The Child and Adult Care Food Program and Food Insecurity

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I. INTRODUCTION

High rates of food insecurity are a significant problem in the United States. It is currently estimated that almost 49 million people live in food insecure households, meaning that at some time during the previous year, they were unable to acquire or were uncertain of having enough food to meet basic needs due to inadequate household resources (Coleman-Jensen, Nord, and Singh, 2013). Rates of food insecurity are substantially higher among those in households with incomes below the poverty line (40.9 percent) and in households with children headed by a single woman (35.4 percent). Levels of food insecurity increased across U.S. households in 2008 as a result of the "Great Recession" rising from around 11 percent in the 2005-2006 time period to the measured high of approximately 14.5 in 2008, where it remains essentially unchanged as of the 2012 estimate.

From a developmental perspective, it is believed that food insecurity has cumulative effects at different stages of development beginning in the prenatal period (Bhattacharya, Currie, and Haider 2004; Cook and Frank, 2008; Duncan, Brooks-Gunn and Klebanov, 1994; Pollit, 1994; Morgane et al., 1993; Scholl and Johnson, 2000). During infancy, hunger has negative effects during the period of neurodevelopment. Controlled experiments with animals suggest that hunger results in irreversible damage to brain development such as that associated with the insulation of neural fibers (Yaqub, 2002). The damage associated with a lack of nutritional intake accumulated during the first 2 years of life includes susceptibility to infections, slowed cognitive development and physical growth, susceptibility to chronic diseases, and a higher risk of delivering low-birth weight babies. Other non-health related problems include reduced school performance, increased school dropout and reduced productivity during adulthood (Hoddinott, et. al, 2008).

Prior literature has largely neglected the contributions of the Child and Adult Care Food Program (CACFP) to household food security. There are two studies that evaluate the impact of participation in CACFP on child and household food security and these find no effect (Gordon et al. 2010; Korenman et al. 2012). This is surprising given the impact that nutritional inadequacy can exert on early developmental processes. In what follows, we explain the CACFP program in detail and review prior research examining CACFP participation. Then we describe our data and methods for each of our research questions. Using data from the Early Childhood Longitudinal Study Birth Cohort we examine the association between CACFP provider participation and food security status. After presenting our findings, we discuss their limitations and implications for state-level participation in the CACFP program.

II. The Child and Adult Care Food Program (CACFP)

Program Information: The Child and Adult Care Food Program (CACFP) provides cash reimbursement to home-based child care programs, child care centers, homeless shelters, and after-school programs for meals and snacks served to children. While adults and school-aged children are eligible, the large majority of funding through this program is directed towards younger children. In 2012, 3.4 million children received meals and snacks in an average day (versus 112,000 adults). Except in special circumstances, children older than age 12 are not eligible to participate. Overall, participation is on the level of the Summer Food Service Program, and is dwarfed by participation in the National School Lunch Program, which had 31.7 million participants in 2010 (USDA 2012).

Figure 1 shows the number of meals served in child care centers and home-based child care programs. From 1969 to 1976 meals were served only in centers and the number of meals served in centers increased sharply across the time period. However, after meals in homes were introduced the number of meals served in homes increased more rapidly than the number served

in centers, and in 1990 home meals surpassed center meals. In 1997 the number of meals served in homes was surpassed by meals served in centers again. Since then, the number of meals served in centers has continued to grow while the number of meals served in homes has steadily decreased (USDA 2012). Unlike other counter-cyclical nutrition programs such as SNAP, CACFP participation has increased steadily over time due to program expansion even when the economy has been strong (Hanson and Oliveira 2012). In fiscal year 2010, 3.3 million children participated across 52,000 child care centers and 137,000 home-based child care programs (FRAC 2012).

Participation in CACFP is open to most child care providers and all children, but reimbursement rates vary depending on the type and auspice of care (e.g., center versus home, if licensed and for-profit), the income level of the neighborhood and household income of the children. In child care centers, a reimbursement scheme parallel to that of the National School Lunch Program is used wherein meals and snacks served are reimbursed at three payment levels tied to the family income of the children (sometimes termed *free, reduced price, and full price*).[1] For home-based child care providers, there are two levels of reimbursement that are determined by a mix of neighborhood, provider and family income. For the purposes of CACFP participation, children are eligible if they reside in households with income below 185 percent of the federal poverty line or if they are part of a household that receives SNAP or TANF.

CACFP Studies: Previous research on CACFP has focused on modeling participation in CACFP at the provider level (Kapur, Kilburn and Fair 1999) and child level (Gordon et al 2010). Participation is more likely among poor children who reside in low-income areas than among poor children in wealthier areas, as well as among children from low income households who

[1] Current per child per day reimbursement rates for center in FY2013 for breakfast, lunch or supper and one snack are $.63 for non-qualifying children, $4.21 for children that qualify for reduced price and 5.31 for children that qualify for free meals (USDA 2013).

spend more time in child care. Providers are more likely to participate if they have larger enrollments, are licensed, accredited, and not-for-profit; Head Start programs and participants are categorically eligible to participate in CACFP (Gordon et al 2010). Significant variation in participation among eligible providers also exists by state (Kapur, Kilburn and Fair 1999). Recent efforts have focused on identifying the barriers to serving healthy foods in CACFP-participating child care settings (Institute of Medicine 2012; Institute of Medicine 2011).

