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Alleviating Poverty in the United States: The Critical Role of SNAP Benefits

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Alleviating Poverty in the United States: The Critical Role of SNAP Benefits

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Abstract

The Supplemental Nutrition Assistance Program (SNAP) is one of the largest safety net programs in the United States, serving 44.7 million individuals in an average month in 2011. We used Current Population Survey data to examine the effect of SNAP on poverty from 2000 to 2009, by adding program benefits to income and calculating how SNAP benefits affected the prevalence, depth, and severity of poverty. We found an average decline of 4.4 percent in the prevalence of poverty due to SNAP benefits, while the average decline in the depth and severity of poverty was 10.3 and 13.2 percent, respectively. SNAP benefits had a particularly strong effect on child poverty, reducing its depth by an average of 15.5 percent and its severity by an average of 21.3 percent from 2000 to 2009. SNAP's antipoverty effect peaked in 2009, when benefit increases were authorized by the American Recovery and Reinvestment Act. Our analysis shows that SNAP significantly improves the welfare of low-income households.

Keywords: SNAP, food stamps, food assistance, poverty, child poverty, nonmetropolitan poverty, Current Population Survey

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Summary

What Is the Issue?

The Supplemental Nutrition Assistance Program (SNAP, formerly called the Food Stamp Program) plays a vital role in the social safety net in the United States, providing almost \$72 billion in benefits in 2011. An important measure of SNAP's effectiveness is the extent to which the program reduces poverty. Evaluations of the antipoverty effect of safety net programs often focus on the *rate* of poverty. However, the poverty rate reflects only one aspect of the antipoverty effect of a safety net program—whether or not adding program benefits to a family's resources lifts them above the poverty threshold. Two other measures, portraying the depth and severity of poverty, capture how program benefits increase income among the poor even if they do not lift them out of poverty. Both measures provide richer information on how program benefits improve the well-being of poor families, and the severity measure is particularly sensitive to how program benefits increase well-being among the poorest of the poor.

In this report, we calculated the rate, depth, and severity of poverty, using the definition of family income in the official U.S. poverty estimation (which does not include SNAP benefits). We then estimated the reduction in the three poverty measures for the years 2000 through 2009, after including SNAP benefits in family income. Our analysis focuses on a time period that includes the 2001 and the 2007-2009 recessions as well as the implementation of additional SNAP benefits through the 2009 stimulus legislation.

What Did the Study Find?

SNAP benefits have a relatively stronger effect on the depth and severity of poverty than on the prevalence of poverty, and have a particularly strong alleviative effect on poverty among children, who experience significantly higher rates of poverty than the overall population.

Specifically, we found that:

- SNAP benefits led to an average annual decline of 4.4 percent in the prevalence of poverty from 2000 to 2009, while the average annual decline in the depth and severity of poverty was much larger (10.3 and 13.2 percent, respectively).
- When SNAP benefits are included in family income, the average annual decline from 2000 to 2009 in the depth of child poverty was 15.5 percent and the average annual decline in the severity of child poverty was 21.3 percent.
- SNAP benefits reduced the depth and severity of poverty in both metropolitan areas and nonmetropolitan areas, with somewhat greater poverty reductions among individuals in nonmetropolitan areas.

SNAP's antipoverty effect was strongest in 2009, when benefit increases were authorized by the American Recovery and Reinvestment Act (ARRA), also known as the stimulus package. In 2009, SNAP benefits:

- Reduced the depth of child poverty by 20.9 percent and the severity of child poverty by 27.5 percent.
- Ensured that the depth and severity of poverty in the overall population increased only slightly from their 2008 levels despite worsening economic conditions.

Our analysis shows that examining the basic poverty rate on its own leads to an understatement of the role of SNAP benefits in the reduction of poverty. Extending the analysis to include the poverty-gap and squared-poverty-gap indices adds to our understanding of the role SNAP plays in improving the welfare of individuals in low-income households.

How Was the Study Conducted?

We used 10 years of cross-sectional data from the U.S. Census Bureau's Annual Social and Economic Supplement to the Current Population Survey (CPS), a nationally representative sample of households that provides information on several different sources of income, including in-kind benefits such as SNAP. SNAP benefits are not included in the definition of family income used in the official U.S. poverty calculation. We added the value of SNAP benefits to family income, and compared several measures of annual poverty with and without SNAP benefits. We used the CPS for this analysis because it is the data source for official U.S. poverty estimation. A limitation of the CPS is that SNAP participation and benefits are under-reported in the survey, thus leading to an underestimate of SNAP's effect on poverty.

To estimate the effect of SNAP on poverty, we examined how supplementing income with SNAP benefits affects the headcount, poverty-gap, and squared-poverty-gap indices. The headcount is simply the proportion of persons living in poverty, or the poverty rate. The poverty-gap index measures the depth of poverty and is defined by the mean distance below the poverty threshold, where the mean is formed over the entire population (the nonpoor are counted as having zero poverty gap). The third measure is the squared-poverty-gap index, which provides a measure of the severity of poverty, and is defined as the mean of the squared proportionate poverty gaps.

Introduction

The Supplemental Nutrition Assistance Program (SNAP, formerly called the Food Stamp Program) is one of the largest means-tested social programs in the United States, providing total benefits of almost \$72 billion in 2011. SNAP has experienced significant growth during the last decade. The average monthly SNAP caseload increased from 17.2 million individuals in 2000 to 44.7 million individuals in 2011.

In light of the vital role of SNAP in the social safety net, it is worthwhile to examine the program's effectiveness. Numerous studies have evaluated the effect of SNAP on outcomes such as food expenditures (Breunig and Dasgupta, 2005), food insecurity (DePolt et al., 2009; Gundersen et al., 2009; Gundersen and Oliveira, 2001; Kreider et al., forthcoming 2012; Nord and Prell, 2011; Ratcliffe and McKernan, 2011; Wilde and Nord, 2005), diet quality and nutrition (e.g., Fox et al., 2004; Wilde et al., 1999) and obesity (Baum, 2011; Meyerhoefer and Pylypchuk, 2008; Ver Ploeg and Ralston, 2008).

Previous research has also examined the effect of SNAP benefits, as well as other near-cash government benefits, on the poverty rate. Much of this research has been conducted as part of efforts to develop and assess alternatives to the official measure of U.S. poverty (Citro and Michael, 1995; Garner and Short, 2010; Iceland et al., 2001; Blank, 2008). This broad research effort has culminated in the development of the Research Supplemental Poverty Measure (SPM) by the U.S. Census Bureau, which complements the official poverty measure (Short, 2011).¹ The SPM is designed to account for government expenditures that improve the well-being of low-income families, and has been used to calculate the number of individuals lifted above the poverty line by SNAP benefits (DeNavas-Walt et al., 2010; Short, 2011). Research in the United States tends to focus on the poverty rate, though recent studies have paid greater attention to how government transfers have decreased the aggregate poverty gap, or the sum of the differences between the poverty threshold and the incomes of the poor (Scholz et al., 2009; Ziliak, 2005, 2008), and others have examined trends in the distribution of government transfers to different income classes and demographic groups among the poor (Moffitt and Scholz, 2010; Newman et al., 2011; Todd et al., 2010; Ziliak, 2008).

We contribute to this literature in three ways. First, we examine the effect of SNAP on measures that reflect the depth and severity of poverty as well as the poverty rate from 2000 to 2009, providing an update to previous research by Jolliffe et al. (2005) that examined the effect of SNAP on poverty in the 1990s.² Second, we consider poverty in the overall population and among two subpopulations—children and those living in nonmetropolitan areas—who experience relatively high rates of poverty. Finally, we examine the antipoverty effect of the additional SNAP expenditures authorized by the American Recovery and Reinvestment Act (ARRA) of 2009, also known as the stimulus package.

¹For more details on the Supplemental Poverty Measure, see <http://www.census.gov/hhes/povmeas/methodology/supplemental/overview.html/>.

²Ziliak (2005) also considers trends in the depth and severity of poverty through 2003, after the inclusion of SNAP and other in-kind benefits.

SNAP: Eligibility, Participation, and Benefits

SNAP is the largest U.S. food assistance program, providing 44.7 million individuals with an average monthly benefit of \$134 in 2011. In contrast with many other programs serving low-income households, SNAP eligibility does not depend on family structure, age, or disability status, so benefits reach a broad range of disadvantaged households.³

To receive SNAP benefits, households must meet three financial criteria: the gross income, net income, and asset tests.⁴ A household's gross income before taxes in the previous month must be at or below 130 percent of the poverty line, or \$1,984 per month in fiscal year 2010 for a three-person household.⁵ (Federal fiscal years span October 1 through September 30 of the year listed). In addition to the gross income test, a household must have net monthly income at or below the poverty line.⁶ Finally, income-eligible households must have assets less than \$2,000 (\$3,000 for households with a household member who is over age 60 or disabled).

The SNAP benefit formula is a function of the maximum SNAP benefit amount (also known as the benefit guarantee) and the household's net income. Households with no net income receive the maximum SNAP benefit, based on the estimated cost of a nutritionally adequate diet for a given household size.⁷ The SNAP benefit reduction rate is 30 percent—benefits are reduced by 30 cents for each additional dollar in household net income—and therefore, the poorest SNAP households receive the largest benefits.

