INSTITUTE for RESEARCH on POVERTY
UNIVERSITY OF WISCONSIN–MADISON

IRP Discussion Paper

Estimating the Impact of Food Stamps on the New York City Poverty Rate Using a
National Academy of Sciences-Style Poverty Measure

Mark Levitan
Director of Poverty Research
New York City Center for Economic Opportunity

Daniel Scheer
Research Scientist
New York City Center for Economic Opportunity

November 2011

Abstract

The official poverty measure, which relies solely on pre-tax cash income, provides a limited view of the impact of government policy on the poverty rate. By taking taxation and in-kind benefits such as Food Stamps into account, poverty measures based on the National Academy of Science's recommendations are suited to capture the effect of a wider range of anti-poverty policies. Over the past several years, the New York City Center for Economic Opportunity (CEO) has developed such a measure for New York City. This study utilizes CEO's approach to assess the impact of Food Stamps on the New York City poverty rate from 2007–2009. We find that the Food Stamp program plays an important role in anti-poverty policy for the City as a whole, as well as for specific sub-groups. Because benefits are not conditioned on employment, Food Stamps offset some of the income loss associated with the economic downturn. We also develop counterfactual scenarios in order to identify the role of efforts to expand the program's participation rate in 2008 and 2009, and the increase in benefit levels in 2009. We find that these additional efforts had relatively small and statistically insignificant effects on the City poverty rate. We conclude that policymakers should focus on maintaining the program's relative flexibility, bolstering its level of benefits and continuing work to increase the participation rate among eligible individuals.

I. Introduction

Beginning in 2011, the Census Bureau will report poverty rates based on a Supplemental Poverty Measure (SPM) in addition to those based on the current, official methodology. The SPM is modeled on the recommendations of the National Academy of Sciences (NAS).[1] Like the official measure, the SPM measures poverty through the lens of income adequacy. But, the SPM employs a far more inclusive definition of the resources it considers to be income than does the official measure. In addition to pre-tax cash, the new measure captures the effect of taxation along with the cash value of in-kind housing and nutritional assistance. Under this measure, the value of Food Stamp benefits will be an important component of family resources.[2]

The introduction of an alternative method for measuring poverty, which accounts for Food Stamp benefits, is well-timed; over the course of the recent recession, the Food Stamp program has become an increasingly significant element of the social safety net. This is due in part to the flexibility of the program and its broad eligibility requirements. Unlike other government assistance programs, the Food Stamp program is not strictly work-conditioned and is available for individuals up to 130 percent of the Federal poverty line.[3] This flexibility means that the Food Stamp program can be much more responsive to demand for assistance associated with recessions. Between 2007 and 2009, Food Stamp caseloads grew by 45 percent nationwide. In contrast, U.S.-wide TANF caseloads grew by only 13 percent.[4] In response to the leap in participation, researchers and policymakers have become acutely interested in understanding the degree to which the program has ameliorated the impact of the recent economic downturn on families vulnerable to poverty.

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[1] Citro, Constance F. and Robert T. Michael (eds). Measuring Poverty: A New Approach, Washington, DC: National Academy Press, 1995.

[2] The Food Stamp program was renamed as the Supplemental Nutritional Assistance Program in the 2008 Farm Bill. We will refer to SNAP benefits colloquially as "Food Stamps", as most people still use the term.

[3] In some states, unemployed childless adults are limited to three months of Food Stamps. However in most states this rule is currently suspended because of the economic downturn. For more information on eligibility requirements, see: `http://www.cbpp.org/cms/index.cfm?fa=view&id=2226`.

[4] "TANF Responded Unevenly to Increases in Need During the Downturn", Center for Budget and Policy Priorities, `www.cbpp.org/cms/index.cfm?fa=view&id=3379`.

The New York City Center for Economic Opportunity (CEO) has been engaged in developing an alternative poverty measure for New York City based on the NAS recommendations for several years. CEO has employed the Census Bureau's American Community Survey (ACS) as its main data set because it provides a large annual sample for New York City. While the ACS is a rich data source for measuring pre-tax cash income, its Food Stamp data is incomplete and suffers from multiple forms of measurement error. In addition, there are challenges posed by the survey's unit of analysis. Addressing these data issues is critical for the development of CEO's poverty measure as an effective tool for evaluating poverty trends and the impact of anti-poverty programs.

This study utilizes CEO's poverty measure to assess the impact of Food Stamps on poverty in New York City from 2007-2009. Section II discusses the measure and its relationship to the current, official measure. Section III describes the imputation model used to estimate Food Stamp benefits, as well as trends in Food Stamps in New York City. Section IV investigates the impact of Food Stamps on the New York City poverty rate and Section V estimates the effect of Food Stamp policy changes undertaken during the recent recession. We find that the Food Stamp program plays an important role in anti-poverty policy for the City as a whole, as well as for specific sub-groups. Because benefits are not conditioned on employment, Food Stamps offset some of the income loss associated with the economic downturn. We also develop counterfactual scenarios in order to identify the role of efforts to expand the program's participation rate in 2008 and 2009, and the increase in benefit levels in 2009. We find that these additional efforts had relatively small and statistically insignificant effects on the City poverty rate.

II. Poverty Measurement

IIA. The Official and NAS Approaches to Poverty Measurement

The official measure's poverty threshold was developed in the early 1960s and was based on the cost of the U.S. Department of Agriculture's "Economy Food Plan", a diet designed for "temporary or emergency use when funds are low." Because the survey data available at the time indicated that families typically spent a third of their income on food, the cost of the plan was simply multiplied by three to account for other needs. Since the threshold's 1963 base year, it has been updated annually by the change in the Consumer Price Index.

Nearly a half-century later, this poverty line has little justification. The threshold does not represent contemporary spending patterns; food now accounts for less than one-seventh of family expenditures, and housing is the largest item in the typical family's budget. The official threshold also ignores differences in the cost of living across the nation, an issue of obvious importance to measuring poverty in New York City. A final shortcoming of the threshold is that it is frozen in time. Since it only rises with the cost of living, it assumes that a standard of living that defined poverty in the mid-1960s remains appropriate, despite advances in the nation's standard of living since that time.

The official measure's definition of the resources that are compared against the threshold is pre-tax cash. This includes wages, salaries and earnings from self-employment; income from interest, dividends, and rents; and some of what families receive from public programs, if the assistance takes the form of cash. Thus, payments from Unemployment Insurance, Social Security, Supplemental Security Income, and Public Assistance are included in the official resource measure.

Given the data available and the policies in place at the time, this was not an unreasonable definition. But for decades now an increasing share of what government does to support low-income families takes the form of tax credits (such as the Earned Income Tax Credit) and in-kind benefits (such as Food Stamps). If policymakers or the public want to know how

these programs affect poverty, the official measure cannot provide an answer.

NAS-based methods take a considerably different approach to both the threshold and resource side of the poverty measure. The poverty threshold reflects the need for clothing, shelter and utilities as well as food. It is established by choosing a point in the distribution of "reference" families' expenditures for these items, plus a small multiplier to account for miscellaneous expenses such as personal care, household supplies, and non-work-related transportation. The threshold is updated each year by the change in the level of this spending. This connects the threshold to the growth in living standards. In further contrast to the official measure, the NAS-style poverty line is also adjusted to reflect differences in housing costs by geography.[5]

The NAS-based income measure is designed to account for the flow of resources that a family can use to meet the needs represented in the threshold. The tax system and the cash-equivalent value of in-kind benefits for food and housing are important additions to family resources. But families also have non-discretionary spending needs that reduce their disposable income. These include the cost of commuting to work, childcare, and medical care that must be paid for out-of-pocket. This spending is accounted for as deductions from income.