Korenman and colleagues (2012) and Gordon and colleagues (2010) explored the child nutrition correlates of participation in CACFP under the expectation that CACFP participation should be associated with declines in food insufficiency and greater consumption of healthy foods. Among a sample of low-income 4- year olds enrolled at non-Head Start child care centers, Gordon et al. found that CACFP participation is associated with greater in-take of milk, vegetables, and fruit and a lower incidence of underweight. No association was reported between CACFP participation and child overweight or food security status at the child or household level. A significant limitation of this study is that the models estimated do not control for the non-random selection process into a CACFP participating child care center. Given that this study identified a number of individual and provider level factors that differ systematically between CACFP participants and non-participants, this is a noteworthy omission that biases their findings. Additionally, Gordon et al. (2010) examined CACFP participation only among low-income children who attend child care centers: however, many participants access CACFP through home-based child care and Head Start. Additionally, because CACFP is a direct subsidy to programs, the benefits are likely spread throughout the enrollment of children and families, regardless of the income level of the children. Thus, meal reimbursements and nutritional guidelines for CACFP reimbursed meals may benefit all children enrolled at the center and not just low-income children.

Korenman et al. (2012) address some of these limitations by extending their analysis to include children in both Head Start and non-Head Start center care. However, Korenman et al. continue to exclude from their analysis children in home-based child care programs that are also eligible to participate in CACFP. More importantly though, Korenman et al., use a non-standard definition of food insecurity in which households who endorse *any* of the eighteen items in the Food Security Module are considered to be food insecure, instead of the standard cut-off of three endorsed items. As a consequence, Korenman et al.'s findings are not comparable to others in the literature. Additionally, the authors attempt to deal with the selection bias into CACFP participation by using a technique, inverse propensity weighting, which only controls for selection on observable characteristics, leaving the bias from selection on unobservable characteristics present in their results. We address these limitations in the current study by extending our analysis of the effects of provider participation in CACFP on the full sample of children participating in center-based, Head Start and home-based child care programs, using the standard measures of food insecurity and by using instrumental variable models which control for selection bias on both observable and unobservable factors related to CACFP participation.

Relevant non-CACFP studies: While studies of the relationship between CACFP participation and child outcomes are scarce, evaluations of WIC and the Food Stamp program provide some guidance as all three programs are designed to improve access to nutritious food and must address the methodological issue of selection bias into program participation. That is, households that choose to participate in programs that offer nutritional benefits are often different from similarly eligible households that choose not to participate and these differences are often unobservable when using survey datasets. Using a variety of methodological techniques to address selection bias, several studies have demonstrated that WIC recipients benefit from participation across a range of outcomes beginning with pregnancy and birth outcomes,

improved iron status among preschoolers, lowered prevalence of iron-deficiency anemia among young children, and reduced levels of household food insecurity and food insecurity with hunger (Cook and Frank, 2006; Lee, Mackey-Bilaver and Chin, 2006; Kennedy, et al. 1982; Bitler and Currie 2005; Bitler et al., 2005; Metallinos-Katsaras et al. 2010).

Several studies have examined the relationship between food insecurity and participation in the Food Stamp program. A rigorous study that controlled for endogeneity of food stamp program participation with an instrumental variable approach found that participation in the Food Stamp program reduced the severity of food insecurity (Yen et al., 2008). Similarly, using logistic regression, Cook and coauthors (2006) reported that receipt of food stamps reduced negative child health consequences among food insecure families, including hospitalization, and led to a 25 percent reduction in the likelihood of household food insecurity. However, issues with selection bias into food stamp receipt and measurement error in reports of program participation have created identification problems in evaluating the treatment effect of food stamps (Gundersen, Joliffe and Tiehan 2009; Gundersen and Kreider 2007; Gibson and Foster 2006; Gundersen, Kreider, and Pepper 2011).

Drawing upon the prior research indicating positive impacts of participation in WIC and the Food Stamp program, we explore the contribution of the CACFP program to household food security status. We use instrumental variable methods to address issues of selection into a CACFP-participating child care program, including child care centers, Head Start, and home-based child care programs. More specifically, we estimate the direct effect of provider participation in the CACFP program on household food security status for families from all income levels.

III. DATA AND METHODS

Our data come from the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B). The ECLS-B includes a nationally representative sample of children born in 2001 and utilizes a multi-reporter, multi-method design to gather extensive information about children's home and educational experiences, including child care, from birth through kindergarten entry. About 10,700 parents and children participated at study initiation (i.e., child age 9-months); subsequent data collections occurred when children where approximately 24-months-old, 4-years-old, and at kindergarten entry. The ECLS-B contains a wealth of information including the core food security module, parent(s)' demographic background, family utilization of federal assistance (including SNAP and WIC), household income and composition, and detailed parent and provider reports concerning the study child's child care arrangements (including child care program reports of CACFP participation). Our analysis focuses on the sample of 4-year-olds who attend child care (n=4250). The ECLS-B uses a stratified cluster sample that consists of 90 strata with two clusters in each stratum. To account for the possibility of any nesting of children, three degrees of weighting were used in our analysis: base (design) weights, population-sampling unit weights (PSUs), and post-stratification weights (strata)[2].

Little is known about the role of the Child and Adult Care Food Program in the household food security status of families with children of preschool age, in part because of difficulty identifying participating providers. Unlike most food and nutrition programs, parents often do not know if their provider is participating in CACFP, making parental reports unreliable. A distinct strength of the ECLS-B is that CACFP participation data were gathered from child care program directors and home-based child care providers, thus reducing the type of

[2] The statistical software that we used for our analysis was STATA. We used the command 'svy' to make adjustments to standard errors associated with complex survey data. We also followed the National Center for Education Statistics guidelines when selecting and applying the sample weight variables that represent the strata, the clusters, the wave of data collection, and the respondent(s) (Nord, et. al, 2006).

measurement error one might expect from parental reports of CACFP participation (Gundersen and Kreider 2009).

One way to assess the relative importance of CACFP participation on household food security status during the preschool years is to estimate the following probit model:

(1) $$Y_i = \alpha_{0i} + C_i\alpha_1 + X_i\alpha_2 + \varepsilon_i$$

Where Y_i indicates a measure of food security for household *i*, C_i identifies participation on CACFP for the child care provider for household *i*, α_1 is a vector of estimated coefficients associated with C, X_i includes demographic, household composition, labor force participation and other characteristics that prior literature has indicated are associated with food security status, α_2 is a vector of estimated coefficients associated with X, and ε is a normally distributed error term with constant variance and mean of 0.

