levels less than 250% of the federal poverty line, SNAP and non-SNAP households are different with respect to a number of demographic dimensions. For example, the SNAP group is more likely to have a female head, a black, unemployed, or disabled head, but less likely to have a married head, a white, or full-time employed head. Demographic differences between the two groups is less of a concern in DID methodology because the goal of DID analysis is to compare relative differences across the two groups over time.

Empirical Strategy

Analysis Sample

In the main analysis, we compare post-SNAP cut outcomes measured in December 2014 (about thirteen months after the benefit cut) with pre-SNAP cut outcomes measured in December 2012 (about eleven months before the benefit cut).⁸ The change from 2012 to 2014 for SNAP recipients (treatment group) is compared with the change for non-recipients (control group).

In the CPS-FSS, households report whether they had received SNAP benefits during the previous year, and if so, during which months. We define treatment groups in multiple ways: i) households that received SNAP for all twelve months during the previous year ("High Intensity treatment group"); ii) households that participated in SNAP any time during the previous year ("Any SNAP treatment group"). These two treatment groups are compared with the rest of households with income levels less than 250% of the federal poverty threshold.

However, there is substantial under-reporting of SNAP receipt in the CPS-FSS (Nord and Golla 2009). Comparing the SNAP receipt in the CPS to the administrative aggregates shows that approximately 30–50% of the households do not report SNAP receipt (Meyer and Sullivan 2008; Meyer and George 2011). This relatively large under-reporting of SNAP receipt is a

⁶The TFP is a national standard for a low-cost diet that meets nutrition guidelines. This normalization was also used by Nord and Prell (2011) and Nord (2013).

⁷In order to check for the possible measurement error in income, we also tried substituting the upper and lower income cutoff in place of the income midpoint. Estimations using both measures produced similar results.

⁸We compared the outcomes in December 2013 (just one month after the benefit cut) with outcomes in December 2012 (results not shown). This analysis serves as a robustness check, for it is unlikely to have a sizable impact on the outcomes only a month after the benefit change.

Table 1 Descriptive Statistics for SNAP and non-SNAP Participants by Year

Year	Dec. 2012		Dec. 2014	
	SNAP	Non-SNAP	SNAP	Non-SNAP
Outcome variables				
Food insecure (%)	50.22	21.47	54.43	20.52
Very low food secure (%)	22.72	7.97	24.39	7.67
SNAP monthly amount (\$)	270.44 (179.62)	—	250.44 (177.75)	—
Food at home expenditure relative to TFP	1.01 (0.97)	0.93 (0.79)	0.99 (0.94)	0.92 (0.82)
Ever run short on food (%)	65.37	33.59	67.09	32.83
Household head characteristics				
Female head (%)	67.44	52.42	67.49	52.95
Married head (%)	25.72	41.37	26.34	41.55
Non-citizen (%)	10.45	10.41	9.99	11.02
Race: White (%)	45.09	61.44	46.28	59.33
Race: Black (%)	27.00	13.00	26.71	14.20
Race: Hispanic (%)	22.12	18.99	22.19	19.70
Race: Others (%)	5.77	6.56	4.80	6.75
Labor: employed full time (%)	23.42	40.81	25.08	40.39
Labor: Employed part time (%)	13.21	12.33	13.36	11.83
Labor: Retired (%)	11.13	24.06	11.47	24.46
Labor: Disabled (%)	22.48	7.33	24.27	8.00
Labor: Unemployed (%)	12.04	5.45	10.05	4.15
Labor: Others (%)	17.66	9.50	15.69	10.54
Income relative to FPL	0.86 (0.56)	1.54 (0.68)	0.88 (0.55)	1.50 (0.67)
No. of children	1.22 (1.42)	0.66 (1.07)	1.23 (1.42)	0.66 (1.12)
Family size	3.02 (1.80)	2.52 (1.56)	3.02 (1.81)	2.53 (1.60)
Family with elderly (%)	16.47	29.25	17.52	30.12
Metropolitan area (%)	79.48	80.29	78.38	80.93
Most highly educated adult				
Less than high school (%)	21.15	10.70	18.74	11.33
High school graduate (%)	36.66	31.94	37.00	30.45
Some college (%)	33.38	35.83	34.04	35.66
Bachelor's and above (%)	8.84	21.51	10.19	22.53
No. of households	4,159	12,461	3,982	11,938

Source: Current Population Survey Food Security Supplement (CPS-FSS) 2012 and 2014.

Note: Analysis sample includes the households with annual income less than 250% of the federal poverty line. The SNAP group indicates households that received SNAP at any time during the previous year.