IIB. CEO's Adoption of the NAS Measure

The NAS report provided a conceptual framework for developing a poverty measure. While some of its proposals were quite specific, other recommendations went no further than suggesting a direction for future research or calling on others to settle various issues. One important decision the NAS Panel felt it should not make was where precisely to draw the poverty line. The Panel merely proposed a range (spanning 78 percent to 83 percent of median expenditures) in the belief that, given the inherently political nature of the issue, this should be left up to policymakers.

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[5]Citro, Constance F. and Robert T. Michael (eds). Measuring Poverty: A New Approach, Washington, DC: National Academy Press, 1995.

The first task CEO faced, therefore, was making choices among the options. In this work, we were guided by the NAS report, subsequent research conducted (primarily) by staff at the U.S. Census Bureau and Bureau of Labor Statistics, and local conditions (particularly the unique character of the City's housing market). On a practical level, our choices also reflected the decision to use the Census Bureau's American Community Survey as our principal data set.

For the poverty line, we rely on the U.S.-wide thresholds that have been calculated from the Bureau of Labor Statistics' Consumer Expenditure Survey and have been used by the Census Bureau for its own research on NAS-style poverty measures. In 2009, the NAS threshold for a two-adult, two-child family equaled \$24,522.[6] We then adjust the threshold to account for the relatively high cost of living in New York City, using the ratio of the New York City to U.S.-wide Fair Market Rent for a two-bedroom apartment. In 2009, our poverty line for this family comes to \$29,477.[7] (The official threshold for the corresponding two-adult, two-child family in 2009 is \$21,756). We refer to this New York City-specific threshold as the CEO poverty threshold.

To measure the resources available to a family to meet the needs represented by the threshold, our poverty measure employs the Public Use Micro Sample from the Census Bureau's American Community Survey (ACS) as its principal data set. The advantages of this survey for local poverty measurement are obvious. The ACS is designed to provide measures of socio-economic conditions on an annual basis in states and larger localities. It offers a robust sample for New York City (roughly 25,000 households) and contains essential information about household composition, family relationships, demographic characteristics and cash income from a variety of sources.

However, as noted earlier, the NAS-recommended poverty measure greatly expands the

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[6]CEO uses the FCSU-CE threshold, which is derived from the Bureau of Labor Statistics Consumer Expenditure Survey. This threshold does not include medical care or mortgage principal payments.

[7]In our reports, we refer to families as "Poverty Units." These units are constructed from ACS microdata and are a modified version of the Census Bureau family unit used in the Official poverty measure. For more information, see: Levitan, et al. "Policy Affects Poverty: The CEO Poverty Measure, 2005-2009", New York City Center for Economic Opportunity, March 2011.

scope of resources that must be measured in order to determine whether a family is poor. Unfortunately, the ACS provides only some of the information needed to estimate the additional resources required by the NAS measure. CEO has developed a variety of models that estimate the effect of taxation, nutritional and housing assistance, work-related expenses and medical out-of-pocket expenditures on total family resources and poverty status. We refer to the constructed estimate of family income as "CEO Income."[8]

III. Estimating the Value of Food Stamps

Data in the ACS regarding the Food Stamp program are very limited. First, as of 2008, the ACS only indicates whether a member of a household received Food Stamps at any time in the prior 12 months, providing no information on the value of the benefit, which must be estimated.[9] CEO's decision to make use of New York City administrative data as its source for imputing the value of Food Stamps received leads to a second issue: Food Stamp participation in the ACS is reported at the household level, which differs from a typical Food Stamp case. A household is comprised of all persons who share residence in a housing unit. A Food Stamp case, in contrast, includes only those household members who are close relatives and who purchase and prepare food in common (see below). The distinction shows up clearly in the data. In 2007, for example, the average New York City Food Stamp case had 1.85 members, while the average ACS household reporting Food Stamp receipt had 2.87 members. A third problem is underreporting of program participation. CEO's method for imputing the yearly value of Food Stamps, thus, entails three steps: (1) creating Food Stamp units within ACS household units; (2) estimating the value of yearly Food Stamp receipt; and (3) adjusting the number of Food Stamp cases created in the ACS data to correct for

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[8]For a more complete discussion of CEO's procedures for estimating these income components, see the appendices of our report, "Policy Affects Poverty: The CEO Poverty Measure, 2005-2009", New York City Center for Economic Opportunity, March 2011.

[9]The decision to drop the question about the value of Food Stamps received was influenced by the Census Bureau's testing of the ACS questionnaire, which revealed that respondents were more likely to indicate receipt of the benefit if the follow-up question about the value of the benefit did not appear in the survey instrument. See: http://www.census.gov/acs/www/AdvMeth/content_test/H6_Food_Stamps.pdf.

underreporting.

IIIA. The Imputation Model

Food Stamp Units

To create commensurable units, CEO developed a program that divides ACS households into the maximum number of "Food Stamp units" that the program rules allow. The Food Stamp program uses the following rules to determine who in a household must be in the same Food Stamp case:

- Spouses.

- Parents and children under 22, including spouses of these children, and grandchildren.

- A child under 18 living with, and under the parental control of, an adult that provides 50 percent or more of the minor child's support.

- Anyone else in the household that purchases and prepares food together.

The first two of these rules are readily described by variables in the ACS. Others are not and must be created. To construct these relationships, we use the minimal household unit (MHU) program, which was originally written by Jeff Passel, Senior Demographer at the Pew Hispanic Center. The MHU program is designed to parse an American Community Survey (ACS) household into its smallest family units.[10] The program loops through the data, linking individuals within the ACS household by kinship and marriage. This work creates Food Stamp case units that conform to the first three rules listed above.

Because CEO does not attempt to infer who else in a household is purchasing and preparing food together, the program creates the maximum number of Food Stamp units within each household allowable under program rules. The size and composition of the Food Stamp

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[10]Passel, Jeffrey. "Editing Family Data in Census 2000 Public-Use Microdata Samples: Creating Minimal Household Units (MHUs)." August 2002.

Table 1: **Distribution of Food Stamp Cases by Size, 2007**

	ACS Households		CEO Food Stamp Units		Administrative Cases	
Size	Frequency	Percent	Frequency	Percent	Frequency	Percent
One	120,621	29.7	401,400	57.5	443,378	57.6
Two	89,263	22.0	130,443	18.7	149,863	19.5
Three	68,936	17.0	71,358	10.2	89,344	11.6
Four	54,999	13.6	49,640	7.1	49,685	6.5
Five	32,276	8.0	23,853	3.4	21,282	2.8
Six	19,864	4.9	10,844	1.6	8,439	1.1
Seven	8,440	2.1	5,159	0.7	3,685	0.5
Eight	5,214	1.3	2,433	0.3	1,735	0.2
Nine	3,788	0.9	2,879	0.4	895	0.1
Ten or more	2,074	0.5	666	0.1	997	0.1
Total	405,475	100.0	698,675*	100.0	769,303	100.0

Source: 2007 American Community Survey Public Use Micro Sample as augmented by CEO, New York City Human Resources Administration.