The number of people participating in SNAP has grown steadily from 2000 to 2009 (fig. 1). Figure 1 also shows that, historically, SNAP has been a countercyclical program; the caseload increases during recessionary times and declines during economic expansions (Mabli et al., 2009; Ziliak et al., 2003). One notable exception was during the period of economic growth after the 2001 recession, when the unemployment rate dropped, but the SNAP caseload continued to increase. The poverty rate continued to increase during this time period, which may help to explain the caseload increase. There are also a number of changes in SNAP policy that have occurred over the past decade that may have contributed to the caseload increase. States have been granted increased flexibility in how they administer SNAP, in an effort to increase program access and reduce administrative burden (GAO, 2002). Many of the changes are designed to increase SNAP participation among working poor households. For example, States have been given the option to exempt the value of one or more household vehicles from the calculation of a household's assets (USDA/FNS, 2009).⁸ States have also implemented a number of program changes to simplify the administrative process to apply for and remain on SNAP (GAO, 2002).

As the caseload increased from 2000 to 2009, total SNAP benefits also increased (table 1). Real average benefits per person increased somewhat from 2000 to 2008, and then jumped by 20 percent from 2008 to 2009, when the 2009 ARRA increased SNAP benefit levels.

³There are certain restrictions placed on legal immigrants and able-bodied adults without dependents who apply for SNAP payments.

⁴SNAP eligibility guidelines are available at: http://www.fns.usda.gov/snap/applicant_recipients/eligibility.htm/.

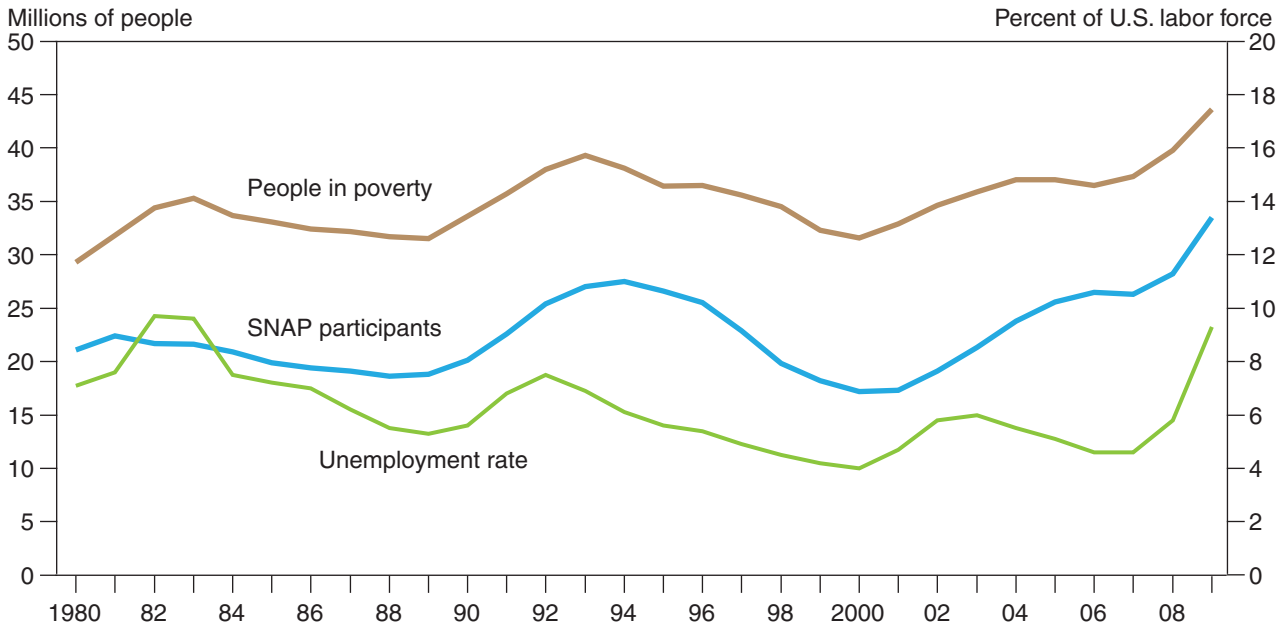
⁵Households with a household member who is over the age of 60 are exempt from the gross income test.

⁶Net income is equal to gross income minus a number of deductions. These deductions are a standard deduction, as well as deductions for labor market earnings (up to 20 percent of earnings), child care expenses, expenses for medical care of disabled dependents, and shelter costs in excess of 50 percent of a household's net income.

⁷For more details on the SNAP benefit formula, see: http://www.fns.usda.gov/snap/applicant_recipients/eligibility.htm/.

⁸The Federal asset test requires that the market value of a vehicle over \$4,650 be counted as part of the household's assets.

Figure 1
SNAP participants, people in poverty, and the unemployment rate, 1980-2009



SNAP = Supplemental Nutrition Assistance Program.

Source: USDA, Economic Research Service calculations based on data from USDA, Food and Nutrition Service, U.S. Census Bureau, and U.S. Bureau of Labor Statistics.

Table 1
SNAP benefits: Total, average monthly per person, and distribution across poverty levels, 2000-09

Year	Total SNAP benefits <i>2009 dollars (billions)</i>	Average monthly SNAP benefit per person <i>2009 dollars</i>	Poor households <i>Percent of SNAP benefits received</i>	Households in deep poverty
2000	11.6	94.12	95.7	53.7
2001	12.4	94.05	95.9	55.1
2002	14.8	98.35	95.6	56.8
2003	17.7	101.45	95.7	58.2
2004	21.0	100.57	95.0	57.1
2005	25.0	105.67	95.0	56.8
2006	27.1	105.19	94.3	56.3
2007	28.3	102.66	94.6	56.1
2008	33.4	105.12	94.5	58.3
2009	50.4	124.25	93.0	55.8

Note: Deep poverty is defined as having income below 50 percent of the Federal poverty guidelines.

SNAP = Supplemental Nutrition Assistance Program.

Source: USDA, Economic Research Service calculations based on USDA, Food and Nutrition Service data.

The ARRA increased the maximum SNAP benefit by 13.6 percent over the fiscal year 2008 level, effective April 2009, but did not change the SNAP benefit reduction rate. In other words, the ARRA shifted up the intercept of the SNAP benefit formula, but did not change its slope with respect to household net income. Households of the same size received the same dollar increase in SNAP benefits, regardless of their net income. For example, the maximum monthly benefit level for a three-person SNAP household increased from \$463 to \$526 starting in April 2009, resulting in a \$63 increase in monthly SNAP benefits for all three-person SNAP households.⁹

Table 1 also provides evidence of the targeting of SNAP benefits to poor households. According to USDA administrative data, over 90 percent of SNAP benefits were received by poor households and over half were received by households with income less than 50 percent of the Federal poverty guidelines. While real total SNAP benefits more than quadrupled from 2000 to 2009, the share of total benefits received by the poor and the severely poor remained fairly steady over the time period.

⁹The exceptions are one- and two-person SNAP households receiving the minimum benefit, which increased from \$14 to \$16 per household per month under the ARRA.

The Current Population Survey Data

To measure the effect of SNAP on poverty, we used data from the Annual Social and Economic (ASEC) Supplement to the Current Population Survey (CPS) conducted by the U.S. Census Bureau. We used 10 years of CPS-ASEC data from 2001 to 2010, which provided us with estimates of poverty and SNAP benefit levels from 2000 to 2009. The CPS is administered monthly by the U.S. Census Bureau for the U.S. Department of Labor's Bureau of Labor Statistics and collects data from a nationally representative sample of households on employment, unemployment, earnings, occupation, and hours of work. Respondents to the CPS provide information on several different sources of income, including noncash income sources such as SNAP.

We used the CPS because it is the data source for official U.S. poverty estimation, and our analysis focused on how SNAP affects poverty. We considered the effect of adding the value of SNAP benefits to family income and compare several measures of poverty with and without SNAP benefits. We were particularly concerned about matching the official poverty estimates, and the CPS allowed us to do this.

A shortcoming of the CPS is that, as recently documented by Meyer et al. (2009), it underestimates the number of SNAP recipients and the value of SNAP benefits. We found that, from 2000 to 2009, the reported average monthly individual participation in the CPS was 70.6 percent of the average monthly individual participation in SNAP administrative data and the reported total benefits in the CPS were 59.3 percent of administrative totals. The under-reporting of SNAP receipt is not unique to the CPS, as shown by Bollinger and David (1997) and Meyer et al. (2009). One common approach to correct for under-reporting of program participation is to predict receipt, based on the observable characteristics of participants. (See, for example, Scholz et al. (2009).) However, recent research using SNAP administrative data in two States matched with CPS data suggested that there are systematic differences in the characteristics of SNAP participants who correctly report participation and those who do not (Meyer and Goerge, 2011). Although we did not correct for the under-reporting of SNAP receipt in this analysis, future research could incorporate the information on SNAP receipt gained from efforts to match survey and administrative data across a larger share of the U.S. population. We consider the implications of the under-reporting of SNAP benefits in our discussion of the results.

Measures of Poverty

The official U.S. poverty measure is based on a comparison of a family's income relative to its needs. The income measure includes all pre-tax income, such as earnings, unemployment compensation, and Social Security payments. It also includes cash benefits from means-tested transfer programs such as Supplemental Security Income (SSI) and Temporary Assistance for Needy Families (TANF). The measure does not include unrealized capital gains, and because it is a pre-tax measure, it does not include Earned Income Tax Credit (EITC) payments. Of particular relevance for this analysis, the family income measure does not include any noncash benefits such as SNAP benefits, housing assistance, or Medicaid. The family-income measure includes income of all family members in a household, but excludes income of nonrelatives, such as unmarried cohabitators.¹⁰ A family's need is measured by the poverty threshold, based on a cost-of-basic-needs methodology. The U.S. Federal poverty thresholds vary for persons of different ages and families of different sizes. In 2010 for example, the poverty threshold was set at \$11,369 for an individual under 65 years of age, \$15,063 for a two-person family with one child and one adult, and \$26,080 for a family with two adults and three children.¹¹

If family income is less than the poverty threshold, then all members of the family are considered poor. The rate of poverty (or headcount index) is then the proportion of individuals living in poor families relative to the total population. The rate of child poverty is the proportion of children living in poor families relative to the total number of children in the population. We similarly computed the other poverty indices by assigning to each person their family's income and poverty threshold.