However, a potential problem with the model shown in (1) is that differences in the population of children who attend child care programs that participate in CACFP are likely to be different from children who do not attend CACFP participating care arrangements, because children were not randomly assigned to a CACFP care provider or not. This is known in the literature as the selection bias problem. This means that our probit estimates from equation 1 are likely to be biased because CACFP may be correlated with unobserved parental tolerance regarding their household's food insecurity. Although parental knowledge of the CACFP program is likely limited, parents' child care decisions are likely influenced by whether the program provides nutritious meals and snacks. Thus, we suspect that there are unobserved factors that influence parents' child care choices and that these factors may be correlated with the maximization process that parents pursue regarding their household food supply. To address this issue, we use an instrument with two properties: (1) our instrument predicts CACFP

participation but (2) our instrument does not affect food insecurity except through its influence on CACFP.[3]

The first property is known in the literature as the exogeneity condition and it is easily tested using an F-statistic on the excluded instrument on the first stage. The second property is known as the exclusion restriction and there is no direct way to test it. However, factors that are external to the household, such as program access, are good candidates (Angrist and Pischke, 2009; Wooldridge, 2011; Angrist and Krueger, 2001). Therefore, similar to Ravallion and Wodon (2000) and Schultz (1999), we use CACFP provider availability as a determinant of CACFP participation at the household level under the assumption that CACFP program availability does not influence household food insecurity conditional on household participation. To measure the relative availability of CACFP providers at the state level, we calculate the ratio of the total number of CACFP participants divided by the total number of children in poverty under age 5 by state for 2009. It is important to note that this is a "back of the envelope" calculation as the total attendees will include a small number of older children and adults that participated in CACFP. Additionally, the number of children living below the poverty line below the age of 5 is not the universe of children eligible for CACFP since income eligibility extends to 185 percent of the poverty line and households receiving SNAP or TANF. Both of these errors in identifying the correct population should operate to positively bias the coverage of CACFP. (See Figure 1.) However, this instrument meets the condition that it predicts CACFP

[3] An additional assumption for instrumental variable (IV) models is monotonicity, which means that the instrument may have no effect on some individuals, but that all who are affected, are affected in the same way. Stated differently, the direction of the effect is the same for all members of the sample. In addition, it is important to note that IV models estimate the causal effect for those affected by the instrument only. That is, our models estimate local treatment effects and not average treatment effects.

participation, but does not affect household food security status directly. In other words, this instrument can be used to obtain a causal estimate of CACFP participation (Wooldridge, 2011).[4]

Thus, an instrumental variable approach to estimate the effects of CACFP on food security status is used. In the first stage, we predict CACFP participation:

(2) $C_i = \beta_{1i} + Z_i\beta_2 + X_i\beta_3 + \mu_i$

Where C_i identifies participation in CACFP for the child care provider for household *i*, Z includes an exogenous instrument that affects CACFP but does not affect food insecurity directly (the relative availability of CACFP providers), β_2 is a vector of estimated coefficients associated with Z, X_i includes demographic, household composition, labor force participation and other characteristics, β_3 is a vector of estimated coefficients associated with X, and μ is a normally distributed error term with constant variance and mean of 0.

In the second stage, we predict food insecurity, similarly to equation (1). The only difference with equation (1) is that we use the predicted value for CACFP that was calculated during the first stage, $\hat{C}_i$, to predict food insecurity in the second stage.

(3) $Y_i = \alpha_{0i} + \hat{C}_i\alpha_1 + X_i\alpha_2 + \varepsilon_i$

For each of our models, we present results for four different groups of children. First, we consider the sample of children who attend child care and estimate the impact of CACFP participation on household food security status. Next, the sample is divided by type of child care arrangement; specifically, center-based child care, Head Start, and home-based child care.

[4] For this method to work well it is necessary to include control variables for geographic heterogeneity, because latent effects due to omitted variables correlated with program placement can bias the estimated effects. Particularly, one concern might be that any omitted geographic heterogeneity might be a confounder. We use geographic controls that have been widely used in the literature: population density, share of urban population, state level income, health spending indicators, and education spending indicators.

We consider the impact of CACFP program participation on household food security status. It has been documented that direct measures of low food security among children are lower than household measures of very low food security. Qualitative reports suggest that children may be buffered from the reduced food intake by other adults in the households (Polit, London, & Martinez, 2001). Thus, participation in food and nutrition programs that increase the supply of food to children may be observed to affect not only the food security status of the child participating, but may also increase the food consumed by adults in the household. As a consequence, our analyses will explore the effects of program participation on the food security status of the household.

Household food security status is derived from the USDA's 18 item Core Food Security Module. Eighteen questions are considered in order to rate food security for households. Using validated cut-points, we consider a household to be food secure if 0 to 2 items in the scale were answered affirmatively (this category is often referred to as high food security). If three or more items were answered affirmatively, we consider a household to be food insecure (USDA considers three different categories: marginal food security, low food security and very low food security) (Nord, 2009). See appendix table 1 for the food insecurity battery of questions.

Our control variables include a set of child and parental characteristics that have been found to be correlated with food security status in the extant literature. For child characteristics we include the child's age in months, gender, maternal rating of child health and race (Black, Hispanic, Asian, mixed, and other versus White). For parent characteristics we include maternal age in years, maternal education level (less than high school, more than high school and college versus high school degree), marital status (1=married versus not married), household income level (measured in categories), the number of household members less than 18 present, the number of household members 18 and over present, region (Midwest, South, West versus East)

and urbanity (1=metropolitan area residence versus all others). Table 1 presents descriptive statistics for the full sample and by child care arrangement for our main measures and Appendix table 2 presents descriptive statistics for demographic and socio-economic characteristics.