*The total "CEO Food Stamp Units" figure includes eligible, non-reporting cases that received PA or SSI. This adjustment is discussed below.

cases produced with this method accurately reproduce that of the cases in the administrative data. In 2007, for example, the proportion of single-person Food Stamp cases created in the ACS (57.5 percent) was virtually identical to the proportion of single-person cases in the administrative data (57.6 percent). Using the Food Stamp unit rather than the ACS household also increases the estimated number of Food Stamp cases in the 2007 ACS from 405,475 (50 percent of the administrative total) to 625,394 (78 percent of the administrative total).[11]

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[11]Tables on the development of the Food Stamp imputation model are for 2007, which is the last year for which data on the value of Food Stamps is reported in the ACS.

Benefit Levels

Integrating ACS data and administrative Food Stamp data can be accomplished through a broad category of methods known as "statistical matching."[12] Given two data sets, A and B, where A and B share common variables, X, and B contains a variable of interest Y, a synthetic data set, C, can be created by matching observations in A and B based on their common characteristics within the vector of variables, X. The goal of the match is for $E[Y_C|X] = E[Y_B|X]$ and $Var[Y_C|X] = Var[Y_B|X]$; that is, for the distribution of Y in the donor data set to be preserved in the synthetic data set, conditional on X.

An appropriate statistical match requires that two assumptions be fulfilled. First, the data sets A and B must be independent and drawn from the same population. Second, the Conditional Independence Assumption (CIA) must hold. In this context, the CIA says that $E[Y_C|X, D] = E[Y_C|X]$, where D is a binary variable differentiating data sets A and B. The CIA requires that, conditional on the matching variables, X, Y is randomly distributed with respect to the two data sets. This implies that the matching variables explain all the systematic variation in Y that occurs in data sets A (if Y were observed) and B. Thus, no other confounding variables across A and B exist and any difference between $E[Y_B]$ and $E[Y_C]$ is random.

The statistical match was performed using a predictive mean match (PMM), a technique originally developed by Rubin (1986) and Little (1988).[13] The PMM algorithm has three steps: (1) estimate a regression model of Y on X in data set B; (2) use the estimated coefficients to compute predicted values for Y in A and B; (3) match host observations to donor observations with the closest predicted value; and (4) donate the *actual* value of Y in A to observations in B.

The PMM method has several advantages. First, it can handle both continuous and

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[12]D'Orazio, Marcello and Marco Di Zio and Mauro Scanu. *Statistical Matching: Theory and Practice.* Wiley Series in Survey Methodology. West Sussex: 2006.

[13]Grau et. al. "Predictive Mean Neighborhood Imputation With Application To The Person-Pair Data Of The National Household Survey On Drug Abuse." *Proceedings of the Annual Meeting of the American Statistical Association*, August 5-9, 2001.

categorical data. Second, it accounts for the covariance among explanatory variables, which leads to a more accurate match. Third, since matching is performed using a scalar value, PMM is relatively simple to program and avoids the "sparse-cell" issue that can arise in Hot-Deck and other non-parametric matching methods. Finally, since the actual and not predicted value is donated, PMM reproduces a more faithful distribution of Y than simple regression imputation.[14]

For each year from 2005 through 2009, we compiled administrative data on Food Stamp cases in New York City from the Human Resources Administration's internal database. The data includes all cases in New York City that were active for any period between July and June of the appropriate year. This period was chosen because it represents the mid-point in the ACS rolling sample, helping to ensure that the administrative data was comparable to the ACS data over the ACS survey year.[15] To preserve consistency with our poverty universe, individuals in group quarters were removed from both the administrative data and the ACS sample.

The administrative data set contains demographic information about the Food Stamp case-heads and families, as well as relevant budget information such as household income. For each case, we summed the total of Food Stamp payments over the previous 12 month period. Using this data, we developed a regression model using the demographic characteristics present in both the administrative and ACS data sets in order to predict the yearly value of Food Stamp payments to families in New York City.

We focused on variables that were strongly predictive of Food Stamp benefits and for which high quality data existed in both the ACS and administrative data sets. Case size was, unsurprisingly, the strongest predictor of benefit level. Further, the number of children, and the dummy variables for elderly case-head and elderly or disabled member in the case

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[14]O'Donnell, Sharon and Rodney Beard. "Imputing medical out of pocket (MOOP) expenditures using SIPP and MEPS." Presented at the August 2009 Meeting of the American Statistical Association Section on Social Science Statistics.

[15]The ACS employs a twelve-month rolling sample design, where one-twelfth of the sample is interviewed in each month.

were also predictive of the benefit level. This is likely due to the fact that it is easier for these groups to remain on Food Stamps longer since they are not subject to work requirements. Age of the case-head was included as a proxy for factors such as work status.[16] The coefficient on the age of the case-head is positive in all four years, even controlling for elderly status. This may be because the probability of employment among low-income New Yorkers declines after age 50, which would lead to an increasing benefit with age in the administrative data that is independent of elderly status.

We tested numerous regression specifications, evaluating them on the basis of fit. The final model is generally consistent over the years 2005-2009. It is worth noting, however, that the sign of the coefficients on elderly case-head and elderly or disabled member in the case change in the most recent years. This likely reflects the changing composition of the Food Stamp caseload in New York City over the sample period. In 2008 and 2009, as the recession began to impact New York City families, the proportion of two-parent families on Food Stamps grew. This may have changed the benefit level of elderly cases, relative to the average, resulting in a change in the sign of the coefficients.

The development of a regression model for the purpose of matching records was complicated by the fact that the ACS and administrative data are constructed differently and are utilized for very different purposes. This was a particular issue with regard to measuring income. While the ACS reports yearly cash income, the administrative data only contains the monthly income reported on the Food Stamp application.[17] Because families often apply for Food Stamps after an income shock, such as a job loss, the difference between the income variables in the two data sets lead to a poor statistical match. Food Stamp units in the ACS have higher income than otherwise comparable administrative Food Stamp cases. As a result, we made the decision to leave income out of the regression model.

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[16]While the New York City administrative database does contain information on work status of Food Stamp recipients, this data is generally low-quality and contains large numbers of missing observations. As a result, we decided to use the age proxy in the regression model.

[17]Income data in the administrative database is subject to change upon case recertification. However, the parameters of our query required that we pull data from the initial application.

Table 2: **Regression Modeling of Yearly Food Stamp Value, 2005-2009**

Variable	2005	2006	2007	2008	2009
Intercept	123.10	123.13	47.22	38.09	47.40
	(30.77)	(31.52)	(30.33)	(30.44)	(29.40)
Household Size	696.56	699.45	674.70	738.73	793.86
	(8.40)	(8.61)	(8.37)	(16.55)	(16.14)
Number of Children	105.80	121.01	161.36	93.62	169.11
	(7.77)	(8.02)	(7.91)	(13.60)	(13.13)
Elderly Case-Head	82.55	50.87	19.59	-22.24	-53.06
	(25.09)	(25.69)	(24.65)	(25.85)	(26.60)
Elderly or Disabled Person in Case	-144.13	-158.49	-54.41	-77.41	160.98
	(16.89)	(17.57)	(17.11)	(17.92)	(18.64)
Age of Household Head	5.57	7.33	7.98	8.84	9.09
	(0.66)	(0.68)	(0.66)	(0.69)	(0.69)
R^2	.513	.505	.488	.479	.496

Standard errors in parentheses. All coefficients significant at the $p < 0.001$ level.
Source: New York City Human Resources Administration.