To understand the effect of SNAP on poverty, we examined how supplementing income with SNAP benefits affects the headcount, poverty-gap, and squared-poverty-gap indices.¹² These three measures are from the frequently used Foster-Greer-Thorbecke (1984, hereafter referred to as FGT) family of poverty indices. The headcount is simply the proportion of persons living in poverty, or the prevalence of poverty. The poverty-gap index measures the depth of poverty and is defined by the mean distance below the poverty threshold, where the mean is formed over the entire population (the nonpoor are counted as having zero poverty gap). The third measure is the squared-poverty-gap index, which provides a measure of the severity of poverty, and is defined as the mean of the squared proportionate poverty gaps.

The FGT class of poverty indices, also referred to as P_α , can be represented as:

$$(1) \quad P_\alpha = 1/n \sum_i I(y_i < z)[(z - y_i)/z]^\alpha$$

where n is the sample size, i subscripts the individual or family, y is income, z is the poverty threshold, and I is an indicator function which takes the value of one if the statement is true and zero otherwise. When $\alpha=0$, the resulting measure is the headcount index, or P_0 . When $\alpha=1$, the FGT index results in the poverty-gap index, or P_1 and the squared-poverty-gap index (P_2) results when $\alpha=2$.

¹⁰Because we considered the official poverty measure, our analysis estimated the effect of SNAP on poverty in the absence of income sources, such as the EITC, that are not included in the official income measure.

¹¹For a complete listing of the poverty thresholds for individuals and families of various sizes, see the U.S. Census Bureau's web page on poverty at: <http://www.census.gov/hhes/www/poverty.html/>.

¹²We assumed that a household's SNAP benefits are equivalent to cash. Research suggests that this is a reasonable assumption, given that the typical SNAP household's expenditures on food are greater than the household's SNAP benefit (Hoynes and Schanzenbach, 2009).

The usefulness of these measures can be illustrated by considering a transfer of money from a nonpoor person to a poor person that is not large enough to move the poor person above the poverty threshold. This transfer has no effect on the headcount index, but the poor person is better off and this welfare improvement is reflected in a reduction of both the poverty-gap and squared-poverty-gap indices.

The difference between the poverty-gap index and the squared-poverty-gap index can be illustrated by considering two possible transfers of equal amounts from a nonpoor person. The first is a transfer to a poor person whose income is equal to 50 percent of the poverty threshold and the second is a transfer to a poor person with higher income, equal to 75 percent of the poverty threshold. Again, the transfers are not enough to lift either person above the poverty threshold and therefore neither transfer will reduce the poverty rate. Since the transfers are of equal amounts, they will each reduce the poverty-gap index by the same amount. However, the squared poverty gap will be reduced more by the first transfer, which is received by a relatively poorer person, than by the second transfer. In general, the lower the income of the poor person who receives a transfer from a nonpoor person, the greater will be the effect on the squared-poverty-gap index.¹³ (See box “How Government Transfers Can Reduce the Depth and Severity of Poverty” for more detailed information on the poverty-gap and squared-poverty-gap indices.)

These examples point to an important reason to consider the poverty-gap and squared-poverty-gap indices in addition to the commonly reported headcount index. As discussed above, SNAP benefits are inversely related to net income, and as a consequence, adding benefits to income will raise only a small subset of recipients above the poverty threshold. However, the progressive benefit delivery design will be relatively more effective at reducing the depth and severity of poverty than at reducing the prevalence of poverty.

It is important to note that we did not capture the potential behavioral response to SNAP benefits. If SNAP benefits reduce an individual’s labor supply (the amount of time spent working), then earned income will be lower than it would have been in the absence of SNAP and we would overstate the effect of SNAP on total family income. Research suggests, however, that the labor supply response to SNAP benefits is small (Fraker and Moffitt, 1988; Hagstrom, 1996; Hoynes and Schanzenbach, 2010; Keane and Moffitt, 1998).

To examine the efficacy of SNAP benefits in reducing poverty, one needs both measures of poverty and measures of their sampling variance in order to know if changes in poverty are statistically significant or simply an artifact of the sampling procedure. We estimated the variance of P_{α} , using an estimation technique that accounted for the fact that the CPS data were not derived from a simple random sample.¹⁴

¹³Unlike the Sen (1976) or Kakwani (1980) poverty indices, the squared-poverty-gap index also satisfies “subgroup consistency,” which means that if poverty increases in any subgroup, and does not decrease elsewhere, then aggregate poverty must increase (Foster and Shorrocks, 1991).

¹⁴Kish (1965) and Howes and Lanjouw (1998) provide evidence of the importance of correcting for deviations from a simple random sample design. Further details on the method employed to estimate the sampling variance are provided in Jolliffe and Semykina (1999), Jolliffe (2002/2003), and Jolliffe et al. (2005).

How Government Assistance Can Reduce the Depth and Severity of Poverty

A simple example can help to explain how the poverty-gap index and the squared-poverty-gap index are affected by anti-poverty programs. Consider a community with two poor people—Alice and Ralph—and eight nonpoor people. The poverty threshold is \$11,000 per year, Alice’s pre-transfer annual income is \$8,000, and Ralph’s pre-transfer annual income is \$5,000. In the absence of government assistance, the poverty rate is 20 percent. The poverty-gap index is 8.2 and the squared-poverty-gap index is 3.7. The aggregate poverty gap—the total amount of money that would need to be transferred to the poor in order to lift all poor people out of poverty—is \$9,000.

Under Scenario A, each poor person receives \$1,000 in government assistance each year, so Alice’s post-transfer annual income is \$9,000 and Ralph’s post-transfer annual income is \$6,000.¹ Neither person’s income is raised above the poverty threshold, so the poverty rate does not change; 20 percent of people in the community are poor. However, the depth and severity of poverty are both reduced. Notice that the aggregate poverty gap has been reduced to \$7,000.

Under Scenarios B and C, only one person receives government assistance. Under Scenario B, Alice receives \$2,000 and Ralph receives no government assistance, and under Scenario C, Alice receives no government assistance and Ralph receives \$2,000. In both Scenarios B and C, the aggregate poverty gap and the depth of poverty are reduced by equal amounts. However, the severity of poverty is reduced more in Scenario C than in Scenario B, reflecting the fact that the severity measure is more sensitive to income changes among the poorest of the poor.

¹We assume that the government transfers do not result in any nonpoor person being moved below the poverty line.

How anti-poverty programs affect the poverty-gap index and the squared-poverty-gap index—hypothetical scenarios

		Pre-transfer income	Post-transfer income	Poverty rate	Aggregate poverty gap	Depth of poverty ¹	Severity of poverty ²
Original	Alice	\$8,000		20 percent	\$9,000	8.2	3.7
	Ralph	\$5,000					
Transfer Scenario A	Alice	\$8,000	\$9,000	20 percent	\$7,000	6.4	2.4
	Ralph	\$5,000	\$6,000				
Transfer Scenario B	Alice	\$8,000	\$10,000	20 percent	\$7,000	6.4	3.1
	Ralph	\$5,000	\$5,000				
Transfer Scenario C	Alice	\$8,000	\$8,000	20 percent	\$7,000	6.4	2.1
	Ralph	\$5,000	\$7,000				

Note: All poverty indices are multiplied by 100.

¹Poverty-gap index.

²Squared-poverty-gap index.

The Effect of SNAP Benefits on Poverty

We estimated poverty and child poverty rates from 2000 to 2009, reported in table 2. These estimates use income (but do not include SNAP benefits) and form a baseline for comparison with later tables (which do include SNAP benefits). Table 2 verifies the well-known result that the proportion of children living in poverty, or the child headcount index, is much higher than for the entire population. For example, in 2009, 20.7 percent of all children were poor versus 14.3 percent of all persons. Between 2000 and 2009, the child headcount index was on average 41.4 percent higher than the headcount index for the population, and the difference was statistically significant in all years.¹⁵ Table 2 also shows that the poverty-gap and squared-poverty-gap indices are higher for children than for the total population. For example, in 2009 the poverty-gap index was 42.9 percent higher for children than for all people, and the squared-poverty-gap index was 38.8 percent higher for children than for all people. Thus, not only are children more likely to be poor than the overall population, poor children are disproportionately represented at the lower end of the income distribution among the poor.

¹⁵We follow Howes and Lanjouw (1998) to correct the standard errors and test for differences in P_0 , P_1 , and P_2 . Over the 10 years, and for all three poverty measures, the child poverty rate is higher than the overall poverty rate with p-values that are much less than 0.0001.