Standard deviations appear in parentheses. All analyses use household supplement weights.

source of potential bias in our estimates, especially if under-reporting of SNAP receipt is related to the household's income or food security. For instance, a food-secure SNAP household that does not report SNAP participation will lead to underestimating the effect of SNAP on food security. Similarly, a food-insecure SNAP household that does not report SNAP receipt will lead to overestimating the effect of SNAP on food security. One way of tackling this issue would be to use an income cutoff to define the

treatment and control groups rather than using the error-ridden measure of SNAP receipt in the CPS-FSS.

Accordingly, we create the third treatment group: iii) “SNAP eligible households”, which have an income level less than 185% of the poverty line. This group is compared to “nearly SNAP eligible households” with an income level above 185% but below 250% of the poverty line. Even though the federal gross income limit for SNAP eligibility is 130% of the poverty line, the broad-based categorical eligibility policy has raised the gross income threshold to 185 or 200% in some states. Hence, this justifies our choice of the 185% threshold for defining the third treatment group.

Difference-in-Differences Framework

As seen in [table 1](#), changes in outcome variables from 2012 to 2014 among SNAP households can be directly compared with changes among non-SNAP households. For instance, the mean prevalence of food insecurity increased by 4.21 percentage points for the SNAP group, whereas it fell for the non-SNAP group by 0.95 percentage points. This leads the unadjusted DID to be 5.16 ($=4.21 - (-0.95)$) percentage points. The same result holds for very low food security: the mean prevalence of very low food security increased by 1.67 percentage points for SNAP group, whereas it fell by 0.3 percentage points for the non-SNAP group, leading the unadjusted DID estimate to be 1.97 ($=1.67 - (-0.30)$) percentage points. This unadjusted DID is a crude estimate of the effect of the reduction in SNAP benefits on SNAP households.

Going beyond simply comparing the sample mean of the two groups before and after the SNAP cut, we examine the effects of the SNAP benefit cut by employing the DID identification strategy as specified by the following equation:

$$Y_{ist} = \beta_0 + \beta_1 \text{SNAP}_{ist} + \beta_2 \text{After}_{ist} + \beta_3 (\text{SNAP})_{ist} (\text{After})_{ist} + \gamma X_{ist} + Z_s + \epsilon_{ist} \quad (1)$$

where Y_{ist} denotes outcomes of interest for household, i , in year, t , and state, s ; SNAP_{ist} is an indicator for SNAP participating households. Further, After_{ist} takes a value of zero for the 2012 CPS-FSS, and a value of one for the 2014 CPS-FSS. Several characteristics of the households could potentially affect the outcomes, regardless of the policy change. Hence, we control for a vector of demographic characteristics, X_{ist} , such as race, marital status, citizenship, employment status of the household head, income relative to poverty ratio, educational attainment of the most highly-educated adult, family size, the number of children, and whether the household resides in a metropolitan statistical area (MSA) as listed in [table 1](#). In order to control for differences in SNAP policies across the states,⁹ we include state fixed effects represented by Z_s .

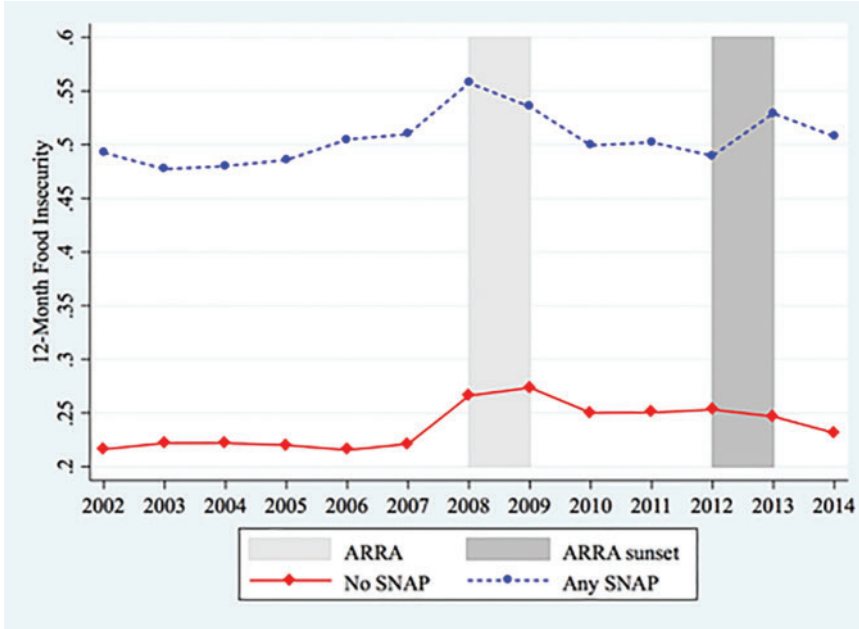
This is a standard DID model, with β_3 measuring the difference between the change in the SNAP group’s outcome pre- to post-SNAP cut and the change in the non-SNAP group’s outcome pre- to post-SNAP cut. Changes in

⁹There has been considerable variation in SNAP eligibility rules across states due to the introduction of broad-based categorical eligibility.