Another issue we faced is that the ACS contains data on whether a household received Food Stamps for some period over the previous year but does not contain data on how many months the household participated in the program. This is, potentially, a source of unexplained variation, as households receiving Food Stamps for six months will have a lower yearly value than households receiving them for the full year, holding other factors constant. However, the variables included in the regression correlate with the months of receipt variable in the administrative data, particularly case size and number of children. As a result, a good deal of the variation from the months of receipt variable is captured in the regression model.

Table 3: **Correlations Between Regression Variables and Months on the Program, 2007**

	Pearson's R
Case Size	.610
Children	.599
Elderly Case-Head	-.130
Elderly/Disabled Member	-.091
Age of Case-Head	-.143

Source: New York City Human Resources Administration.
Notes: All Pearson's R coefficients significant at the $p < 0.001$ level.
N = 30,090

The regression model was then used to impute Food Stamp values through a predictive mean match (PMM), as described above.[18] In addition to matching based on predicted values, we added a constraint that required both the host and donor cases to be in the same Community District.[19] This additional match criterion was designed to capture neighborhood effects that were not explicitly in the model. These effects might include decreased stigma and increased knowledge about the program in communities with high participation rates, which may encourage participating families to maintain their enrollment. The ACS case was then given the actual Food Stamp value from the administrative case. Once an administrative case donated its value to an ACS case, it was removed from the donor pool.

The advantage of using PMM rather than simply using the estimated values is that PMM does a better job at preserving the actual distribution of Food Stamp values, as can be seen in Table Four. Regression estimates accurately capture the mean and aggregate values of the distribution but yield considerably less variation than is present in the donor data set. This is unsurprising, given the fact that regressions are designed to model means rather than full distributions. Figure One shows the full distributions for these data, displayed as a density plot.

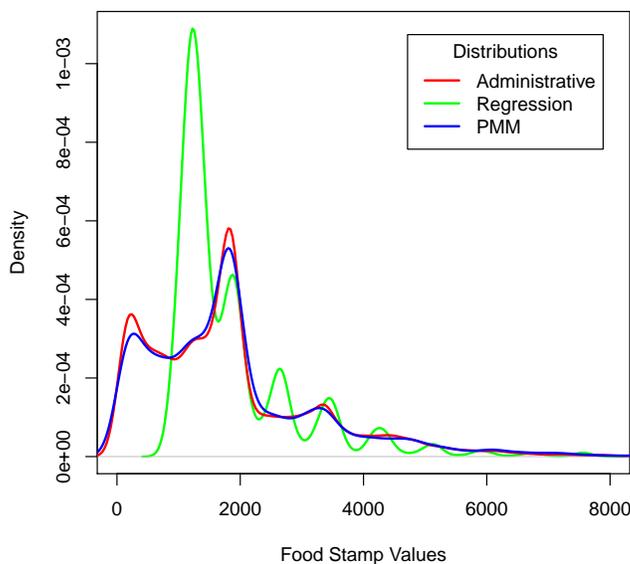[18]See O'Donnell and Beard 2009 for an application of this method in a similar context.
[19]The ACS's public use micro sample areas are constructed to match New York City's Community Districts.

Table 4: **Comparison of estimated and PMM Food Stamp Value Distributions, 2007**

	Regression	PMM	Administrative
Food Stamp Cases	698,675	698,675	804,433
Mean	$1,934	$1,893	$1,855
Median	$1,470	$1,696	$1,693
Standard Deviation	$1,116	$1,503	$1,511
Aggregate Value (in Thousands)	$1,267,734	$1,240,477	$1,391,875

Sources: 2007 American Community Survey Public Use Micro Sample as augmented by CEO, New York City Human Resources Administration.

Figure 1: Comparison of Distributions of Food Stamp Values

Participation

The ACS, like most surveys, suffers from underreporting of participation in the Food Stamp program.[20] Given the gap between the number of Food Stamp cases in the administrative data and the number of observations in the ACS reporting Food Stamp receipt, CEO decided to assign participation in the Food Stamp program to some of the apparently

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[20]Meyer, Bruce D. and James X. Sullivan. "Reporting Bias in Studies of the Food Stamp Program." Harris School Working Paper Series, 08.01.

eligible units that did not report receipt.

There are several possible reasons for not reporting receipt, including stigma and inattentiveness while filling out the survey. Meyer and George (2009) have attempted to model underreporting at the household level, using matched administrative and survey data for Illinois and Maryland.[21] While their results are intriguing, the authors note that the work is preliminary. Further, different variables in their analysis were correlated with false negatives across the two states, casting doubt on our ability to use their results for New York City. What is well-known is that Food Stamp participation is highly correlated with participation in other income support programs, such as Public Assistance (PA) and Supplemental Security Income (SSI). Analysis of administrative data shows that in 2007, roughly 80 percent of people on PA and SSI participated in the Food Stamp program. Given this high degree of participation, we assigned Food Stamp values to individuals who were eligible for Food Stamps and reported PA or SSI receipt, but did not report Food Stamp receipt.[22] Adding these cases increased the number of Food Stamp units from 625,394 to 698,675 in that year.

Table 5: **Comparison of Self-reported and Estimated Food Stamp Values, 2007**

	Cases		Individuals		Total Value	
	Thousands	CEO/Admin	Thousands	CEO/Admin	Thousands	CEO/Admin
ACS Households*	406	0.50	1,164	0.79	$879,185	0.63
Food Stamp Units**	625	0.78	1,164	0.79	$1,117,917	0.80
Food Stamp Units***	699	0.87	1,348	0.91	$1,240,477	0.89
Administrative	804	1.00	1,475	1.00	$1,391,875	1.00

Sources: 2007 American Community Survey Public Use Micro Sample as augmented by CEO, New York City Human Resources Administration, EDW.
*(Self Reported Participation and Values)
**(Self Reported Participation, Matched Values)
***(Self Reported plus Assigned Participation, Match Values)

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[21]Meyer, Bruce D. and Robert M. George. "The Analysis of Food Stamp Program Participation with Matched Administrative and Survey Data", prepared for the APPAM Meetings, November 5, 2009.

[22]"Eligible" is defined using the Food Stamp program rules, such as that the recipient be a citizen or legal resident for five years or more with a gross income less than 150 percent of the Official poverty line.