[Table 1 about here]

Our analysis also explores the causal pathway through which CACFP might affect food insecurity. One potential mechanism is a proxy for 'quality of food service'. The National Center for Educational Statistics (NCES) created the "quality of food service" variable using child care provider interview data. Using a Likert type scale from zero to seven, it reflects the appropriateness and timing of the foods served, the sanitary conditions in which the food is prepared, and whether well-balanced and nutritional meals and snacks are served; the scale takes a value of zero if a meal is not served. (see table 1 for more details).

IV. Results

To examine the effect of CACFP program participation on household food security status, a series of two-stage probit models were estimated. Due to the non-random assignment of CACFP participation at the child care arrangement level, we control for the non-random selection process on both observable and unobservable factors by using an instrumental variable method. Results from the first-stage model, where we estimate the probability of CACFP participation, are shown in appendix table 3.

CACFP Participation: IV Results for Full Sample. We begin with results for models that do not control explicitly for the type of child care arrangement. In Appendix Table A3, we find that our instrument, the relative availability of CACFP providers, positively affects CACFP participation (0.612; $p<0.001$). Moreover, the F-statistic test that excludes this variable from the regression estimation also shows that the instrument used is relevant (F-stat=19.283; $p<0.001$), as shown in Table 2.

We then used the predicted values for CACFP participation to estimate its effect on food insecurity (details of the second stage estimation can be found in appendix table 4). Table 2 shows marginal effects of CACFP participation on food security. Beginning with the top row in Table 2, we present results for models which do not control explicitly for the type of care. We find that when we control for unobserved factors related to CACFP participation using instrumental variable models, a 1.81 percent (p=.002) reduction in household food insecurity is evident for the sample of children who attend child care programs that participate in CACFP.

CACFP Participation: IV Results by Child Care Arrangement Type. Next, we turn to results by child care arrangement, beginning with (non-Head Start) center-based care. Children living in states with greater relative access to CACFP providers are more likely to participate in CACFP 0.555; p<0.01) as shown in Appendix Table 3. Similarly, the F-statistic that tests the relevance of the instrument indicates that for-profit care setting is a key determinant of CACPF participation (F-stat=23.131, p<0.001), as shown in Table 2. Then, we examine the results for children that attend Head Start. Here we find no effect of the instrument on CACFP participation, which is expected since all Head Start providers are categorically eligible to participate in the program. Finally, we examine children in home-based child care programs and we see that the instrument positively affects CACFP participation (1.325; p<0.01), from Appendix Table 3. However, the F-statistic used to test the relevance of the instrument suggests that the state level availability is not a strong instrument (F-stat=2.056; p<0.20).

Turning to the marginal effects of predicted CACFP participation on food security status, we once again begin with children in (non-Head Start) center-based care. Children in CACFP-participating center based programs have a small, negative marginal effect (-0.0051; p=.003) of experiencing household-level food insecurity, a similar sign as the overall group, but a smaller magnitude. Next we examine the results for children that attend Head Start. Here we find no

effect of provider participation in CACFP, which is expected since all Head Start providers are categorically eligible to participate and 85 percent report participating. Similarly, we examine children in home-based child care programs and we see that there is a negative marginal effect, although significant, it is very small (-0.0001; $p<0.001$).

V. SENSITIVITY ANALYSIS

Our finding that CACFP reduces household food insecurity after unobserved factors related to program participation are included in the model is consistent with the findings of other nutritional support programs (Schmeiser, 2012; Yen et al., 2008). However, CACFP differs from other programs such as SNAP or WIC in one important aspect in that the nutritional support is provided to the child care program and not directly to the household. What then is the mechanism that links exposure to CACFP with the household food supply?

As a sensitivity analysis we explore one possible mechanism through which CACFP at the child care program level might influence household food security status, 'quality of food service'. The classic mediation analysis suggests that the strength of the CACFP coefficient will be reduced when a correlated mediator is added to the model. Therefore, we re-estimate the same IV models shown in Table 2 with the hypothesized mediator, quality of food service. As Table 3 indicates, CACFP participation declines in magnitude substantially and is no longer statistically significant when 'quality of food service' is added to the model. This suggests that one possible way that CACFP operates to improve the household food supply is by providing more predictable meals, a more sanitary food preparation space, and more nutritious meals.

VI. DISCUSSION

The CACFP program is an under-researched piece of the national food assistance bundle of programs available to low-income households. Participation in CACFP is at the child care program level and is open to all home-based child care providers, Head Start, all non-profit child

care centers and for-profit centers that serve a substantial low-income population. Participating providers receive reimbursements for meals served and the level of reimbursement is similar to the National School Lunch Program in that it is based on the mix of household incomes of children served.

We used nationally representative data from the ECLS-B to examine the relationship between provider participation in CACFP and food security status with the expectation that access to CACFP would be associated with increased food security. We applied an instrumental variable approach to account for the fact that unobserved parental preferences for child care program types may be correlated with unobserved parental decisions about managing the household food supply. We analyze separate models for the sample of children attending child care and by child care setting—center care, Head Start, and home-based child care programs. The instrumental variable approach indicated that attending a child care setting that participates in CACFP has a negative marginal effect on the observed probability of the household being food insecure for the general sample ($p=0.005$) and specifically for children that attend (non-Head Start) child care centers ($p=0.001$).

We also identified one potential causal pathway through which CACFP participation might support household food security. Providers that participate in CACFP are more likely to provide higher quality food service. Remember that are likert-type quality variable takes a value of zero if no meal is served. It is reasonable to assume that the demands on the household food supply are lower when parents do not need to send food along with their children to daycare. Thus, the finding that CACFP participation reduces the risk of household food insecurity may be explained by the increased likelihood of the child care provider, particularly in child care centers, to reduce the household food burden by directly supplying food for the children while in their care.