Figure 1 Trends of twelve-month food insecurity for the “Any SNAP treatment group” and “Non-SNAP group”

Source: Current Population Survey Food Security Supplement (CPS-FSS) 2002 to 2014.

Note: The figure shows the mean prevalence of the twelve-month food security for each year. “Any SNAP group” indicates households that received SNAP at any time during the previous year.



outcomes common to both groups, such as year-to-year changes in food prices or macroeconomic conditions, are netted out. All analyses use household supplement weights so that the sample represents the population of interest.

Identifying Assumption Check

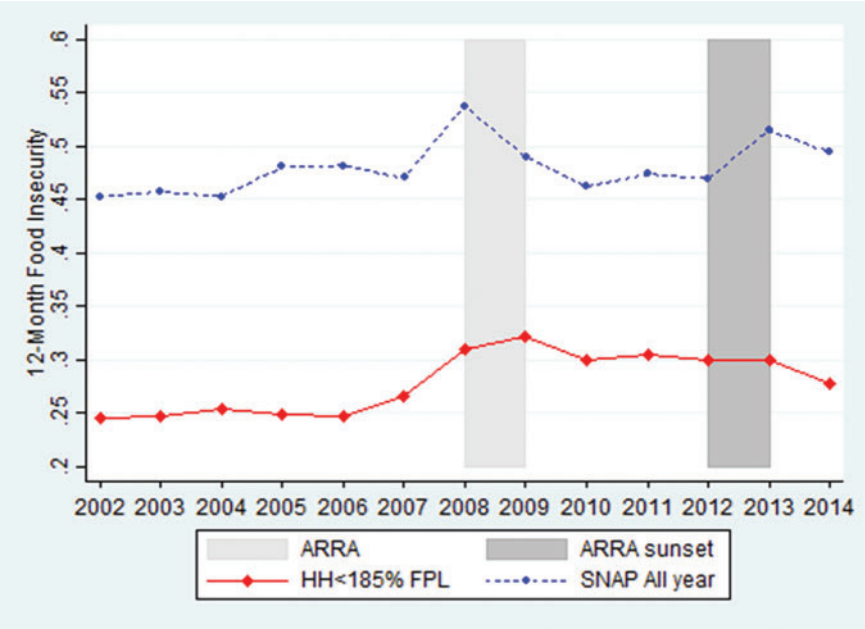
We test the identification assumption of our estimation strategy by determining whether the prevalence of food insecurity was trending similarly for the treatment and control groups in the absence of the policy change. Figure 1 compares the prevalence of the twelve-month food insecurity between households who were enrolled in SNAP for at least one month during the year (Any SNAP treatment group) and non-SNAP households from 2002 to 2014. Similarly, figure 2 compares the prevalence of the twelve-month food insecurity between households who were enrolled in SNAP throughout the year (High Intensity treatment group) and the rest of the households below 185%.¹⁰ Both figures show that the food insecurity was trending similarly for the treatment and control groups in all years but 2009 (ARRA) and 2013 (ARRA sunset). During the 2009 ARRA, food insecurity

¹⁰In figure 1 and 2, we are restricting the sample to those with an income to poverty ratio $\leq 185\%$. In earlier years, the income eligibility criteria was uniformly set at 130% of the poverty line. Thus, using a higher income to poverty ratio cutoff for earlier years will include a large number of ineligible households, leading to biased results. We obtained similar results with the sample restricted to an income to poverty ratio $\leq 250\%$.

Figure 2 Trends of twelve-month food insecurity for the “High Intensity treatment group” and “Low-income group”

Source: Current Population Survey Food Security Supplement (CPS-FSS) 2002 to 2014.

Note: The figure shows the mean prevalence of the twelve-month food security for each year. “High Intensity treatment group” indicates households that received SNAP for all months during the previous year.



for the SNAP households dropped substantially, while that of non-SNAP households slightly increased. Meanwhile, during the 2013 ARRA SNAP benefit cut, food insecurity for SNAP households rose compared to that of non-SNAP households.

Next, we address the question of whether the benefit cut changed the probability of SNAP participation in the following year. We test this possibility by investigating whether observable characteristics predict the probability of participation differently before and after the cut. We pool the data and regress the probability of participating in SNAP anytime during the previous years on all covariates, the post-year (2014) indicator, and the interaction of the post-year indicator with all covariates. We test the hypothesis for coefficients of the post-year indicator, and all the interactions terms are jointly zero. Results for the test are available in supplementary online appendix table A4, and reveal that there is no significant difference in observable characteristics either before or after the benefit cut for both the “Any SNAP treatment group” and the “High Intensity treatment group”. However, characteristics of households with an income less than 185% of the federal poverty line have changed significantly after the expiration of ARRA. For this reason, we consider SNAP-participating households as our major treatment groups, while we acknowledge the issue of under-reporting.