IIIB. New York City Food Stamp Trends

The CEO Food Stamp estimates of the trends in Food Stamp receipt and value from 2005 to 2009 are reported in Table Six. They come close to replicating the observed trends in the administrative data, but do not do so exactly. While the administrative data show a consistent upward trend over the five years, the CEO estimates show a decrease in cases and aggregate value from 2006 to 2007, which interrupts the pattern of increases. Additionally, the CEO estimates show a larger spike in the number of cases between 2007 and 2008 than the increase evident in the administrative data. This may be a result of the change in the question regarding Food Stamps in the 2008 ACS survey, described above.
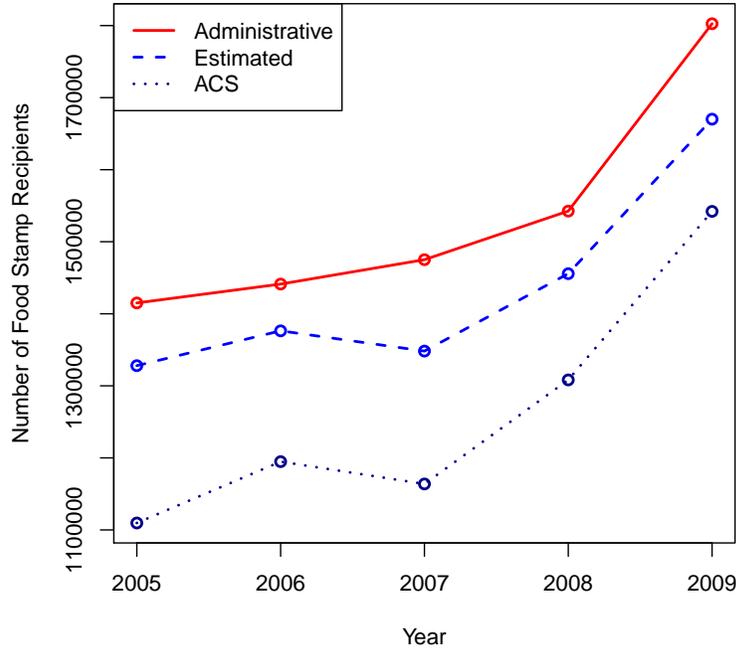
Table 6: **Comparison of CEO Estimates to Administrative Food Stamp Data, 2005-2009**

	Recipients		Aggregate Value		CEO/Admin	
	CEO	Admin	CEO	Admin	Recipients	Value
2005	1,328	1,415	$1,133,319	$1,256,974	93.8%	90.2%
2006	1,376	1,441	$1,259,358	$1,267,019	95.5%	99.4%
2007	1,348	1,475	$1,240,477	$1,391,875	91.4%	89.1%
2008	1,456	1,543	$1,379,449	$1,431,316	94.4%	96.4%
2009	1,670	1,803	$1,915,239	$1,864,967	92.7%	102.7%

Source: American Community Survey Public Use Micro Sample as augmented by CEO.
Note: Values reported in thousands at the Food Stamp Unit level.

Figure 2: New York City Food Stamp Recipients, 2005-2009

IV. The Impact of Food Stamps on the New York City Poverty Rate

IVA. Poverty Rate Estimates

Table Seven reports the poverty rates with and without the value of Food Stamp benefits from 2007 to 2009 for New York City. Where the difference between the poverty rates with and without Food Stamps is statistically significant, the former value is printed in bold.[23] In this study, we focus on the City as a whole, as well as two groups: two-parent families and single-parent families. These two groups provide an interesting contrast. Two-parent families typically have low poverty rates and low participation in the Food Stamp

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[23]See the Appendix for a discussion of the calculation of statistical significance.

program, but (as will be shown) they increased their participation over the course of the recent recession. Single-parent families, on the other hand, typically have high poverty and participation rates.

Table 7: **Impact of Food Stamps on the New York City Poverty Rate, 2007-2009**

	2007	2008	2009
Citywide			
Total CEO Income	**20.7**	**19.6**	**19.9**
CEO Income without Food Stamps	22.3	21.5	22.1
Impact of Food Stamps on Poverty Rate	-1.6	-2.0	-2.2
Persons Living in Families with Two Parents			
Total CEO Income	17.0	**14.6**	**14.0**
CEO Income without Food Stamps	17.9	16.4	16.3
Impact of Food Stamps on Poverty Rate	-1.0	-1.8	-2.2
Persons Living in Families with Single Parents			
Total CEO Income	**34.2**	**31.4**	**34.6**
CEO Income without Food Stamps	38.0	35.3	38.8
Impact of Food Stamps on Poverty Rate	-3.8	-3.9	-4.2

Source: Tabulated from American Community Survey Public Use Micro Sample as augmented by CEO.
Note: Bold indicates the difference between the poverty rates with and without Food Stamps is statistically significant.

The Citywide poverty rates reveal some interesting findings. In spite of the fact that the U.S. entered a recession at the end of 2007, the poverty rate in New York City declined between 2007 and 2008. This occurred because of the difference in timing of the onset of the recession in New York City versus the U.S. as a whole, and the Federal government's response to the national recession. New Yorkers were able to take advantage of tax initiatives such as the 2008 Recovery Rebate, even though the City's economy continued to expand in 2008. Further, in spite of the deep recession in 2009, the rise in the poverty rate between 2008 and 2009 was small and statistically insignificant. This stability in the poverty rate was primarily the result of policy at the Federal level, namely the 2009 American Recovery and Reinvestment Act. In Levitan et. al (2011), we estimate that without these policies, the 2009 New York City poverty rate would have been 22.6 percent instead of 19.9 percent.

Food Stamps have a large and statistically significant impact on the poverty rate in all three years, ranging from 1.6 to 2.2 percentage point reductions. The data suggest an increase in the effect of Food Stamps on the poverty rate over this period. This finding is consistent with our ACS estimates, which show an increase in Food Stamp caseloads and benefits in New York City over this period.

IVB. Poverty Among Single- and Two-Parent Families

Though the impact of Food Stamps grew for all groups over the 2007-2009 period, analysis of various sub-groups within the City reveals considerable heterogeneity in the impact of Food Stamps on the poverty rate. For example, Food Stamps play a larger role in families with children headed by single parents than for two-parent households.[24]

As Table Seven shows, for persons living in families with single parents—a target group for anti-poverty policies—Food Stamps yield a statistically significant reduction in the poverty rate in all three years. In contrast, for persons living in families with two parents, Food Stamps only reduced the poverty rate by a statistically significant amount in 2008 and 2009.

It is not surprising that Food Stamps would play a larger role for single-parent families than two-parent families. Single-parent families are nearly all either single-earner families or have no earned income. Further, eligible single-parent families are much more likely to participate in the Food Stamp program, as is shown in Table Eight. What is interesting is that Food Stamps played a statistically significant role in reducing the poverty rate for persons living in two-parent families in 2008 and 2009, but not for 2007.

One possible reason for this difference has to do with participation in the Food Stamp program. We computed Food Stamp participation rates for two-parent and single-parent families. The participation rate for a given group is simply the number of individuals receiving Food Stamps divided by the number of eligible individuals. Following Isaacs et. al

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[24]In contrast to the official poverty measure, we group unmarried partner families in the category of two-parent families.

$(2011)^{25}$, we define "eligible" as either: (1) reporting receipt; or (2) living in a family with an income less than or equal to 150 percent of the income threshold set by the Food Stamp program. We use the 150 percent income eligibility standard to adjust for the fact that some families in the ACS may have been eligible for certain months out of the year, but had a yearly income above the 130 percent threshold set by the Food Stamp program rules.

Table 8: **Percent Change in Food Stamp Cases and Benefits**

| | Single-Parent Families | | |
	Number of Cases	Median Benefit	Participation Rate
2007	147,461	$2,934	57.2%
2008	148,997	$3,001	58.6%
2009	158,964	$3,582	64.7%
Percent Change			
2007-08	1.0%	2.3%	2.4%
2008-09	6.7%	19.4%	10.4%
2007-09	7.8%	22.1%	13.1%

| | Two-Parent Families | | |
	Number of Cases	Median Benefit	Participation Rate
2007	68,077	$3,860	36.0%
2008	78,828	$4,030	40.6%
2009	101,318	$5,141	43.1%
Percent Change			
2007-08	15.8%	4.4%	12.8%
2008-09	28.5%	27.6%	6.2%
2007-09	48.8%	33.2%	19.7%

Source: American Community Survey Public Use Micro Sample as augmented by CEO.