This paper is not without several limitations that must be noted. First, we rely upon contemporaneous reports of food security with CACFP participation and without clear temporal ordering this weakens our ability to draw causal inferences from our models. Secondly, data were collected around 2005 when the United States had a particularly strong macroeconomy, likely downward biasing the importance of participation in CACFP during more dire economic times as well as limiting the external validity of our findings.

Given our finding that receiving child care from a provider that participates in CACFP in non-Head Start centers is associated with reductions in household food insecurity, there are several implications for future research. First, it would be interesting to move beyond the nutritional outcome examine here to investigate if child developmental outcome are associated with CACFP participation. Additionally, other outcomes such as overall health and doctor visits may provide important information regarding other indirect effects of CACFP participation on child well-being.

Given these wide eligibility criteria that renders the majority of child care providers eligible and the tight operating margins of child care, it is interesting to note the wide variation in CACFP coverage at the state level. In Figure 2, we present the state level distribution of relative availability of CACFP in 2009, which we use as our instrumental variable. Keeping in mind that for reasons noted above the errors in our calculation operate to positively bias the coverage of CACFP, coverage rates shown extend beyond 100 percent. However, Figure 2 clearly shows wide levels of state variation in CACFP coverage. CACFP participation in states at the low end of the spectrum (Nevada, Arizona, Idaho, and South Carolina) is below 40 percent of the children living in poverty, even with the positive bias noted. In contrast, there are a group of states (North Dakota, Minnesota, Nebraska, and Wyoming) with very high levels of estimated participation among eligible populations. This wide level of state variation suggests that access

to the nutritional benefits of CACFP has significant implications in light our findings that CACFP program participation improves household food security. Given the known cognitive and health consequences associated with food insecurity during the early childhood period and our findings that CACFP is an effective nutritional support for reducing the risk of household food insecurity, focus should now be directed towards improving access to CACFP.

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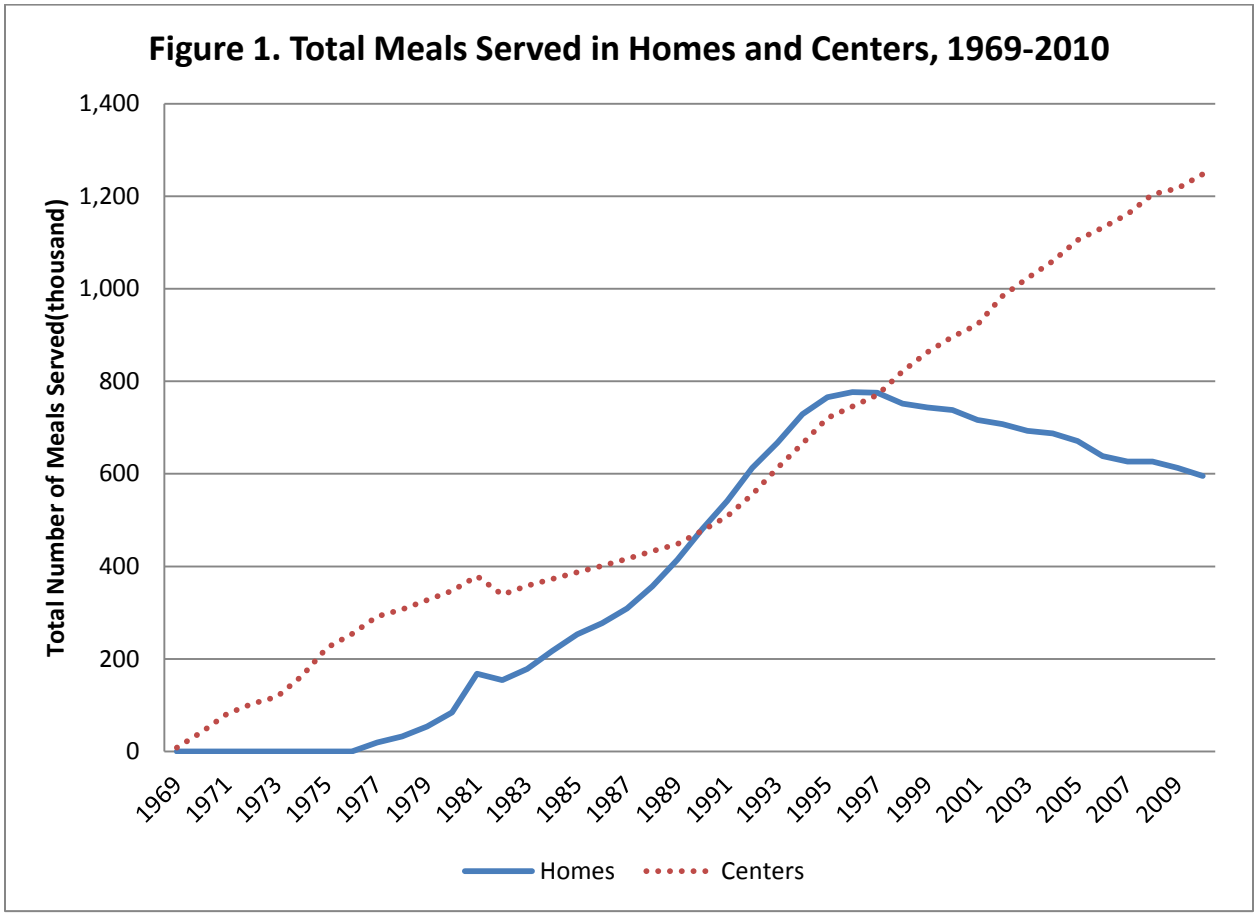
Figure 1. Total Meals Served in Homes and Centers, 1969-2010
Total Number of Meals Served(thousand)
1,400
1,200
1,000
800
600
400
200
0
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
Homes
Centers