Table 2 DID Regression of Food Insecurity on Pre- versus Post-SNAP Cut

		Dec. 2012 vs. Dec. 2014	
Treatment Group		Low and Very Low Food Security	Very Low Food Security
SNAP all 12 months past year	Treatment	0.106*** (0.013)	0.058** (0.010)
	Post	−0.010 (0.006)	−0.004 (0.004)
	Treatment*post	0.037** (0.017)	0.031** (0.014)
Any SNAP past year	Treatment	0.189*** (0.011)	0.101*** (0.009)
	Post	−0.011* (0.006)	−0.004 (0.004)
	Treatment*post	0.034** (0.014)	0.021* (0.011)
Annual income < 185% of poverty line	Treatment	0.054*** (0.011)	0.017** (0.008)
	Post	0.000 (0.008)	0.007 (0.005)
	Treatment*post	−0.003 (0.011)	−0.007 (0.008)
No. of households		32,135	32,135

Note: Asterisks indicate the following: * = ($p < 0.10$), ** = ($p < 0.05$), and *** = ($p < 0.01$). Standard errors appear in parentheses. Outcomes are the twelve-month food security measure. Each set of coefficients is from a separate DID regression model that includes all covariates reported in table 1 and state fixed effects. Analysis sample includes the households with an annual income less than 250% of the federal poverty line. Mean prevalence of outcomes for each group are available in supplementary online appendix table A3.

Results

We document the effects of the expiration of ARRA on food insecurity, SNAP benefit amount, the likelihood of running short of money for food, and food-at-home spending.

Food Insecurity

The main results for the effect of the SNAP benefit cut are shown in table 2. The prevalence of food insecurity increased by 3.7 percentage points in households that received SNAP benefits all months during the previous year (High Intensity treatment group) as compared to other low-income households.¹¹ The likelihood of very low food security increased by 3.1 percentage points for the same group. This corresponds to a 7.6% increase in the prevalence of food insecurity and a 14% increase in the prevalence of very low food security, respectively, compared to the other low-income households. Among households with any SNAP receipt during the previous year (Any SNAP treatment group), the prevalence of food insecurity increased by 3.4 percentage points compared to the non-SNAP group. Similarly, the likelihood of very low food security increased by 2.1

¹¹ All the estimates in the results are interpreted as change relative to the control group.

percentage points for the same households compared to their low-income counterparts who did not participate in SNAP in the previous twelve months. This corresponds to a 6.7% increase in the prevalence of food insecurity and a 9.2% increase in the prevalence of very low food security. As expected, the effect of the SNAP benefit cut is larger for households who received SNAP for the entire year. It is worth noting that these numbers align well with the estimates from Nord (2013), who argues that SNAP benefits declined due to inflation by about \$47 per month for a family of four from 2009 to 2011. Nord finds that the decline in SNAP value led to an increase of 2 percentage points, or an increase of 16.5%, in the likelihood of very low food security among SNAP recipient households.

Lastly, we observe no difference in the food insecurity outcomes between SNAP-eligible households with an income level less than 185% of the federal poverty line (SNAP eligible treatment group) and those with an income level above the eligibility line. The small and insignificant estimates for the SNAP-eligible low-income group may be due to the inclusion of many non-SNAP households that were not affected by SNAP benefit changes, thereby diluting the effect.

It is crucial to compare our estimates of the 2013 ARRA SNAP cut in light of those from the 2009 ARRA SNAP benefit increase. Nord and Prell (2011) found that the prevalence of food insecurity and very low food security declined by 3 to 3.5 percentage points for SNAP-participating households after the benefit boost in 2009. These authors found the declines of 2.2 and 2.0 percentage points of food insecurity and very low food security, respectively, for SNAP-eligible households with an income level less than 130% of the poverty line. It should be noted that Nord and Prell's analysis is based on double-equation estimates from logistic regression, and therefore is not perfectly comparable to our estimates from the single DID equation with OLS. In the report, the authors state "Difference-in-difference estimates were stronger based on single-equation models with OLS regression," Nord and Prell (2011).

No effects were found when December 2012 food security was compared with that of December 2013 (results not shown). The ARRA SNAP benefit cut was implemented in November 2013, hence it is too soon to detect any effect within a month. Furthermore, the SNAP cut occurred all the way through 2013 (in November), thus the twelve-month food security scale in the analysis could introduce an unknown amount of bias when comparing 2012 with 2013.

We also looked at "placebo changes" by estimating the DID estimates for each pair of years starting in 2005. Figures 3 and 4 illustrate the trend in the DID estimates for the prevalence of the twelve-month and the thirty-day food insecurity, respectively, for households that participated in SNAP at least one month in the year (Any SNAP group). The SNAP benefit changes happen in October of every year.¹² Consequently, in order to capture the effect of SNAP benefit change occurred in year n , we compare the prevalence in the twelve-month food insecurity between year $n-1$ and year $n+1$. For example, coefficient estimate plotted for 2009 is the difference in food security between the years 2008 and 2010. Similarly, the coefficient plotted for 2014 is the difference in the food security between 2013 and 2015.