From data in Table Six, we estimate that, Citywide, the number of families participating in the Food Stamp program grew by 10.7 percent from 2007 to 2008 and 13.2 percent from 2008 to 2009. Although there are many more Food Stamp cases composed of single-parent families than two-parent families, the growth rate in participation was much more rapid for

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[25]Isaacs, Julia, Joanna Y. Marks, Timothy M. Smeeding, and Katherine A. Thornton. "Wisconsin Poverty Report: Were Anti-Poverty Policies Effective in 2009?" Institute for Research on Poverty, University of Wisconsin-Madison, May 2011.

two-parent families than single-parent families. The number of two-parent families partici-pating in the Food Stamp program grew 19.7 percent from 2007 to 2009. The corresponding figure for single-parent families is 13.1 percent. Increases in median benefit levels are not so dissimilar, but again, the growth rate for two-parent families, 4.4 percent in 2007 to 2008 and 27.6 percent in 2008 to 2009, outpaced that of single-parent families, 2.3 percent and 19.4 percent, respectively. (The large increase in the median benefit for both family types reflects not only the legislated rise in the maximum benefit, but the increased number of months per year that families were receiving Food Stamp benefits in 2009 compared to the prior year. This is particularly true for two-parent families).

IVC. Foster, Greer, Thorbecke Poverty Indices

The poverty rate is a one-number summary measure. It simply tells us what fraction of the population lives below the poverty threshold. Because it is based on a binary classification—people are either poor or not poor—the rate makes no distinction between the poor who live far below the poverty line and those who live just under it. By the same token, the poverty rate does not indicate whether a relatively large share of the non-poor live just above the line or far beyond it. These can be important distinctions. The distance between people just below and those just above the poverty line may only be a few dollars, while the distance between the poorest of the poor and those just below the poverty threshold can be $20,000 or more.

In order to gain a richer understanding of the effect of the Food Stamp program on poverty in New York City, we employ the Foster, Greer, Thorbecke Poverty Index (FGT).[26] The FGT poverty measures derive from a general formula:

$$P_\alpha = \frac{1}{N} \sum_{i=1}^{q} (\frac{z_i - y_i}{z_i})^\alpha$$

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[26]Foster, James, Joel Greer and Erik Thorbecke. "A Class of Decomposable Poverty Measures." *Econometrica*, Vol. 52, No. 3 (May, 1984).

where z_i and y_i represent the poverty threshold and income, respectively, for individual i. Only individuals whose income falls below the threshold are summed in the FGT formula, and the summation is divided by N, the total population.

The coefficient α is a scaling factor, which can be used to produce different poverty measures. For $\alpha = 0$, the value $(z_i - y_i)/z_i$ collapses to one, and the formula yields the number of poor divided by the population, or the Headcount Index (HCI). For $\alpha = 1$, the FGT formula yields the Poverty Gap Index (PGI), a measure of how far the poor fall below the poverty threshold. This is the minimum cost of bringing the poor out of poverty, as a percentage of the threshold, over the total population.

The HCI and PGI measures implicitly place equal weight on all poor individuals, regardless of how far below the threshold they fall. By the logic of these measures, a dollar given to someone just below the threshold is as useful as a dollar given to someone who is desperately poor. Thus we also report a third measure, the Squared Poverty Gap (SPG), which sets $\alpha = 2$. By squaring the distances between income and the threshold, this measure puts additional weight on individuals whose income falls further below the threshold, emphasizing the severity of poverty.

Table Nine reports the FGT poverty index measures for New York City covering the period of 2007-2009. As with the poverty rate, we tested these measures for statistical significance against a null hypothesis of a poverty measure that does not include Food Stamps in its construction. The Food Stamp program generated a statistically significant reduction in the Citywide HCI and PGI in all three years. This was not the case for the SPG, for which only 2007 and 2009 saw statistically significant reductions.

For persons living in two-parent families, Food Stamps have a statistically significant impact on the HCI in 2008 and 2009, but not on the other two measures. Conversely, for persons living in single-parent families, Food Stamps have a statistically significant impact on all three measures in all years. The difference between these groups is likely driven by the participation gap among different groups of eligible families. While the participation rate

Table 9: **Foster, Greer, Thorbecke Poverty Indices, 2007-2009**

	2007	2008	2009
Citywide			
FGT0: Head Count Index	**20.7**	**19.6**	**19.9**
FGT1: Poverty Gap Index	**7.2**	**7.2**	**7.0**
FGT2: Squared Poverty Gap	**4.2**	4.7	**4.4**
Persons Living in Families with Two Parents			
FGT0: Head Count Index	17.0	**14.6**	**14.0**
FGT1: Poverty Gap Index	4.8	4.0	3.9
FGT2: Squared Poverty Gap	2.2	1.9	1.9
Persons Living in Families with Single Parents			
FGT0: Head Count Index	**34.2**	**31.4**	**34.6**
FGT1: Poverty Gap Index	**11.4**	**11.1**	**11.0**
FGT2: Squared Poverty Gap	**5.9**	**6.3**	**5.7**

Source: American Community Survey Public Use Micro Sample as augmented by CEO.
Note: Bold indicates difference between poverty indices with and without Food Stamps is statistically significant.

for eligible two-parent families grew faster than for single-parent families from 2008 to 2009, the participation gap between single- and two-parent families was still more than twenty percentage points (64.7 percent versus 43.1 percent) in 2009. This suggests that outreach campaigns should target eligible two-parent families, as a large number of eligible families in this group do not participate.

IVD. Degrees of Poverty

We supplemented the analysis of FGT indices with a breakdown of the population by degrees of poverty. Unlike the FGT indices, this analysis allows us to understand the impact of Food Stamps on individuals above, as well as below, the CEO poverty threshold. We report the degrees of poverty with and without Food Stamps for the City as a whole for 2009.[27] Table Ten shows that Food Stamps add income to families living well above the poverty threshold.

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[27]The data for 2007 and 2008 are quite similar and there is no meaningful difference in the pattern across the years.

For example, while Food Stamps reduce the proportion of the population under 50 percent of the threshold by 1.0 percentage points, it reduces the proportion of the population under 125 and 150 percent of the threshold by 2.2 and 1.5 percentage points, respectively. The effect phases out near 200 percent of the threshold.

Table 10: **Distribution of Population by Degrees of Poverty, 2009**

Percent of Threshold	Total Income	Income without FS	Percentage Point Difference
<50	4.9	5.9	1.0
<75	10.3	12.6	2.3
<100	19.9	22.1	2.2
<125	31.2	33.4	2.2
<150	42.1	43.6	1.5
<175	51.2	52.2	1.0
<200	59.0	59.5	0.5

Sources: American Community Survey Public Use Micro Sample as augmented by CEO.

The FGT indices and Degrees of Poverty table show that, within the context of CEO's measure, Food Stamps can impact the poverty rate more than the severity of poverty. We see this most clearly for two-parent families, as is shown in Table Nine. The rather small effect on extreme poverty runs counter to other empirical work and to the basic structure of the program. Since Food Stamp benefits decrease as income increases, they should, all else equal, raise the resources of lower-income individuals more than higher-income individuals. In order to explain this anomalous finding, we computed the participation rate for these income groups for the years 2007-2009. We found that the poorest group, those whose income was less than 50 percent of CEO's threshold, had the lowest participation rate in all three years. There is also a weak tendency for participation rates to increase with rising income.[28]

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[28]If we consider the population groups by percentages of the official threshold, on the other hand, we do not see this pattern; Food Stamp participation rates using that measure are slightly higher for those under 50 percent of the official threshold. We do not report the table of participation rates by percent of the official threshold. Data is available from the authors upon request.