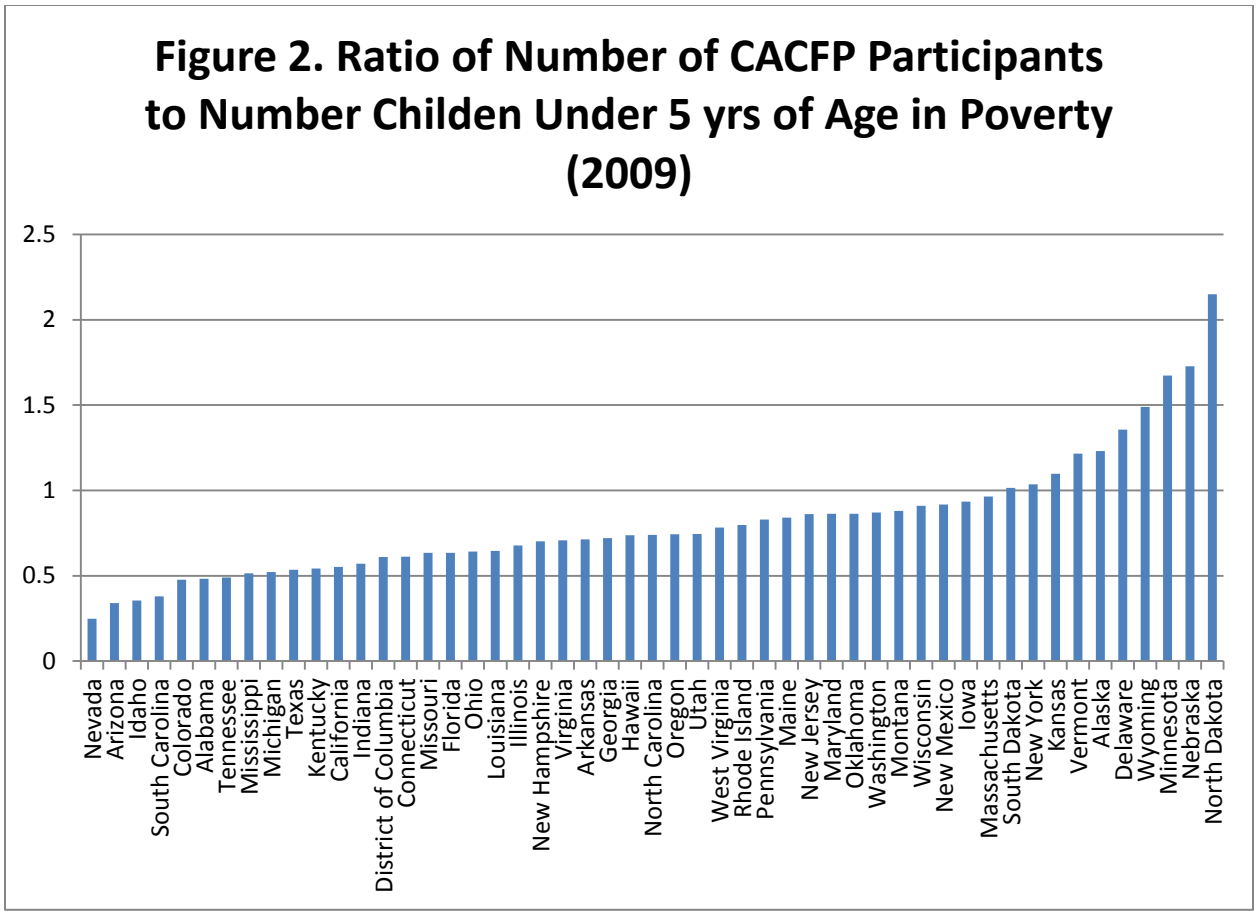
Figure 2. Ratio of Number of CACFP Participants to Number Childen Under 5 yrs of Age in Poverty (2009)
2.5
2
1.5
1
0.5
0
Nevada
Arizona
Idaho
South Carolina
Colorado
Alabama
Tennessee
Mississippi
Michigan
Texas
Kentucky
California
Indiana
District of Columbia
Connecticut
Missouri
Florida
Ohio
Louisiana
Illinois
New Hampshire
Virginia
Arkansas
Georgia
Hawaii
North Carolina
Oregon
Utah
West Virginia
Rhode Island
Pennsylvania
Maine
New Jersey
Maryland
Oklahoma
Washington
Montana
Wisconsin
New Mexico
Iowa
Massachusetts
South Dakota
New York
Kansas
Vermont
Alaska
Delaware
Wyoming
Minnesota
Nebraska
North Dakota

Table 1. Descriptive Statistics

Variables	***Full Sample (N=4250)***	***Center Care (n=3300)***	***Head Start (n=450)***	***Family Care (n=500)***
Dependent Variable:				
Household Food Insecurity in wave 3				
Food Secure	90.59%	93.94%	77.78%	90.00%
Food Insecure	9.41%	6.06%	22.22%	10.00%
Variable of Interest:				
CACFP Participation				
No Participation	65.88%	68.18%	11.11%	97.79%
Participation	34.12%	31.82%	88.89%	2.21%
Instrument:				
Availability of CACFP providers	0.6737	0.6812	0.6573	0.6468
Mediator:				
Mean Index of Quality of Food	0.9851	0.7107	3.7086	0.1751

Note: Numbers represent percentages unless notes as means.

Table 2. Marginal Effect of CACFP on Food Insecurity, IV Models

	dF/dx	z	P>z	F-test for IV*
Overall (n=4250)	-0.0181	-3.07	0.002	19.283
	(0.0072)			
Center based care (n=3300)	-0.0051	-3.04	0.002	23.131
	(0.0030)			
Head Start (n=450)	-0.1825	-0.59	0.557	0.864
	(0.3085)			
Family Care (n=500)*	-0.0001	-1.86	0.062	2.0562
	(0.0003)			

Notes : Robust standard errors are in parentheses.
*indicates that the F-statistic on the excluded instruments is strong using the test proposed by Stock &Yogo (2006).