Table 2
Rates of poverty and child poverty, 2000-09

Year	Headcount index		Poverty gap		Squared poverty gap	
	Persons	Children	Persons	Children	Persons	Children
2000	11.3 (0.18)	16.1 (0.38)	5.1 (0.10)	7.2 (0.21)	3.4 (0.08)	4.6 (0.16)
2001	11.7 (0.15)	16.3 (0.29)	5.4 (0.08)	7.7 (0.17)	3.8 (0.07)	5.2 (0.14)
2002	12.1 (0.15)	16.7 (0.29)	5.6 (0.08)	7.6 (0.16)	3.9 (0.07)	5.0 (0.13)
2003	12.5 (0.15)	17.6 (0.30)	6.0 (0.09)	8.4 (0.18)	4.2 (0.08)	5.7 (0.15)
2004	12.7 (0.15)	17.8 (0.31)	6.1 (0.09)	8.4 (0.18)	4.3 (0.08)	5.6 (0.15)
2005	12.6 (0.15)	17.6 (0.31)	6.1 (0.09)	8.4 (0.18)	4.3 (0.07)	5.7 (0.15)
2006	12.3 (0.15)	17.4 (0.30)	5.9 (0.09)	8.2 (0.18)	4.1 (0.07)	5.5 (0.15)
2007	12.5 (0.15)	18.0 (0.31)	5.9 (0.09)	8.5 (0.18)	4.1 (0.07)	5.7 (0.15)
2008	13.2 (0.16)	19.0 (0.31)	6.4 (0.09)	9.2 (0.19)	4.5 (0.08)	6.3 (0.16)
2009	14.3 (0.16)	20.7 (0.32)	7.0 (0.10)	10.0 (0.20)	4.9 (0.08)	6.8 (0.16)

Note: All poverty indices are multiplied by 100. The first column under each of the three indices lists the poverty rates for all people and the second column lists the child poverty rates. Estimates are based on Current Population Survey March Supplement data and standard errors (in parentheses) are corrected for sample-design effects following Jolliffe (2002/03).

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data.

Table 3 reports the same poverty measures introduced in table 2, but focuses on a comparison of metropolitan areas with nonmetropolitan areas, with results from every other year from 2001 to 2009.¹⁶ Table 3 shows that, consistent with previous research, the prevalence of poverty is higher among persons in nonmetropolitan areas than among those in metropolitan areas (DeNavas-Walt et al., 2010; Jolliffe, 2003). In addition, we found that the depth and severity of poverty were consistently higher in nonmetropolitan areas than in metropolitan areas (though the metro-nonmetro difference in the severity of poverty was statistically insignificant at conventional levels in 3 of the 10 years of the analysis).¹⁷ The same relationships hold for children; child poverty is higher in nonmetropolitan than in metropolitan areas across all three poverty measures. These results indicate that poverty is more prevalent in nonmetropolitan areas, and the nonmetropolitan poor are more likely than the metropolitan poor to be at the lower end of the income distribution of the poor.¹⁸

¹⁶This analysis could also be extended to other population groups, such as those based on family structure and race/ethnicity as in Gundersen and Ziliak (2004).

¹⁷Jolliffe (2003) finds that the annual differences in the depth and severity of poverty between metro and nonmetro areas are much less likely to be statistically significant during the 1990s. The metro-nonmetro difference in the poverty gap is statistically significant in only 6 of the 10 years and the squared poverty gap is statistically significant in only 3 of the 10 years.

¹⁸Adjusting for geographic differences in housing costs has been shown to reduce the poverty rate in nonmetropolitan areas and to increase the poverty rate in metropolitan areas (Jolliffe, 2006; Short, 2011). Jolliffe (2006) also finds reductions in the depth and severity of nonmetropolitan poverty and increases in the depth and severity of metropolitan poverty after adjusting for housing cost differences. While data constraints did not allow us to incorporate the changes in poverty measurement introduced in the Research SPM for our study period, this is an important area of future research.

Table 3
Poverty and child poverty indices in metro and nonmetro areas, 2001-09

Year	Area	Headcount		Poverty gap		Squared poverty gap	
		Persons	Children	Persons	Children	Persons	Children
2001	Metro	11.1 (0.16)	15.4 (0.32)	5.2 (0.09)	7.3 (0.19)	3.6 (0.08)	4.9 (0.15)
	Non-metro	14.2 (0.34)	20.2 (0.70)	6.3 (0.20)	9.7 (0.46)	4.3 (0.17)	6.7 (0.39)
2003	Metro	12.1 (0.17)	17.1 (0.33)	5.9 (0.10)	8.2 (0.20)	4.2 (0.08)	5.6 (0.17)
	Nonmetro	14.2 (0.34)	20.1 (0.68)	6.4 (0.19)	9.2 (0.39)	4.3 (0.15)	6.1 (0.33)
2005	Metro	12.2 (0.17)	17.2 (0.34)	5.9 (0.10)	8.2 (0.20)	4.2 (0.08)	5.5 (0.16)
	Nonmetro	14.4 (0.35)	19.8 (0.72)	6.9 (0.21)	9.7 (0.45)	4.7 (0.18)	6.6 (0.39)
2007	Metro	11.9 (0.17)	17.2 (0.34)	5.7 (0.10)	8.1 (0.20)	4.0 (0.08)	5.5 (0.17)
	Nonmetro	15.4 (0.38)	22.1 (0.76)	7.0 (0.22)	10.4 (0.46)	4.8 (0.18)	7.0 (0.38)
2009	Metro	13.9 (0.18)	20.2 (0.36)	6.8 (0.11)	9.8 (0.22)	4.8 (0.09)	6.7 (0.18)
	Nonmetro	16.6 (0.39)	23.5 (0.77)	7.7 (0.22)	11.1 (0.46)	5.3 (0.18)	7.5 (0.38)

Note: All poverty indices are multiplied by 100. The first column under each of the three indices lists the poverty rates for all people and the second column lists the child poverty rates. For each year, the first row lists the poverty rates for the metropolitan population (persons and children) and the second rows list the poverty rates for the nonmetropolitan population. Standard errors for all poverty estimates are corrected for sample-design effects following Jolliffe (2002/03) and are in parentheses. Odd years only are listed due to space considerations; results in the even years are consistent with those presented for the odd years.

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data.

SNAP Impact Is Stronger on Reducing Depth and Severity of Poverty Than Prevalence of Poverty

Our next step is to examine the impact of SNAP on poverty.¹⁹ Table 4 lists poverty rates for each of the three poverty measures with the value of SNAP benefits added to family income. More precisely, the columns labeled “Income + SNAP” in table 4 report:

$$(2) \quad P'_\alpha = 1/n \sum_i I(\{y_i + \text{fsb}_i\} < z)[(z - \{y_i + \text{fsb}_i\})/z]^\alpha$$

where fsb_i is the value of SNAP benefits for family i , and all other terms are defined as in equation (1). The next column reports the percentage decline in poverty from including SNAP benefits, $[(P_\alpha - P'_\alpha)/P_\alpha]*100$; in other words the percentage difference between the results from equation (2) and

¹⁹We note that our primary analysis focused on families below the poverty threshold. Therefore, we did not capture improvements in well-being among SNAP recipients with family income above the poverty threshold. Among SNAP recipients in fiscal year 2009, 10.9 percent had gross income above the poverty guidelines (Leftin et al., 2010). We conducted additional analysis of the effect of SNAP on poverty, where a family is considered poor if its income is below 130 percent of the official poverty threshold, which closely matches SNAP gross income eligibility guidelines. Using this higher poverty threshold, we found that SNAP had a relatively smaller effect on the headcount index, as shown in appendix table 1. This is not surprising, given that SNAP benefits continue to taper off as income increases.

Table 4
Poverty and SNAP benefits, 2000-09
Percentage reduction in poverty from SNAP benefits

Year	Headcount		Poverty gap		Squared poverty gap	
	Income + SNAP	Percent decline	Income + SNAP	Percent decline	Income + SNAP	Percent decline
2000	10.9 (0.18)	3.1 (2.23)	4.6 (0.09)	8.6*** (2.55)	3.0 (0.07)	11.3*** (3.02)
2001	11.3 (0.14)	3.2* (1.73)	5.0 (0.08)	8.4*** (2.03)	3.4 (0.06)	11.0*** (2.40)
2002	11.7 (0.15)	3.1* (1.69)	5.1 (0.08)	8.6*** (1.91)	3.4 (0.06)	11.3*** (2.23)
2003	12.0 (0.15)	3.6** (1.68)	5.4 (0.08)	9.5*** (1.93)	3.7 (0.07)	12.3*** (2.27)
2004	12.2 (0.15)	4.4*** (1.66)	5.5 (0.08)	9.9*** (1.90)	3.7 (0.07)	12.9*** (2.23)
2005	12.1 (0.15)	4.4*** (1.66)	5.4 (0.08)	10.5*** (1.88)	3.7 (0.07)	13.3*** (2.18)
2006	11.7 (0.15)	4.5*** (1.68)	5.3 (0.08)	10.2*** (1.94)	3.6 (0.07)	13.0*** (2.27)
2007	11.9 (0.15)	4.3** (1.69)	5.3 (0.08)	10.7*** (1.91)	3.6 (0.07)	13.5*** (2.23)
2008	12.5 (0.15)	5.2*** (1.62)	5.6 (0.08)	11.8*** (1.83)	3.8 (0.07)	14.8*** (2.13)
2009	13.2 (0.16)	7.7*** (1.52)	5.9 (0.08)	14.6*** (1.69)	4.0 (0.07)	18.0*** (1.94)
<i>Mean: 2000-09</i>	<i>12.0</i>	<i>4.4</i>	<i>5.3</i>	<i>10.3</i>	<i>3.6</i>	<i>13.2</i>

Note: All poverty indices are multiplied by 100. The first column under each of the three poverty indices lists the poverty estimates with SNAP benefits added to income. Standard errors for all poverty estimates are corrected for sample-design effects following Jolliffe (2002/03) and are in parentheses. The second column under each of the poverty measures lists the percentage decline in the poverty index from the SNAP benefits. The estimated percent reduction is superscripted with *, **, or *** if the p-value is less than 0.1, 0.05, or 0.01, respectively. Standard errors for the percent decline are listed in parentheses and are second-order approximations.

SNAP = Supplemental Nutrition Assistance Program.