Table 11: **Participation Rates by Degrees of Poverty, 2007-2009**

Percent of Threshold	2007	2008	2009
< 50	31.5%	31.3%	34.2%
50-74	45.1%	44.2%	46.0%
75-99	40.4%	45.6%	49.2%
100-124	45.7%	49.5%	49.9%
125-149	49.7%	50.4%	59.6%
150-174	47.3%	49.4%	56.1%
175-199	42.5%	45.4%	51.9%

Sources: American Community Survey Public Use Micro Sample as augmented by CEO.

This finding highlights important differences between the official measure and poverty measures based on the NAS recommendations. Since we count Food Stamps as income, the causality between participation and income is bidirectional; Food Stamps are both a cause and effect of income levels. The differences in participation rates help explain why Food Stamps reduced the poverty rate more than the severity of poverty, as individuals closer to the threshold (both below and above) were more likely to avail themselves of the benefits. This suggests that more can be done to reach out to the very poor (particularly those in two-parent families) and ensure that they receive Food Stamp benefits.

V. Modeling Policy Effects

As noted above, participation in the Food Stamp program in New York City increased between 2007 and 2009, which bolstered the effect of the program on the poverty rate. Our estimates for the ACS indicate that from 2007 to 2008, the Food Stamp caseload grew by 10.7 percent and rose another 13.2 percent from 2008 to 2009. Median benefits per case increased modestly from 2007 to 2008, 3.4 percent, but, reflecting the 13.6 percent increase that became effective in April 2009, jumped up by 10.7 percent from 2008 to 2009. The aggregate value of Food Stamp benefits, the sum of benefits to City residents, rose by 11.2 percent from 2007 to 2008 and leapt by 38.8 percent from 2008 to 2009.

The Food Stamp program's growing impact on poverty in New York City is the result of three factors, two of which were recent, deliberate policy decisions: (1) an outreach initiative in New York City aimed at increasing participation among eligible households; (2) the 13.6 percent increase in Food Stamp benefit amount in the 2009 American Recovery and Reinvestment Act (ARRA); and (3) an increase in demand for Food Stamps in response to the recession. In order to understand the impact of Food Stamp policy changes on the poverty rate, independent of the growth in demand from the recession, we needed to parse these different factors. We did this by creating two counterfactual simulations to go along with the observed ACS data.

First, we looked at the impact of the 13.6 percent increase in benefit levels in 2009. In order to generate this simulation, we re-analyzed the 2009 ACS data using administrative data from 2008, which was then inflated by 1.5 percent to reflect the normal yearly increase in Food Stamp benefits that went into effect in October 2008.[29] This data represents a counterfactual for 2009 benefits without the increase in the stimulus package. Using the adjusted 2008 administrative data decreases the mean Food Stamp benefit in 2009 from $2,279 to $1,945.

Second, we looked at the role of local policy in expanding Food Stamp participation, independent of the impact of the recession. In order to assess the role of local policy, we decomposed the growth in Food Stamp cases into two components: increased demand resulting from the recession and increased "supply" from the local outreach campaign. We did so by compiling data on monthly Food Stamp caseloads and monthly payroll employment for New York City from June 1999 to December 2009. Using this data, we developed a time-series regression model that estimates the relationship between Food Stamp caseloads and labor market conditions.

To address potential increased demand for Food Stamp associated with the benefit in-

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[29]Maximum Food Stamp benefit levels are derived from the U.S.D.A. "Thrifty Food Plan." This food budget is calculated using a market basket of prices for food items, based on the CPI food price index. Between 2008 and 2009, the CPI food price index increased modestly, resulting in this small increase in the Food Stamp benefit level.

crease, we included a dummy variable for April through December 2009. We used a second dummy variable to proxy for the local outreach campaign. This dummy variable accounts for the relaxation of the asset test on Food Stamp applications, initiated in November 2008, representing a heightened emphasis in New York on increasing participation in the program. We estimated the following regression model:

$$\Delta FS_t = \Delta FS_{t-1} + \Delta FS_{t-2} + \Delta EMP_{t-1} + Stim_t + Asset_t + \epsilon_t$$

where the variables ΔFS_t and ΔEMP_t are the first difference of the log of the Food Stamp caseload and New York City payroll employment, respectively. "Stim" is the dummy variable for the benefit increase in the ARRA and "Asset" is the dummy variable for the relaxation of the Food Stamp asset test. The results of the regression are shown in Table Twelve.

Table 12: **Regression Modeling of Food Stamp Caseload and Employment**

Variable	Estimate
Intercept	0.002
	(0.001)
FS_{t-1}	0.305
	(0.089)
FS_{t-2}	0.256
	(0.090)
EMP_{t-1}	-0.302
	(0.264)
Stim	0.001
	(0.005)
Asset	0.004
	(0.005)
R^2	.295

Source: New York City Human Resources Administration.
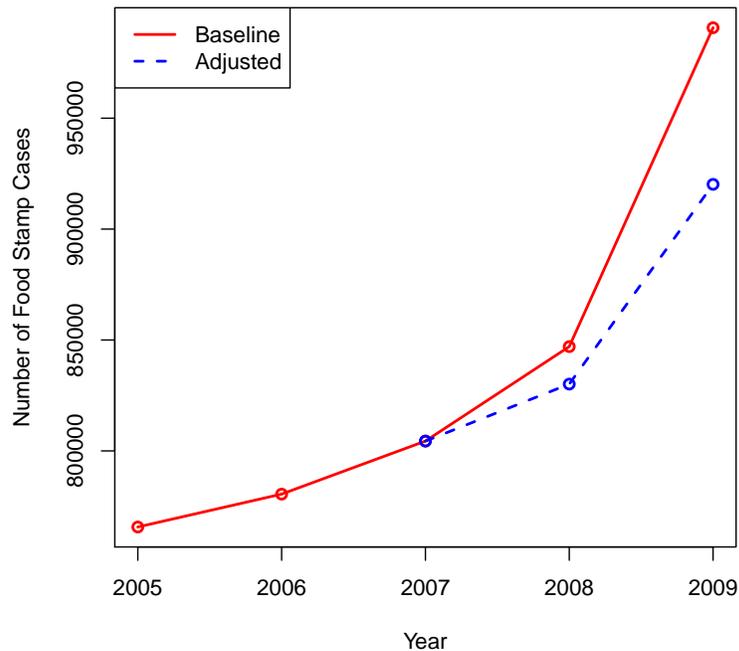Notes: Standard errors in parentheses.
Data covers the period 1999-2009.
The dependent variable is the change in Food Stamp caseload.

Using this model, we constructed predicted values for ΔFS_t, the growth rate of Food Stamp caseloads, based on the lagged value of the growth in payroll employment and keeping

the other factors constant. This data represents a counterfactual series that approximates the growth of caseloads based solely on the employment situation in New York City, absent the outreach effort and increase in benefit level. This alternative scenario yields caseloads two percent lower than the observed data in 2008 and seven percent lower in 2009.