Table 3. Sensitivity Analysis: Marginal Effects of CACFP on Food Insecurity, IV Models with Mediator

	dF/dx	z	P>z	F-test for IV*
Overall (n=4250)	-0.0088	-2.08	0.037	19.6090
	(0.0065)			
Center based care (n=3300)	-0.0046	-3.39	0.001	12.4344
	(0.0027)			
Head Start (n=450)	-0.1312	-0.32	0.750	0.0464
	(0.4083)			
Family Care (n=500)*	0.0204	1.442	0.142	4.1644
	(0.0195)			

Note: The mediator used is a proxy for "quality of food" created by the National Center for Education Statistics. The measure is a composite rating for appropriateness and timing of the food served, the sanitary conditions in which the food is prepared, and whether a well-balanced and nutritional food is served.
-Robust standard errors are in parentheses.
*indicates that the F-statistic on the excluded instruments is strong using the test proposed by Stock & Yogo (2006).

Appendix Table A1. ECLS-B Parent Questionnaire section on Household Food Sufficiency

Instructions: Were the following statement *often true*, *sometimes true*, or *never true* for your household?
Q1. We worried whether our food would run out before we got money to buy more.
Q2. The food that we bought just didn't last, and we didn't have money to get more.
Q3. We couldn't afford to eat balanced meals.
Q4. We relied on only a few kinds of low-cost food to feed the children because we were running out of money to buy food.
Q5. We couldn't feed the children a balanced meal because we couldn't afford that.
Q6. The children were not eating enough because we just couldn't afford enough food.
Q7. Did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?
Q8. (If yes) How often did this happen? 1. Almost every month 2. Some months, but not every month 3. In only 1 or 2 months
Q9. Did you ever eat less than you felt you should because there wasn't enough money to buy food?
Q10. Were you ever hungry but didn't eat because you couldn't afford enough food?
Q11. Did you lose weight because you didn't have enough money for food?
Q12. Did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?
Q13. (If yes) How often did this happen? 1. Almost every month 2. Some months, but not every month 3. In only 1 or 2 months
Q14. Did you ever cut the size of any of the children's meals because there wasn't enough money for food?
Q15. Did any of the children ever skip a meal because there wasn't enough money for food?
Q16. (If yes) How often did this happen? 1. Almost every month 2. Some months, but not every month 3. In only 1 or 2 months
Q17. Were the children ever hungry but you just couldn't afford more food?
Q18. Did any of the children ever not eat for a whole day because there wasn't enough money for food?

Table A2. Descriptive Statistics for Demographic and Socio-Economic Characteristics

Variables	*Full Sample*	*Center Care*	*Head Start*	*Family Care*
Child's Race				
White	48.24%	51.52%	33.33%	40.00%
Black	15.29%	12.12%	33.33%	20.00%
Hispanic	15.29%	13.64%	22.22%	20.00%
Asian	10.59%	13.64%	0.00%	10.00%
Mixed and other	10.59%	9.09%	11.11%	10.00%
Child's Gender				
female	48.24%	48.48%	44.44%	50.00%
male	51.76%	51.52%	55.56%	50.00%
Child's Health Status				
Excellent	52.94%	53.03%	44.44%	50.00%
Very Good	34.12%	33.33%	44.44%	30.00%
Good	10.59%	10.61%	11.11%	10.00%
Fair	2.35%	3.03%	0.00%	a
Poor	0.00%	0.00%	0.00%	a
Mother's Education Status				
Less than High School	9.41%	6.06%	22.22%	10.00%
High School (omitted)	24.71%	21.21%	44.44%	30.00%
Some College Degree	27.06%	27.27%	22.22%	30.00%
College Degree or above	38.82%	45.45%	11.11%	30.00%
Marital Status				
Not Married	28.24%	22.73%	55.56%	40.00%
Married	71.76%	77.27%	44.44%	60.00%
Urban Status				
Not in the Urban Area	14.12%	13.64%	22.22%	10.00%
In the Urban Area	85.88%	86.36%	77.78%	90.00%
Region				
Northeast (omitted)	16.47%	18.18%	11.11%	10.00%
Midwest	23.53%	22.73%	22.22%	30.00%
South	36.47%	36.36%	44.44%	30.00%
West	23.53%	22.73%	22.22%	30.00%

Household Income				
$5,000 or less	3.53%	1.52%	9.09%	0.00%
$5,001 to $10,000	4.71%	3.03%	9.09%	8.33%
$10,001 to $15,000	4.71%	3.03%	18.18%	8.33%
$15,001 to $20,000	4.71%	4.55%	9.09%	8.33%
$20,001 to $25,000	5.88%	4.55%	9.09%	8.33%
$25,001 to $30,000	4.71%	4.55%	9.09%	8.33%
$30,001 to $35,000	4.71%	4.55%	9.09%	8.33%
$35,001 to $40,000	5.88%	4.55%	9.09%	8.33%
$40,001 to $50,000	8.24%	7.58%	9.09%	8.33%
$50,001 to $75,000	16.47%	18.18%	a	8.33%
$75,000 to $100,000	15.29%	18.18%	a	8.33%
$100,001 to $200,000	16.47%	19.70%	a	8.33%
$200,001 or more	4.71%	6.06%	a	8.33%
Mean Age of Child	52.95	53.01	53.17	52.56
Mean Age of Mother	32.85	34.04	30.22	31.79
Mean Number of children in household	2.43	2.38	2.66	2.42
Mean Number of adults in household	2.08	2.07	2.01	2.13
State Variables				
Population Density	254.56	263.39	236.99	214.11
Percentage of Urban population	78.48%	78.81%	75.61%	79.16%
Log of Income Per capita	9.97	9.98	9.94	9.97
Log of Health Expenditure	8.58	8.58	8.58	8.57
Log of Expenditure in Education	9.00	9.01	8.98	8.99
% Spend on Childhood Nutrtion	19.70%	19.70%	20.30%	19.09%

Note: Numbers represent percentages unless notes as means.