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data.

equation (1). Because the interpretation of the values of the poverty-gap and squared-poverty-gap indices are not as straightforward as the interpretation of the value of the headcount index, we compare the percent declines in each of the indices in order to assess SNAP's effect on each. Standard errors for the relative decline in poverty are estimated as a second-order Taylor series expansion.²⁰

As shown in table 4, the percentage of individuals lifted above the poverty threshold by SNAP benefits increased fairly steadily through 2008. The decline in the headcount index from SNAP benefits was 3.1 percent in 2000 and rose to 5.2 percent in 2008. In 2009, the decline in the headcount index from SNAP benefits jumped to 7.7 percent, when SNAP benefits were increased through the ARRA. The decline in the headcount index of 7.7 percent means that the supplemented income brought approximately 3.4 million people over the poverty threshold. This change is qualitatively significant, but given that in 2009 there were over 43.6 million poor people, the change in the headcount index failed to measure much of the poverty alleviation properties of SNAP benefits. In contrast, the estimates in table 4 reveal that both the poverty gap and squared poverty gaps were changed considerably by the inclusion of SNAP benefits.²¹ From 2000 to 2009, supplementing income by the value of SNAP benefits had the effect of reducing the poverty-gap index by an average of 10.3 percent and reducing the squared-poverty-gap index by an average of 13.2 percent. These poverty reductions were much greater than when just considering the change in the headcount index, which was reduced by the inclusion of SNAP benefits by an average of 4.4 percent from 2000 to 2009.

The addition of SNAP benefits to income does relatively less to decrease the prevalence of poverty, P_0 , because benefits are negatively related to income. In general, only a subset of poor households will have income close enough to the poverty threshold to allow SNAP benefits to actually lift them above the threshold, and Leftin (2010) shows that SNAP participation rates of eligible households with higher incomes are lower than for poorer households. Therefore, not only is the effect of SNAP benefits on the headcount index limited to a proportion of poor SNAP participants whose income is closest to the poverty threshold, these are the households that are relatively less likely to participate. In contrast, lower income poor households have higher participation rates, but the addition of the value of SNAP benefits to their income is unlikely to lift them out of poverty and will therefore have no impact on the headcount index (though it will reduce the P_1 and P_2 indices).²²

The evidence that SNAP is more effective at reducing the depth and severity of poverty than the prevalence of poverty is even stronger when we considered children in poor families. Table 5 shows that SNAP benefits in the first decade of the 2000s reduced the child poverty headcount by an average of 5.6 percent, while reducing the child-poverty-gap index by an average of 15.5 percent and the child-squared-poverty-gap index by an average of 21.3 percent.²³ The substantial reduction in the severity of child poverty from SNAP benefits illustrates that program benefits are targeted to children in the poorest of poor families.

²⁰For details of the Taylor series approximation methodology, see Wolter (1985) and for an application to the decline in poverty, see Jolliffe et al. (2005).

²¹One interpretation of the poverty-gap index is that it equals the product of the headcount index and the income gap, where the income gap is the average shortfall of the poor as a fraction of the poverty line. The results indicate that, for example, in 2009, the average shortfall of the poor was 49.0 percent of the poverty line but when supplemented with SNAP benefits, the average shortfall declined to 44.6 percent of the poverty line. Table 2 shows that in 2009, the headcount index was 14.3 and the poverty gap was 7.0. Therefore, the average shortfall of the poor was 7.0 divided by 14.3, or 49 percent. After accounting for SNAP benefits, table 4 shows that the average shortfall of the poor in 2009 was equal to 5.9 divided by 13.2, or 44.6 percent.

²²We also examined the effect of SNAP on poverty, where a family is considered poor if its income is below 130 percent of the official poverty threshold, which more closely matches SNAP gross income eligibility guidelines. Using this higher poverty threshold, we found that SNAP has a relatively smaller effect on the headcount index, as shown in appendix table 1. This is not surprising, given that SNAP benefits continue to taper off as income increases.

²³Because poverty is measured at the family level, if family income plus SNAP benefits are greater than the poverty threshold, all children in the family are lifted out of poverty.

Table 5

Child poverty and SNAP benefits, 2000-09*Percentage reduction in child poverty from SNAP*

Year	Headcount		Poverty gap		Squared poverty gap	
	Income + SNAP	Percent decline	Income + SNAP	Percent decline	Income + SNAP	Percent decline
2000	15.4 (0.37)	3.9 (3.21)	6.2 (0.18)	13.0*** (3.58)	3.8 (0.14)	18.4*** (4.20)
2001	15.6 (0.29)	4.1* (2.45)	6.7 (0.16)	12.8*** (2.81)	4.3 (0.12)	17.9*** (3.27)
2002	16 (0.29)	4.1* (2.39)	6.6 (0.14)	13.5*** (2.63)	4.1 (0.11)	19.1*** (3.03)
2003	16.8 (0.30)	4.5* (2.34)	7.2 (0.16)	14.4*** (2.64)	4.5 (0.13)	20.1*** (3.06)
2004	16.7 (0.30)	5.8** (2.33)	7.1 (0.16)	15.3*** (2.65)	4.4 (0.13)	21.8*** (3.08)
2005	16.6 (0.30)	5.5** (2.36)	7.1 (0.16)	15.9*** (2.58)	4.4 (0.12)	21.8*** (2.96)
2006	16.4 (0.29)	5.8** (2.34)	7 (0.16)	15.3*** (2.65)	4.4 (0.13)	20.9*** (3.10)
2007	17.0 (0.31)	5.6** (2.36)	7.1 (0.16)	16.1*** (2.63)	4.5 (0.13)	21.8*** (3.06)
2008	17.8 (0.31)	6.3*** (2.25)	7.6 (0.17)	17.3*** (2.47)	4.8 (0.13)	23.2*** (2.85)
2009	18.7 (0.31)	9.8*** (2.07)	7.9 (0.16)	20.9*** (2.26)	4.9 (0.13)	27.5*** (2.58)
<i>Mean: 2000-09</i>	<i>16.7</i>	<i>5.6</i>	<i>7.1</i>	<i>15.5</i>	<i>4.4</i>	<i>21.3</i>

Note: All poverty indices are multiplied by 100. The first column under each of the three poverty indices lists the poverty estimates with SNAP benefits added to income. Standard errors for all poverty estimates are corrected for sample-design effects following Jolliffe (2002/03) and are in parentheses. The second column under each of the poverty measures lists the percentage decline in the poverty index from the SNAP benefits. The estimated percent reduction is superscripted with *, **, or *** if the p-value is less than 0.1, 0.05, or 0.01, respectively. Standard errors for the percent decline are listed in parentheses and are second-order approximations.

SNAP = Supplemental Nutrition Assistance Program.

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data.

SNAP Effect on Poverty Levels Is Underestimated in CPS

In our discussion of the CPS, we noted the serious underestimate of both the number of SNAP participants and the total dollar benefits received by participants in the data. The underestimate of participants and benefits would be expected to produce an underestimate of the antipoverty effect of SNAP across all three poverty measures. Therefore, our estimates can be thought of as a lower bound on the antipoverty effect of SNAP. In addition, we found that the proportion of total benefits received by participants with incomes below 50 percent of the poverty line was much greater in the SNAP administrative data than in the CPS. This suggests that the underestimate of the antipoverty effect of SNAP may be particularly acute for the depth and severity of poverty measures. Thus, we would expect that a more accurate accounting of SNAP recipients and benefits in the CPS would further bolster our argument that SNAP is relatively

more effective at reducing the depth and severity of poverty than the prevalence of poverty. As noted previously, the development of methods to correct for the underreporting of program participation and benefits could be useful to improve future assessments of the antipoverty effect of SNAP.

Table 6 examines how the addition of SNAP benefits to income affects the measures of the prevalence, depth, and severity of poverty in metropolitan and nonmetropolitan areas. Our findings are consistent with those from tables 4 and 5; SNAP has a greater effect on the depth and severity than on the prevalence of poverty in both metropolitan and nonmetropolitan areas, and the effect of SNAP on the three poverty measures generally increased from 2000 to 2009. Comparing metropolitan and nonmetropolitan areas

Table 6
Metro and nonmetro poverty and SNAP benefits, 2001-09
Percentage reduction in poverty from SNAP benefits

Year	Area	Headcount		Poverty gap		Squared poverty gap	
		Income + SNAP	Percent decline	Income + SNAP	Percent decline	Income + SNAP	Percent decline
2001	Metro	10.7 (0.16)	3.3* (2.00)	4.8 (0.09)	8.2*** (2.32)	3.3 (0.07)	10.6*** (2.73)
	Nonmetro	13.8 (0.34)	2.8 (3.32)	5.7 (0.19)	9.5** (4.08)	3.7 (0.15)	12.6** (4.96)
2003	Metro	11.6 (0.17)	3.6* (1.92)	5.3 (0.09)	9.1*** (2.20)	3.7 (0.08)	11.8*** (2.56)
	Nonmetro	13.7 (0.33)	3.5 (3.29)	5.7 (0.17)	11.1*** (3.70)	3.7 (0.14)	14.6*** (4.39)
2005	Metro	11.7 (0.16)	4.5** (1.88)	5.3 (0.09)	10.2*** (2.12)	3.6 (0.07)	12.9*** (2.45)
	Nonmetro	13.9 (0.34)	3.8 (3.32)	6.1 (0.19)	11.7*** (3.85)	4.0 (0.16)	15.2*** (4.57)
2007	Metro	11.4 (0.16)	4.3** (1.93)	5.1 (0.09)	10.4*** (2.17)	3.5 (0.07)	13.1*** (2.53)
	Nonmetro	14.7 (0.37)	4.4 (3.37)	6.2 (0.19)	11.8*** (3.90)	4.0 (0.16)	15.3*** (4.59)
2009	Metro	12.9 (0.17)	7.6*** (1.72)	5.9 (0.09)	14.0*** (1.91)	4.0 (0.08)	17.4*** (2.18)
	Nonmetro	15.2 (0.37)	8.2*** (3.12)	6.4 (0.19)	17.1*** (3.45)	4.2 (0.16)	21.2*** (4.02)
10 yr. mean	Metro	11.5	4.3	5.2	9.9	3.5	12.7
	Nonmetro	14.0	4.6	5.9	11.8	3.8	15.3

Note: All poverty indices are multiplied by 100. The first column under each of the three poverty indices lists the poverty estimates with SNAP benefits added to income. Standard errors for all poverty estimates are corrected for sample-design effects following Jolliffe (2002/03) and are in parentheses. The second column under each of the poverty measures lists the percentage decline in the poverty index from the SNAP benefits. The estimated percent reduction is superscripted with *, **, or *** if the p-value is less than 0.1, 0.05, or 0.01, respectively. Standard errors for the percent decline are listed in parentheses and are second-order approximations. Odd years only are listed due to space considerations; results in the even years are consistent with those presented for the odd years.