¹²The only exceptions to this rule were the ARRA SNAP benefit increase, which happened in April 2009, and the ARRA SNAP benefit cut, which happened in November 2013.

Figure 3 Trends in DID estimates for the prevalence of twelve-month food insecurity for the “Any SNAP treatment group”

Source: Current Population Survey Food Security Supplement (CPS-FSS) 2005 to 2015.

Note: “Any SNAP group” indicates households that received SNAP at any time during the previous year. Regressions control for all demographic variables in table 1 and state fixed effect. The DID estimate shows a 95% confidence interval. Each DID estimate compares a year before with a year after. For example, the 2006 DID estimate is derived by comparing 2005 and 2007.

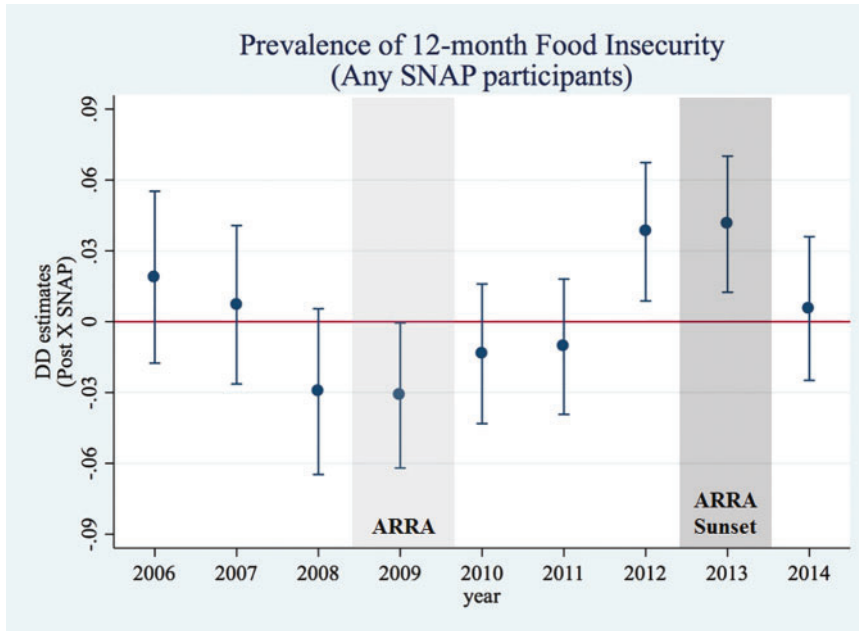


Figure 3 and 4 provide the magnitude of the change relative to usual variation. Overall, we can see a notable drop in the food insecurity level for SNAP households relative to that of non-SNAP households during ARRA, and then a steady increase since 2009, which reaches the peak at the time of ARRA expiration. The DID estimates and standard errors for each pair of years are reported in supplementary online appendix table A2.

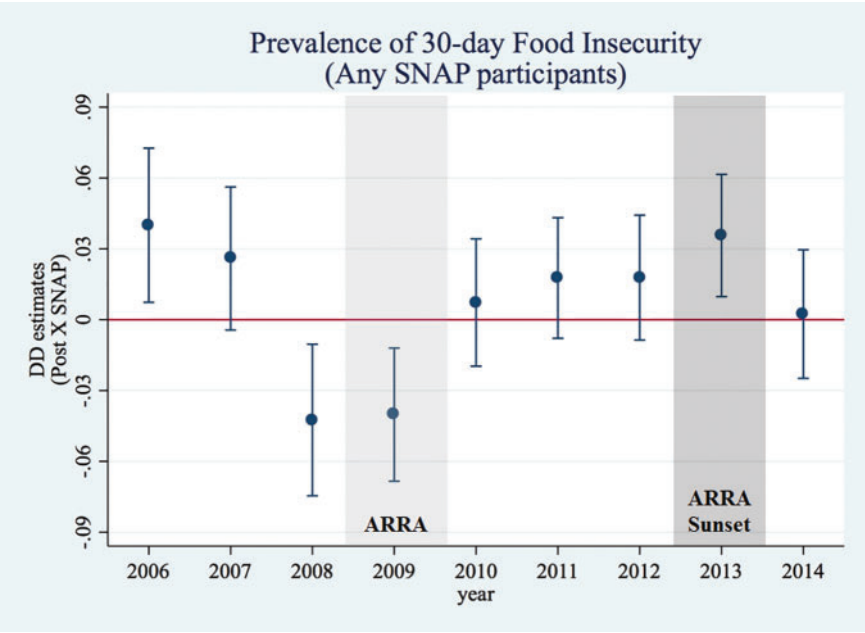
In figure 3, however, the magnitude of food security change during 2009 ARRA is considerably smaller than the magnitude of food security change during the 2013 ARRA Sunset. This might be considered as an aberration from the findings in Nord and Prell (2011). However, one should be careful when interpreting the results from figure 3. In this figure, we are comparing the food security measure between year $n-1$ and year $n+1$ to parallel with our main analysis. Nord and Prell (2011) compare the thirty-day food security measure between two adjacent years—2008 and 2009. In supplementary online appendix figure A1, we illustrate the DID estimates for the prevalence of the thirty-day food insecurity, comparing adjacent years, and show consistency with Nord and Prell (2011).