Figure 3: Estimated New York City Food Stamp Cases, 2005-2009

The new policies had essentially no impact on the poverty rate in 2008, as is shown in Table Thirteen. This is because the benefit increase did not occur until April 2009 and because the increase in participation attributable to the outreach campaign was still small. However, these policies had a more noticeable impact on the poverty rate in 2009. As was already reported in Table Seven, we find that Food Stamps reduced the poverty rate in 2009 by 2.2 percentage points. Without the benefit increase associated with the stimulus, the impact of Food Stamps drops to 2.0 percentage points. Without the benefit increase or the local outreach effort, the impact drops to 1.9 percentage points. Further, while the

CEO poverty rate rises from 19.6 in 2008 to 19.9 in 2009, it would have risen to 20.2 in 2009 without the impact of the benefit increase and outreach efforts.[30] In spite of these policy initiatives, Food Stamps were hardly more effective at reducing poverty in 2009 than in 2008.

Table 13: **Impact of Food Stamp Policy on the New York City Poverty Rate, 2009**

Poverty Rates

	2008	2009
CEO Income without Food Stamps	21.5	22.1
Total CEO Income	19.6	19.9
Total CEO Income, No Benefit Increase	NA	20.1
Total CEO Income, No Benefit Increase or Outreach	19.6	20.2

Difference from No Food Stamps Poverty Rate

	2008	2009
Total CEO Income	-2.0	-2.2
Total CEO Income, No Benefit Increase	NA	-2.0
Total CEO Income, No Benefit Increase or Outreach	-2.0	-1.9

Source: Tabulated from American Community Survey Public Use Micro Sample as augmented by CEO.
Note: The increase in the Food Stamp benefit levels in the ARRA went into effect April 2009.

Table Fourteen shows the FGT indices for 2009 and the counterfactual scenario without the increase in Food Stamp benefits or the outreach campaign. For the City as a whole, the HCI and PGI are statistically significant for both the observed data and the counterfactual. However, the Food Stamp policy effect on the SPG is only significant in the "With Policy" estimate. This suggests that the combined efforts of the two policies helped reduce severe poverty relative to the counterfactual. For persons living in single- and two-parent families, there was no difference in the statistical significance of any of the poverty indices across the observed and counterfactual scenarios.

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[30]Neither difference in poverty rates between 2008 and 2009 is statistically significant. Since Food Stamp benefits are merely one component of CEO Income, their impact can be overwhelmed by other factors in determining year-over-year changes.

Table 14: **Foster, Greer, Thorbecke Poverty Indices, With and Without Policy, 2009**

	With Policy	Without Policy
Citywide		
FGT0: Head Count Index	**19.9**	**20.2**
FGT1: Poverty Gap Index	**7.0**	**7.2**
FGT2: Squared Poverty Gap	**4.4**	4.6
Persons Living in Families with Two Parents		
FGT0: Head Count Index	**14.0**	**14.4**
FGT1: Poverty Gap Index	3.9	4.1
FGT2: Squared Poverty Gap	1.9	2.1
Persons Living in Families with Single Parents		
FGT0: Head Count Index	**34.6**	**35.1**
FGT1: Poverty Gap Index	**11.0**	**11.4**
FGT2: Squared Poverty Gap	**5.7**	**6.0**

Source: 2009 American Community Survey Public Use Micro Sample as augmented by CEO.

Note: Bold indicates difference between poverty indices with and without Food Stamps is statistically significant.

VI. Conclusion

The goal of this study was to analyze the impact of Food Stamps on the poverty rate in New York City. This was done by estimating the value of Food Stamp benefits within the framework of CEO's poverty measure. We analyzed the impact of Food Stamps on three measures of poverty: the poverty Headcount Index, the Poverty Gap Index and the Squared Poverty Gap. We constructed two counterfactual scenarios in order to parse the role of policy measures undertaken to expand the participation rate and benefit levels in the Food Stamp program in 2008 and 2009.

Our analysis demonstrates two points. First, a more inclusive measure of resources allows researchers to understand much more of what public policy does to support a family's capacity to meet its basic needs. Measuring these resources is particularly important in recent years, given the expanded role of anti-poverty policy in response to the recession in 2008-2009. Second, we have shown that Food Stamps are an important component of anti-

poverty policy. Food Stamps reduced the Citywide poverty rate and poverty gap in all years from 2007-2009, though the impact on the severity of poverty is less pronounced. This is an argument for maintaining the program's relative flexibility, bolstering its level of benefits and continuing work to increase the participation rate among eligible individuals.

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Appendix: Calculation of Standard Errors

The principal data set for our poverty estimates is the American Community Survey (ACS) Public Use Micro Sample (PUMS). The ACS is designed to sample one percent of the households in the U.S. each year. The PUMS is a subset of the full ACS sample. It provides information collected from roughly 25,000 households in New York City annually. Because the ACS is a survey, it is subject to two types of error: non-sampling error and sampling error.

Non-sampling Error: Non-sampling error is the error within survey data that is not specifically associated with the statistical sampling procedures of the sample data. Non-sampling error can occur because of erroneous responses by survey respondents, for example. Another source of non-sampling error can come from mistakes in the processing of the data by the Census Bureau, such as when data are edited or recoded. Non-sampling errors can affect the data in two ways; either randomly, which increases the variability of the data, or systematically, which introduces bias into the results. To minimize bias in the survey, the Census Bureau conducts extensive research of sampling techniques, questionnaire design, and data collection and processing procedures. For instance, after identifying a systematic underreporting of Food Stamp receipt and benefit dollar values in the ACS, the Census Bureau researched methods to increase the reported participation rate. The Census Bureau concluded, through this research, that changing the wording of the Food Stamp question to include "Food Stamp benefit card", as well as not asking about the Food Stamp benefit value, would significantly increase the number of households responding that they received Food Stamps.[31]

Sampling Error: Sampling error occurs in the ACS, as in other sample survey data, because inferences about the full population (such as the poverty rate for New York City) are derived from a subset of it (the poverty rate for the ACS sample). Another sample,

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[31]John Hisnanick, T. Loveless, and J. Chesnut. U.S. Bureau of the Census: 2006 American Community Survey Content Test Report H.6 - Evaluation Report Covering Receipt of Food Stamps. January 3, 2007 `http://www.census.gov/acs/www/AdvMeth/content_test/H6_Food_Stamps.pdf`.

drawn from the same population would provide a different estimate of the poverty rate. The sampling error is estimated by the standard error, which can be thought of as a measure of the deviation of an estimate drawn from one sample from the average estimate of all possible samples. For this study, we employed the replicate weight method recommended by the Census Bureau to compute direct standard errors for our estimated poverty rates. The standard errors provide a measure of sampling error and some types of non-sampling error.[32] Using the standard errors, we tested the statistical significance of differences and changes in the report's poverty rates at the 10 percent level of significance. In the report's tables, we highlight, in bold, statistically significant differences between poverty rates.

An additional source of error in the data results from our need to impute information on items such as the value of Food Stamp benefits, housing status, childcare expenditures, and medical out-of-pocket expenditures from other survey data into the ACS sample. We do not, however, account for the imputation error in this report.

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[32]U.S. Bureau of the Census. 2009. PUMS Accuracy of the Data (2008). Available at `http://www.census.gov/acs/www/Downloads/2008/AccuracyPUMS.pdf`.