SNAP = Supplemental Nutrition Assistance Program.

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data.

reveals that SNAP has a somewhat stronger effect on the depth and severity of poverty in nonmetropolitan than in metropolitan areas, which is consistent with the higher SNAP participation rates among households in nonmetropolitan versus metropolitan areas (Leftin, 2010). Table 7 reports the equivalent analysis for children, and again shows that the effect of SNAP at reducing the depth and severity of poverty is stronger among children than among the overall population in both metropolitan and nonmetropolitan areas. For example, SNAP benefits reduced the severity of poverty by an average of 15.3 percent among the overall population in nonmetropolitan areas (table 6, final row) and by an average of 22.5 percent among children in nonmetropolitan areas (table 7, final row).

Table 7

Metro and nonmetro child poverty and SNAP benefits, 2001-09

Percentage reduction in child poverty from SNAP benefits

Year	Area	Headcount		Poverty gap		Squared poverty gap	
		Income + SNAP	Percent decline	Income + SNAP	Percent decline	Income + SNAP	Percent decline
2001	Metro	14.8 (0.31)	4.3 (2.83)	6.3 (0.17)	12.7*** (3.18)	4.0 (0.13)	17.8*** (3.67)
	Nonmetro	19.6 (0.70)	3.4 (4.81)	8.5 (0.41)	12.9** (5.88)	5.5 (0.34)	18.1** (7.02)
2003	Metro	16.3 (0.33)	4.5* (2.67)	7.1 (0.18)	14.0*** (3.02)	4.5 (0.14)	19.5*** (3.49)
	Nonmetro	19.3 (0.67)	4.3 (4.63)	7.7 (0.33)	16.0*** (5.10)	4.7 (0.26)	22.7*** (5.96)
2005	Metro	16.2 (0.33)	5.7** (2.65)	6.9 (0.17)	15.6*** (2.90)	4.3 (0.13)	21.5*** (3.30)
	Nonmetro	18.9 (0.70)	4.9 (4.93)	8.1 (0.39)	17.0*** (5.54)	5.1 (0.31)	23.1*** (6.50)
2007	Metro	16.2 (0.33)	5.7** (2.69)	6.8 (0.18)	16.0*** (2.99)	4.3 (0.14)	21.8*** (3.48)
	Nonmetro	21.0 (0.75)	5.2 (4.71)	8.7 (0.40)	16.3*** (5.35)	5.5 (0.32)	22.0*** (6.21)
2009	Metro	18.3 (0.35)	9.6*** (2.34)	7.8 (0.18)	20.5*** (2.55)	4.9 (0.14)	27.0*** (2.91)
	Nonmetro	21.1 (0.74)	10.4** (4.29)	8.6 (0.38)	22.9*** (4.68)	5.3 (0.30)	30.0*** (5.34)
10 yr. mean	Metro	16.1	5.5	6.8	15.2	4.3	21.0
	Nonmetro	19.6	5.7	8.1	16.5	5.0	22.5

Note: All poverty indices are multiplied by 100. The first column under each of the three poverty indices lists the poverty estimates with SNAP benefits added to income. Standard errors for all poverty estimates are corrected for sample-design effects following Jolliffe (2002/03) and are in parentheses. The second column under each of the poverty measures lists the percentage decline in the poverty index from the SNAP benefits. The estimated percent reduction is superscripted with *, **, or *** if the p-value is less than 0.1, 0.05, or 0.01, respectively. Standard errors for the percent decline are listed in parentheses and are second-order approximations. Odd years only are listed due to space considerations; results in the even years are consistent with those presented for the odd years.

SNAP = Supplemental Nutrition Assistance Program.

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data.

SNAP's Effect on Poverty Was Strongest in 2009

The findings summarized in tables 4 and 5 are displayed in figures 2 and 3, which plot the percent reduction due to SNAP benefits for each measure of poverty (fig. 2) and child poverty (fig. 3) by year.²⁴ Figures 2 and 3 show that the percent decline is largest for the squared poverty gap, followed by the poverty-gap index, and both of these are significantly greater than the decline in the headcount index over all years considered. The figures also show that SNAP's contribution to reducing poverty increased between 2000 and 2009, a period when the SNAP caseload nearly doubled and total SNAP benefits more than quadrupled. As noted previously, this time period was marked by two economic downturns and increasing State flexibility to determine program eligibility and simplify the program application process.

Figures 2 and 3 also make it clear that the effect of SNAP at reducing poverty and child poverty increased dramatically from 2008 to 2009, when additional SNAP benefits were authorized by the ARRA. Focusing on figure 3, the antipoverty effect of SNAP increased most dramatically for the child headcount measure, by 55.6 percent between 2008 and 2009.²⁵ In contrast, the antipoverty effect of SNAP increased by a more modest 20.8 percent for the poverty-gap index and by 18.5 percent for the squared-poverty-gap index.

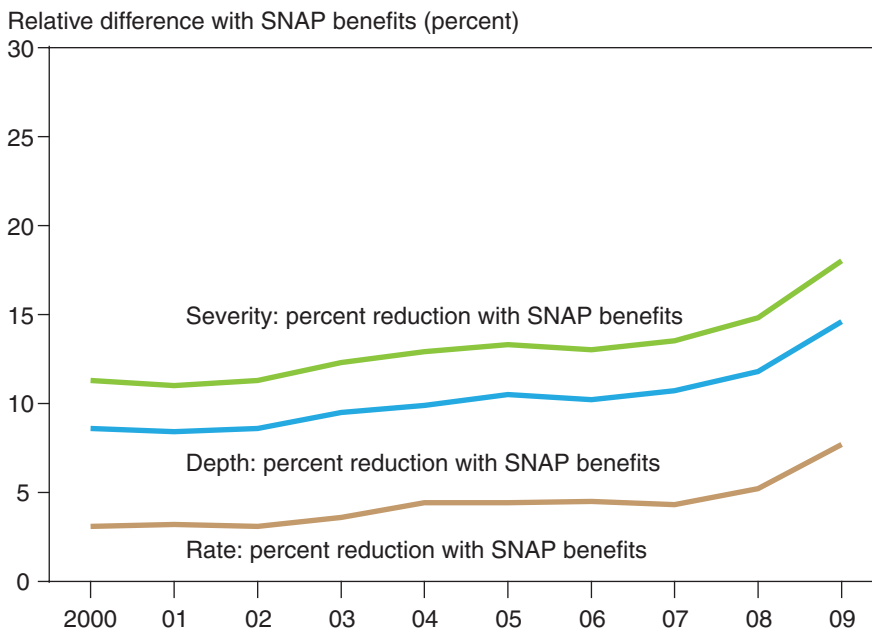
The ARRA-authorized increase in the maximum SNAP benefit means that, for a given level of net income, a poor SNAP household could have a lower level of gross income and still be lifted over the poverty threshold by SNAP benefits.²⁶ Because the SNAP benefit reduction rate was not changed, the dollar decrease in the minimum level of gross income that would allow

²⁴The corresponding figures for the metro and nonmetro areas show a similar relationship among the percent reductions in the headcount, poverty-gap, and squared-poverty-gap indices, and similar trends over time.

²⁵This is measured by the change in $[(P_{\alpha} - P'_{\alpha}) / P_{\alpha}] * 100$ between 2008 and 2009. For example, the percent decline in the child headcount resulting from SNAP benefits increased by 55.6 percent, from 6.3 in 2008 to 9.8 in 2009.

²⁶Of course, the ARRA benefit increase would only decrease the prevalence of poverty among households whose pre-ARRA SNAP benefits would not have already lifted them above the poverty line.

Figure 2
Reduction in poverty from SNAP benefits, 2000-09 for all persons

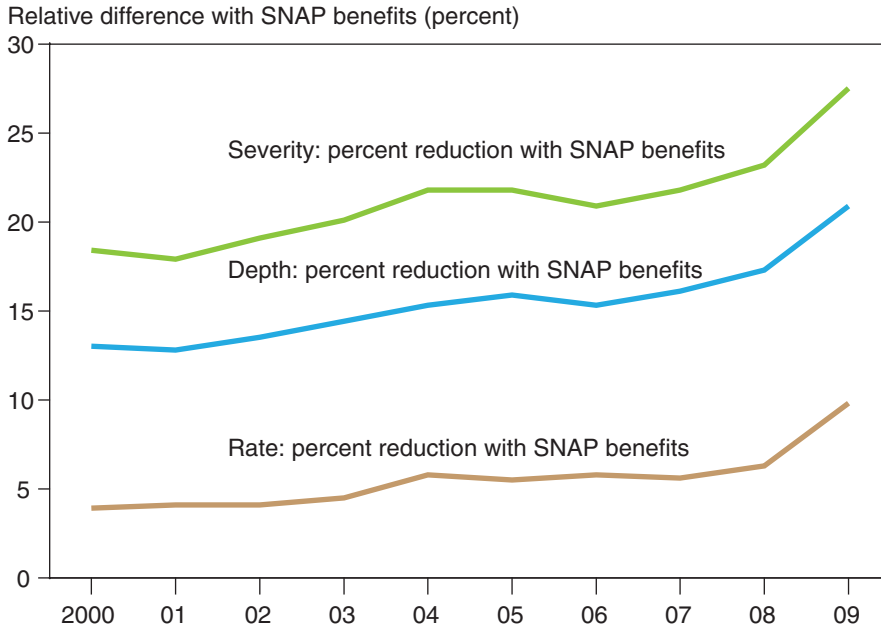


SNAP = Supplemental Nutrition Assistance Program.