Another point of concern from figure 3 is the significant jump in food insecurity in year 2012, prior to the actual benefit cut. To check whether there was something else going on that may have prompted an increase in

Figure 4 Trends in DID estimates for the prevalence of thirty-day food insecurity for the “Any SNAP treatment group”

Source: Current Population Survey Food Security Supplement (CPS-FSS) 2005 to 2015.

Note: “Any SNAP group” indicates households that received SNAP at any time during the previous year. Regressions control for all demographic variables in [table 1](#) and state fixed effect. The DID estimate shows a 95% confidence interval. Each DID estimate compares a year before and a year after. For example, the 2006 DID estimate is derived by comparing 2005 and 2007.



food insecurity prior to the actual benefit cut, we pool the years 2010 to 2012 as pre-SNAP cut years and the years 2014 to 2015 as post-SNAP cut years, and estimate the effect of the 2013 SNAP cut. If the increase in food insecurity occurred even before the 2013 SNAP cut, then using more of these pre-cut years should lower the estimated differential in food insecurity before and after the benefit cut. However, the results in supplementary online appendix table A5 report similar point estimates and significance to our main results in [table 2](#), thus providing strong evidence that the increase in food insecurity is due to the 2013 ARRA sunset.

SNAP Benefit Amount

With the expectation of seeing actual cuts in the SNAP dollar amount reported in the CPS-FSS 2012 and 2014, we explore the changes in household monthly SNAP allotments.¹³ In [table 3](#), we evaluate the impact that SNAP cuts have on the dollar amount of SNAP received for all three treatment groups. Results confirm that the SNAP benefit amount fell significantly between 2012 and 2014 for all treatment groups, ranging from \$7 to \$18. The decrease is larger for households that reported SNAP receipt than

¹³We do not use ratio relative to the cost of USDA’s Thrifty Food Plan (TFP) because the TFP is used to determine the SNAP benefit level, which is a function of net income (i.e., gross income less deductions and exemptions).

Table 3 DID Regression of Monthly SNAP Benefits and Probability of Running Short of Money for Food on Pre- versus Post-SNAP Cut

		Dec. 2012 vs. Dec. 2014	
Treatment Group		Dollar Amount of SNAP Received per Month	Ever Run Short of Money for Food Last 12 Months
SNAP all 12 months past year	Treatment	200.906*** (3.946)	0.135*** (0.013)
	Post	-4.216*** (1.514)	-0.011 (0.007)
	Treatment*post	-12.153** (5.135)	0.055*** (0.017)
Any SNAP past year	Treatment	247.478*** (2.910)	0.245*** (0.011)
	Post	1.704*** (0.582)	-0.007 (0.007)
	Treatment*post	-18.720*** (4.092)	0.025* (0.014)
Annual income < 185% of poverty line	Treatment	-31.710*** (3.129)	0.067*** (0.013)
	Post	1.345 (2.545)	-0.004 (0.010)
	Treatment*post	-7.853** (3.338)	0.007 (0.013)
No. of households		27,761	32,131

Note: Asterisks indicate the following: * = ($p < 0.10$), ** = ($p < 0.05$), and *** = ($p < 0.01$). Standard errors appear in parentheses. Each set of coefficient is from a separate DID regression model that includes all covariates reported in table 1 and state fixed effects. Analysis sample includes the households with an annual income less than 250% of the federal poverty line.

SNAP-eligible low-income households. Since the SNAP-eligible households include both SNAP participants (who have positive SNAP dollars) and non-SNAP participants (who have zero SNAP dollars), the decrease in SNAP benefits for this treatment group is likely to be underestimated.

Likelihood of Running Short of Money for Food

Food insecurity is intrinsically a measure of a lack of resources. Therefore, it is worth asking a question about the meaning behind food insecurity increasing when resources decrease. To find the mechanism through which the SNAP benefit cut threatens the food security of SNAP recipients, we explore the likelihood of running short of money for food in the last twelve months. In table 3, we find that the likelihood increases by 5.5 percentage points following the SNAP cut for the households that received SNAP for the entire year. The estimate is half as large and significant for the “Any SNAP treatment group”. This result is pivotal for understanding the mechanism of policy change. A reduction in benefit levels would seriously threaten SNAP participants’ food security by further tightening their food budget.

Table 4 DID Regression of Food at Home Expenditure on Pre- versus Post-SNAP Cut

Outcome: Log (Food-at-Home Spending relative to TFP)		
Any SNAP past year	Dec. 2012 vs. Dec. 2013	Dec. 2012 vs. Dec. 2014
Treatment	0.086*** (0.018)	0.093*** (0.018)
Post	0.030*** (0.011)	0.019* (0.011)
Treatment*post	−0.055** (0.024)	−0.040* (0.024)
No. of households	26,882	27,144

Note: Asterisks indicate the following: * = ($p < 0.10$), ** = ($p < 0.05$), and *** = ($p < 0.01$). Standard errors appear in parentheses. Each set of coefficients is from a separate DID regression model that includes all covariates reported in [table 1](#) and state fixed effects. Analysis sample includes households with an annual income less than 250% of the federal poverty line.

Food-at-home Spending

Existing studies have found that a large increase in SNAP benefits induces households to increase their food expenditures ([Nord and Prell 2011](#); [Beatty and Tuttle 2014](#)). Hence, we can speculate that a cut to benefits may induce households to decrease household food expenditure, and therefore, food security. In the CPS-FSS, households report actual food spending in the week prior to the interview, including any purchases made with SNAP benefits, at each of three kinds of places: i) supermarkets and grocery stores; ii) other stores, such as meat markets, produce stands, bakeries, warehouse clubs, and convenience stores; and iii) restaurants and fast food places. We classify spending at the first two kinds of places as food-at-home spending.

Considering the time frame of these questions, which ask about food spending in the week just prior to the survey, we also estimate the effects using December 2012 and December 2013 CPS-FSS. [Table 4](#) reports that “Any SNAP” households significantly reduced food-at-home spending immediately following the 2013 SNAP cut. This analysis allows us to detect instantaneous shocks to food-at-home spending following the negative income shock (the expiration of ARRA). The estimate is negative and significant in 2014 as well, showing a long-lasting effect of the SNAP cut.

Sensitivity Analysis

As the SNAP receipt in the CPS is under-reported and therefore incomplete compared to administrative data, using either reported SNAP receipt or income to define a treatment group could produce biased estimators when identifying the causal relationship between SNAP benefit change and food security outcomes. Therefore, we try the following methods to overcome this issue.

First, we use the demographic characteristics of the household head to identify the treatment and control group. Any disadvantageous social economic status such as low education, being single, or being an unemployed

Table 5 DID Regression of Food Insecurity on Pre- versus Post-SNAP Cut—Demographic Variables Used to Define Treatment Group

Treatment Group by Household Head Demographic Characteristics		Dec. 2012 vs. Dec. 2014	
		Low and Very Low Food Security	Very Low Food Security
Single mothers	Treatment	−0.016 (0.018)	−0.051** (0.012)
	Post	−0.006 (0.006)	−0.002 (0.004)
	Treatment*post	0.043* (0.025)	0.046** (0.018)
Education ≤ high school or unemployed	Treatment	−0.001 (0.013)	−0.012 (0.009)
	Post	−0.017* (0.010)	−0.013* (0.007)
	Treatment*post	0.021* (0.012)	0.020** (0.008)
No. of households		32,135	32,135

Note: Asterisks indicate the following: * = ($p < 0.10$), ** = ($p < 0.05$), and *** = ($p < 0.01$). Standard errors appear in parentheses. Outcomes are the twelve-month food security measure. Each set of coefficients is from a separate DID regression model that includes all covariates reported in table 1 and state fixed effects. Analysis sample includes households with an annual income less than 250% of the federal poverty line. Mean prevalence of outcomes for each group are available in supplementary online appendix table A3.

head of household predicts SNAP participation (USDA 2009). Table 5 reports the results for two treatment groups, namely households headed by i) single mothers, and ii) low-educated (high school degree or less) or the unemployed. Results from both treatment groups are similar to the main results. Households headed by single mothers, low educated, or unemployed persons can be considered as a good proxy for SNAP households. The results confirm that the ARRA SNAP benefit cut had a negative impact on a wide range of disadvantaged groups. Both of the treatment groups reveal sizable increases in the prevalence of low and very low food security after the ARRA SNAP cut. The finding of consistent results across different definitions of the treatment group provides evidence that the SNAP benefit cut affected disadvantaged families by threatening their food security levels.

We also evaluate the impact of the 2013 SNAP cut separately by three different types of SNAP households—households with elderly but no children, households with children but no elderly, and households with no children and no elderly.¹⁴ We concentrate on the households with children here because the results i) are easily comparable to those from recent literature, and ii) have a higher policy relevance supported by the information that households with children represented 45% of all SNAP households in fiscal year 2013 (USDA 2014).¹⁵ Results in table 6 suggest that households with

¹⁴Three groups are mutually exclusive. Households with both children and elderly are excluded from the subgroup analysis.