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data.

Figure 3

Reduction in poverty from SNAP benefits, 2000-09 for all U.S. children



SNAP = Supplemental Nutrition Assistance Program.

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data.

SNAP benefits to lift a household out of poverty is the same for a given household size across a broad range of net income levels.²⁷ Thus, the ARRA benefit increase would be expected to expand substantially the subset of poor households that received enough in SNAP benefits to lift them above the poverty threshold.

For example, among three-person families (whose poverty threshold is \$1,440 per month) with net income between \$0 and \$1,306, monthly gross income could be \$63 lower and SNAP benefits could still lift the family out of poverty.²⁸ With net income between \$1,306 and \$1,396, the difference in the minimum gross income that would allow SNAP benefits to lift a three-person family out of poverty decreases by 70 cents for each additional dollar in net income, since the distance between family net income and the poverty threshold is less than the post-ARRA SNAP benefit in this range. If net income is \$1,396 or greater, the ARRA increase in benefits would not influence the prevalence of poverty, because pre-ARRA benefits would already have lifted the family out of poverty. In addition to increasing the subset of SNAP households who could be lifted above the poverty threshold by their SNAP benefits, the ARRA benefit increase may have also encouraged greater enrollment in SNAP among nonparticipating households in the income range that would be lifted above poverty by the increased benefit level.

²⁷The exception is when the distance between net income and the poverty threshold is less than or equal to the SNAP benefit, in which case the constraint that gross income be greater than or equal to net income is binding.

²⁸This example uses the poverty threshold for a family with one adult and two children, and assumes 12 months of SNAP receipt.

While the increase in the antipoverty effect of SNAP between 2008 and 2009 was largest for the headcount measure, SNAP benefits were also quite effective at reducing the depth and severity of poverty in 2009. According to the measure of income used in the official poverty definition (shown in table 2), the depth of child poverty increased by 8.7 percent and the severity of child poverty increased by 7.9 percent from 2008 to 2009, as the severe economic downturn continued from 2007. However, table 5 shows that, after accounting for SNAP benefits, the increase from 2008 to 2009 in the depth of child poverty was only 3.9 percent and in the severity of child poverty was only 2.1 percent. While we did not estimate the exact contribution of the additional ARRA-authorized SNAP benefits, it is clear that total SNAP benefits in 2009 were quite successful in protecting the well-being of the poor during the 2007-09 recession.²⁹

²⁹For an evaluation of the effectiveness of overall 2009 ARRA spending on the headcount index, see Sherman (2011).

Conclusions

Using data from the 2001 to 2010 March Supplement of the Current Population Survey, we show that the depth and severity of poverty, as well as the prevalence of poverty, were significantly higher for children than for the population in general and were higher for those in nonmetropolitan than for those in metropolitan areas. We then examined the effect on poverty of adding the value of SNAP benefits to family income. Our results showed that the prevalence of poverty, as measured by the headcount index, was not reduced much by SNAP. In contrast, the depth and severity of poverty, and particularly of child poverty, were significantly reduced by SNAP. The average decline from 2000 to 2009 in the child-poverty-gap index was 15.5 percent, while the average decline in the squared-poverty-gap index for children was 21.3 percent. SNAP benefits reduced both the depth and severity of poverty in both metropolitan areas and nonmetropolitan areas, with somewhat greater poverty reductions among individuals in nonmetropolitan areas.

The role of SNAP benefits in reducing the prevalence, depth, and severity of poverty increased steadily from 2000 to 2009, during a period of increasing State variation in program administration. Most of the program changes were designed to increase access to working poor households, who would be expected to be at the higher end of the income distribution among eligible households. While we did not find evidence that these program changes diminished the targeting effectiveness of the program, an important area of future research is to examine the influence of specific State SNAP policy choices, as well as changing macroeconomic conditions, on SNAP's poverty-reducing effect.³⁰

The antipoverty effect of SNAP was highest in 2009, when the ARRA increased SNAP benefits to all participants, and SNAP benefits ensured that the depth and severity of poverty increased only slightly from their 2008 levels despite worsening economic conditions. These results clearly show that an examination of only the headcount index, or prevalence of poverty, would lead to an understatement of the role of SNAP benefits in the reduction of poverty. Our analysis of the poverty-gap and squared-poverty-gap indices makes clear that SNAP plays an important role in improving the welfare of individuals in low-income households.

³⁰The role of economic conditions is of particular interest, in light of evidence that macroeconomic conditions in the 1980s and 1990s had a strong effect on poverty and its severity (Gundersen and Ziliak, 2004) and that SNAP participation has become more responsive to changes in unemployment since the 1996 welfare reform (Bitler and Hoynes, 2010).

References

- Baum, Charles L. 2011. "The Effects of Food Stamps on Obesity," *Southern Economic Journal* 77(3):623-51.
- Bitler, Marianne, and Hilary W. Hoynes. 2010. *The State of the Safety Net in the Post-Welfare Reform Era*, Working Paper No. 16504, National Bureau of Economic Research, Cambridge, MA. October.
- Blank, Rebecca M. 2008. "How to Improve Poverty Measurement in the United States," *Journal of Policy Analysis and Management* 27(2):233-54.
- Bollinger, Christopher and Martin David. 1997. "Modeling Discrete Choice with Response Error: Food Stamp Participation," *Journal of the American Statistical Association*, September 1997, 92(439):827-35.
- Breunig, Robert, and Indraneel Dasgupta. 2005. "Do Intra-Household Effects Generate the Food Stamp Cash-Out Puzzle?" *American Journal of Agricultural Economics* 87(3), August, pp. 552-68.
- Citro, Constance F., and Robert T. Michael (eds). 1995. *Measuring Poverty: A New Approach*, National Academies Press, Washington, DC.
- DeNavas-Walt, Carmen, Bernadette D. Proctor, and Jessica C. Smith. 2010. *Income, Poverty, and Health Insurance Coverage in the United States: 2009*, Current Population Report No. P60-238, U.S. Census Bureau.
- DePolt, R., R. Moffitt, and D. Ribar. 2009. "Food Stamps, Temporary Assistance for Needy Families and Food Hardships in Three American Cities," *Pacific Economic Review* 14(2009):445-73.
- Foster, J., and A. Shorrocks. 1991. "Subgroup Consistent Poverty Indices," *Econometrica* 59(1991):687-709.
- Foster, J., J. Greer, and E. Thorbecke. 1984. "A Class of Decomposable Poverty Measures," *Econometrica* 52(1984):761-65.
- Fox, Mary Kay, William Hamilton, and Biing-Hwan Lin. 2004. *Effects of Food Assistance Programs on Nutrition and Health: Volume 3, Literature Review*, USDA, Economic Research Service. December. Available at: <http://www.ers.usda.gov/publications/fanrr19-3/>.
- Fraker, Thomas, and Robert Moffitt. 1988. "The Effect of Food Stamps on Labor Supply: A Bivariate Selection Model," *Journal of Public Economics* 35(1):25-56.
- Garner, Thesia I., and Kathleen S. Short. 2010. "Identifying the Poor: Poverty Measurement for the U.S. from 1996 to 2005," *Review of Income and Wealth* 56:2(June).
- Gundersen, C., and V. Oliveira. 2001. "The Food Stamp Program and Food Insufficiency," *American Journal of Agricultural Economics* 83(November 2001):875-87.

- Gundersen, C., D. Jolliffe, and L. Tiehen. 2009. "The Challenge of Program Evaluation: When Increasing Program Participation Decreases the Relative Well-Being of Participants," *Food Policy* 34(2009):367-76.
- Gundersen, Craig, and James P. Ziliak. 2004. "Poverty and Macroeconomic Performance Across Space, Race, and Family Structure," *Demography* 41(1):61-86.
- Hagstrom, Paul. 1996. "The Food Stamp Participation and Labor Supply of Married Couples: An Empirical Analysis of Joint Decisions," *Journal of Human Resources* 31(2):383-403.
- Howes, S., and J.O. Lanjouw. 1998. "Does Sample Design Matter for Poverty Comparisons," *Review of Income and Wealth* 44(1998):99-109.
- Hoynes, Hilary W., and Diane Whitmore Schanzenbach. 2009. "Consumption Responses to In-Kind Transfers: Evidence from the Introduction of the Food Stamp Program," *American Economic Journal: Applied Economics* 1(4):109-39.
- Hoynes, Hilary Williamson, and Diane Whitmore Schanzenbach. 2010. "Work Incentives and the Food Stamp Program," Working Paper No. 16198, National Bureau of Economic Research, Cambridge, MA.
- Iceland, John, Kathleen Short, Thesia Garner, and David Johnson. 2001. "Are Children Worse Off? Evaluating Well-Being Using the New (and Improved) Measure of Poverty," *Journal of Human Resources* 36(2):398-412.
- Jolliffe, Dean. 2006. "The Cost of the Living and the Geographic Distribution of Poverty," ERR-16, USDA, Economic Research Service. September. Available at: <http://www.ers.usda.gov/publications/err16/>.
- Jolliffe, D., C. Gundersen, L. Tiehen, and J. Winicki. 2005. "Food Stamp Benefits and Child Poverty," *American Journal of Agricultural Economics*, August, 87(3):569-81.
- Jolliffe, D. 2003. "Comparisons of Metropolitan-Nonmetropolitan Poverty During the 1990s," RDRR-96, USDA, Economic Research Service. Available at: <http://www.ers.usda.gov/publications/rdr96/>.
- Jolliffe, D. 2002/2003. "Estimating Sampling Variance from the Current Population Survey: A Synthetic Design Approach to Correcting Standard Errors," *Journal of Economic and Social Measurement* 28(2002/2003):239-61.
- Jolliffe, D., and A. Semykina. 1999. "Robust Standard Errors for the Foster-Greer-Thorbecke Class of Poverty Indices: SEPOV," *Stata Technical Bulletin* 51(1999):34-6.
- Kakwani, N. 1980. "On a Class of Poverty Measures," *Econometrica* 48(1980):437-46.
- Keane, M., and R. Moffitt. 1998. "A Structural Model of Multiple Welfare Program Participation and Labor Supply," *International Economic Review* 39(3):553-89.