¹⁵The estimates for households with elderly and households without children are reported in supplementary online appendix table A6.

Table 6 DID Regression of Food Insecurity on Pre- versus Post-SNAP cut—Subgroup Analysis by Different Household Types: Households with Children

		Dec. 2012 vs. Dec. 2014	
Household with Children		Low and Very Low Food Security	Very Low Food Security
SNAP all 12 months past year	Treatment	0.037* (0.020)	0.008 (0.014)
	Post	−0.012 (0.011)	−0.007 (0.007)
	Treatment*Post	0.038 (0.026)	0.039* (0.019)
Any SNAP past year	Treatment	0.142*** (0.017)	0.060*** (0.012)
	Post	−0.019 (0.012)	−0.009 (0.007)
	Treatment*Post	0.039* (0.021)	0.026* (0.015)
Annual income < 185 % of poverty line	Treatment	0.067*** (0.020)	0.021* (0.012)
	Post	0.004 (0.017)	0.006 (0.009)
	Treatment*Post	−0.009 (0.021)	−0.006 (0.012)
No. of households		11,291	11,291

Note: Asterisks indicate the following: * = ($p < 0.10$), ** = ($p < 0.05$), and *** = ($p < 0.01$). Standard errors appear in parentheses. Outcomes are the twelve-month food security measure. Each set of coefficient is from a separate DID regression model that includes all covariates reported in table 1 and state fixed effects. Analysis sample includes the households with an annual income less than 250% of the federal poverty line. Mean prevalence of outcomes for each group are available in supplementary online appendix table A3. The results for households without children and households with elderly are available in supplementary online appendix table A6.

children responded substantially to the reduction in SNAP benefits. Our estimates can be compared to those reported by Kreider et al. (2012), which have examined the impact of SNAP participation on child food security. These authors address endogenous selection into participation and extensive systematic under-reporting of participation status by applying a range of different nonparametric assumptions. They derive informative bounds on the average treatment effect of SNAP on child food insecurity and find that SNAP participation reduces food insecurity of low-income households with children by five to thirty-eight percentage points.¹⁶ In table 6, we show that the SNAP benefit cut increases the prevalence of food insecurity by four percentage points for SNAP households with children. These estimates are at, or slightly below, the lower bound of what Kreider et al. (2012) suggests. Taking into account that Kreider et al. (2012) evaluate the impact of SNAP participation itself, smaller estimates for the impact of a SNAP benefit change is highly plausible.

¹⁶Their analysis includes 2,707 households with children reporting incomes less than 130% of the poverty line from the 2003 CPS-FSS.

Conclusion

Using data from the CPS-FSS, we study the effect of the 2013 SNAP benefit cut on SNAP participants by comparing food insecurity, food-at-home spending, SNAP benefit amount, and the likelihood of running short of money for food. We start by checking the identifying assumption of the parallel trend of food insecurity between SNAP and non-SNAP participants for the past decade. Food insecurity was trending in parallel for both groups except during the ARRA and ARRA-sunset years. Using DID estimation, we find that food insecurity for SNAP households increased by 3.7 percentage points and the very low food security increased by 3.1 percentage points after the ARRA expired as compared to the other low-income households. This corresponds to a 7.6% increase in food insecurity and a 14% increase in very low food security, respectively. The food security of SNAP recipients could be affected through various channels such as the immediate drop in food-at-home spending or an increase in the likelihood of running short of money for food. These channels force SNAP recipients to further tighten their budgets for food consumption.

We acknowledge the issue of SNAP under-reporting in the CPS-FSS and, consequently, the potential for bias in our estimates. However, our findings are robust to a number of sensitivity analyses and confirm that the 2013 SNAP cut significantly affected a wide range of disadvantaged households at risk of receiving SNAP. Further research should be dedicated towards dealing with bias and confounding factors triggered by under-reporting through the use of administrative data.

The subgroup analysis shows that the effects are strongly driven by households with children. Similarly, the treatment groups formed using lower socio-economic status shows that households headed by single mothers, low educated, or unemployed persons experienced a significant increase in their food insecurity compared to other low-income households. Taken together, these results shed light on important policy implications, as the SNAP cut has resulted in the rise in food insecurity, particularly for the vulnerable population. Our results provide a useful insight into the impact that changes in federal policy have on food security in low-income households. The results from this article raise questions about the sufficiency of current SNAP benefit amounts in terms of reducing poverty and food insecurity. Further research is required to understand the long-term effect of reductions in SNAP benefits and the sustainability of food security among participating households.

Supplementary Material

Supplementary material is available online at *Applied Economic Perspectives and Policy* online.

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