- Kish, L. 1965. *Survey Sampling*, New York: John Wiley & Sons.
- Kreider, B., J. Pepper, C. Gundersen, and D. Jolliffe. Forthcoming 2012. "Identifying the Effects of SNAP (Food Stamps) on Child Health Outcomes When Participation is Endogenous and Misreported," *Journal of the American Statistical Association*. Forthcoming 2012.
- Leftin, Joshua. 2010. *Trends in Supplemental Nutrition Assistance Program Participation Rates: 2001 to 2008*, USDA, Food and Nutrition Service.
- Leftin, Joshua, Andrew Gothro, and Esa Eslami. 2010. *Characteristics of Supplemental Nutrition Assistance Program Households: Fiscal Year 2009*, USDA, Food and Nutrition Service.
- Mabli, James, Emily Sama Martin, and Laura Castner. 2009. *Effects of Economic Conditions and Program Policy on State Food Stamp Program Caseloads: 2000 to 2006*, CCR-56, USDA, Economic Research Service.
- Meyer, Bruce D., and Robert M. Goerge. 2011. *Errors in Survey Reporting and Imputation and Their Effects on Estimates of Food Stamp Program Participation*, Discussion Paper No. 11-14, U.S. Census Bureau, Center for Economic Studies.
- Meyer, Bruce D., Wallace K. C. Mok, and James X. Sullivan. 2009. "The Under-Reporting of Transfers in Household Surveys: Its Nature and Consequences," National Bureau of Economic Research Working Paper #15181, July.
- Meyerhoefer, C., and Y. Pylypchuk. 2008. "Does Participation in the Food Stamp Program Increase the Prevalence of Obesity and Health Care Spending?" *American Journal of Agricultural Economics* 90(2008):287-305.
- Moffitt, Robert, and John Karl Scholz. 2010. "Trends in the Level and Distribution of Income Support," in *Tax Policy and the Economy*, Volume 24, edited by Jeffrey R. Brown. Chicago: University of Chicago Press, pp. 111-52.
- Newman, Constance, Jessica E. Todd, and Michele Ver Ploeg. 2011. "Children's Participation in Multiple Food Assistance Programs: Changes from 1990 to 2009," *Social Service Review*, December, pp. 535-64.
- Nord, Mark, and Mark Prell. 2011. *Food Security Improved Following the 2009 ARRA Increase in SNAP Benefits*, ERR-116, USDA, Economic Research Service. Available at: <http://www.ers.usda.gov/publications/err116/>.
- Ratcliffe, Caroline, and Signe-Mary McKernan. 2011. "How Much Does SNAP Reduce Food Insecurity?" *American Journal of Agricultural Economics*, 93(4): 1082-98.
- Scholz, John Karl, Robert Moffitt, and Benjamin Cowan. 2009. "Trends in Income Support," in *Changing Poverty, Changing Policies*, edited by M. Cancian and S. Danziger. New York: Russell Sage Foundation, pp. 203-41.

- Sen, A. 1976. "Poverty: An Ordinal Approach to Measurement," *Econometrica* 44(1976):219-31.
- Sherman, Arloc. 2011. *Despite Deep Recession and High Unemployment, Government Efforts—Including the Recovery Act—Prevented Poverty from Rising in 2009, New Census Data Show*, Center on Budget and Policy Priorities, Washington, DC, January.
- Short, Kathleen. 2011. *The Research Supplemental Poverty Measure: 2010*, Current Population Report No. P60-241, U.S. Census Bureau.
- Todd, Jessica E., Constance Newman, and Michele Ver Ploeg. 2010. *Changing Participation in Food Assistance Programs Among Low-Income Children After Welfare Reform*, ERR-92, USDA, Economic Research Service, February. Available at: <http://www.ers.usda.gov/publications/err92/>.
- Trippe, Carole, and Jessica Gillooly. 2010. *Non-Cash Categorical Eligibility for SNAP: State Policies and the Number and Characteristics of SNAP Households Categorically Eligible Through Those Policies: Final Memo*, USDA, Food and Nutrition Service, July.
- U.S. Department of Agriculture, Food and Nutrition Service. 2009. *Supplemental Nutrition Assistance Program State Options Report, 8th edition*, USDA, Food and Nutrition Service.
- U.S. General Accounting Office. 2002. *States' Use of Options and Waivers to Improve Program Administration and Promote Access*, GAO-02-409.
- Ver Ploeg, Michele, and Katherine Ralston. 2008. *Food Stamps and Obesity: What Do We Know?*, EIB-34, USDA, Economic Research Service, March.
- Wilde, P., P. McNamara, and C. Ranney. 1999. "The Effect of Income and Food Programs on Dietary Quality: A Seemingly Unrelated Regression Analysis with Error Components," *American Journal of Agricultural Economics* 81(November 1999):959-71.
- Wilde, Parke, and Mark Nord. 2005. "The Effect of Food Stamps on Food Security: A Panel Data Approach," *Review of Agricultural Economics* 27(3):425-32.
- Wolter, K. 1985. *Introduction to Variance Estimation*, New York: Springer Verlag.
- Ziliak, James P. 2008. "Filling the Poverty Gap, Then and Now," *Frontiers in Family Economics* 1(39).
- Ziliak, James P. 2005. "Understanding Poverty Rates and Gaps: Concepts, Trends, and Challenges," in *Foundations and Trends in Microeconomics*, 1(3):127-99.
- Ziliak, James P., Craig Gunderson, and David N. Figlio. 2003. "Food Stamp Caseloads over the Business Cycle," *Southern Economic Journal* 69(4): 903-19.

Appendix table 1

Poverty (130 percent)¹ and SNAP benefits, 2000-09*Percentage reduction in poverty from SNAP benefits*

Year	Headcount		Poverty gap		Squared poverty gap	
	Income + SNAP	Percent decline	Income + SNAP	Percent decline	Income + SNAP	Percent decline
2000	16.4 (0.21)	1.4 (1.81)	6.7 (0.11)	5.6*** (2.13)	4.1 (0.08)	8.8*** (2.57)
2001	16.8 (0.17)	1.0 (1.42)	7.1 (0.09)	5.6*** (1.69)	4.4 (0.07)	8.7*** (2.06)
2002	17.3 (0.17)	1.4 (1.37)	7.3 (0.09)	5.7*** (1.62)	4.6 (0.07)	8.9*** (1.93)
2003	17.7 (0.18)	1.3 (1.38)	7.6 (0.09)	6.4*** (1.63)	4.8 (0.07)	9.8*** (1.95)
2004	17.6 (0.18)	1.6 (1.39)	7.7 (0.09)	6.8*** (1.62)	4.9 (0.08)	10.4*** (1.93)
2005	17.7 (0.17)	1.6 (1.37)	7.6 (0.09)	7.1*** (1.61)	4.9 (0.07)	10.8*** (1.90)
2006	17.2 (0.17)	1.8 (1.40)	7.4 (0.09)	6.9*** (1.64)	4.7 (0.07)	10.5*** (1.97)
2007	17.6 (0.18)	1.8 (1.39)	7.4 (0.09)	7.2*** (1.63)	4.7 (0.07)	10.9*** (1.93)
2008	18.4 (0.18)	2.1 (1.35)	7.9 (0.10)	8.2*** (1.56)	5.0 (0.08)	12.1*** (1.85)
2009	19.1 (0.18)	2.9** (1.30)	8.3 (0.10)	10.6*** (1.47)	5.3 (0.08)	15.0*** (1.71)
<i>Mean: 2000-09</i>	<i>17.6</i>	<i>1.7</i>	<i>7.5</i>	<i>7.0</i>	<i>4.7</i>	<i>10.6</i>

¹This analysis uses a poverty threshold set at 130 percent of the Federal poverty threshold in each year. For example, a family of two adults and two children at 130 percent of the poverty threshold had an income of \$28,283 in 2009.

SNAP = Supplemental Nutrition Assistance Program.

Note: All poverty indices are multiplied by 100. The first column under each of the three poverty indices lists the poverty estimates with SNAP benefits added to income. Standard errors for all poverty estimates are corrected for sample-design effects following Jolliffe (2002/03) and are in parentheses. The second column under each of the poverty measures lists the percentage decline in the poverty index from the SNAP benefits. The estimated percent reduction is superscripted with *, **, or *** if the p-value is less than 0.1, 0.05, or 0.01, respectively. Standard errors for the percent decline are listed in parentheses and are second-order approximations.

Source: USDA, Economic Research Service calculations based on Current Population Survey Annual Social and Economic Supplement data