Table A3. First stage estimation: Probability of participation in the CACFP program for Table 2

Variables	Overall (n=4250)			Center-Based Care (n=3300)			Head Start (n=450)			Family-Based Care (n=500)		
	Coef.		S.E.	Coef.		S.E.	Coef.		S.E.	Coef.		S.E.
Constant term	4.370		6.272	8.059		7.233	-9.930		14.870	3.073		22.860
Age of Child	0.011		0.007	0.013		0.009	-0.007		0.017	0.008		0.027
Child Race												
Black	0.691	***	0.090	0.733	***	0.109	0.272		0.209			
Hispanic	0.488	***	0.087	0.506	***	0.104	0.212		0.211			
Asian	0.251	**	0.104	0.240	**	0.112	0.725	*	0.378			
Other race	0.167		0.119	0.217		0.139	0.350		0.253			
Male Child	0.013		0.059	0.000		0.068	0.147		0.136	0.596	*	0.359
Child Health Status	0.059		0.039	0.049		0.045	-0.020		0.095			
Age of Mother	-0.012	**	0.005	-0.011	*	0.006	-0.008		0.009	-0.008		0.021
Mother's Educational Level												
Less than high school	-0.049		0.104	-0.046		0.143	0.009		0.176			
Some college	-0.301	***	0.076	-0.314	***	0.091	-0.135		0.172			
College	-0.558	***	0.087	-0.507	***	0.096	-0.800	***	0.284			
Mother is married	-0.230	***	0.074	-0.414	***	0.089	0.184		0.151			
Number of children in household	-0.003		0.027	0.015		0.033	0.040		0.056	-0.144		0.168
Number of adults in household	-0.061		0.040	0.098	*	0.055	-0.176	**	0.083	-0.861	***	0.260
Income	-0.022	***	0.006	-0.020	***	0.006	-0.050	***	0.002	-0.150	**	0.072
Urban area	-0.291	***	0.086	-0.155		0.101	-0.166		0.209	-0.082	*	0.467
Region												
Midwest	0.052		0.177	0.231		0.201	-2.207	***	0.714			
South	0.203		0.205	0.207		0.233	-1.749	**	0.745			
West	0.201		0.248	0.219		0.285	-1.467	*	0.819			
State Variables												
Population Density	0.000		0.000	0.000		0.000	-0.002	**	0.008	0.001		0.001
Percentage living in urban areas	-0.005		0.004	-0.006		0.005	-0.024	**	0.010	-0.006		0.018
Log Income per capita	-1.479	***	0.509	-1.549	***	0.596	1.619		1.287	1.048		1.740
Log Education Expenditures	1.130	***	0.401	1.089	**	0.465	0.183		0.939	0.267		1.837
Percentage spent on child nutrition	-0.004		0.244	-0.104		0.284	0.190		0.548	0.627		0.685
Log Health Expenditures	0.006		0.514	-0.363		0.597	-0.192		1.217	-1.881		2.073
Availability of CACFP providers	0.612	***	0.138	0.555	***	0.158	0.017		0.343	1.325	***	0.485

* p<.10, **p<.05, *** p<.01

Table A4. First stage estimation: Probability of participation in the CACFP program for Table 3

Variables	Overall (n=4250)			Center-Based Care (n=3300)			Head Start (n=450)			Family-Based Care (n=500)		
	Coef.		S.E.	Coef.		S.E.	Coef.		S.E.	Coef.		SS.E.
Constant term	10.331	*	6.285	11.857		7.671	-8.851		15.757			
Quality of meals	0.050	***	0.014	0.055	***	0.021	0.017		0.027	0.026		0.042
Age of Child	0.006		0.007	0.010		0.009	0.000		0.017	0.014		0.028
Child Race												
Black	0.753	***	0.087	0.713	***	0.112	0.401	**	0.217			
Hispanic	0.582	***	0.085	0.474	***	0.107	0.216		0.217			
Asian	0.234	**	0.103	0.258	**	0.116	0.695	*	0.384			
Other Race	0.212	*	0.112	0.123		0.136	0.501	*	0.275			
Male Child	0.003		0.057	0.026		0.070	0.182		0.140	0.116		0.208
Child Health Status	0.052		0.039	0.038		0.048	-0.056		0.093	0.087		0.153
Age of mother	-0.013	***	0.005	-0.016	***	0.006	-0.007		0.009	0.007		0.017
Mother's Education Level												
Less than high school	-0.017		0.101	-0.026		0.149	0.022		0.177			
Some college	-0.307	***	0.074	-0.306	***	0.094	-0.169		0.177			
College	-0.605	***	0.086	-0.512	***	0.100	-0.699	**	0.292			
Mother is married	-0.156	**	0.071	-0.370	***	0.092	0.236		0.151			
Number of children in household	0.028		0.027	0.030		0.034	0.030		0.056	0.089		0.109
Number of adults in household	-0.023		0.041	0.132	**	0.056	-0.115		0.082	-0.538	***	0.148
Income	-0.030	***	0.006	-0.024	***	0.006	-0.005	***	0.002	-0.022	**	0.011
Urban area	-0.252	***	0.083	-0.174	*	0.105	-0.197		0.222	-0.195		0.259
Region												
Midwest	-0.159		0.172	0.082		0.205	-2.204	***	0.755			
South	-0.058		0.202	0.096		0.240	-1.760	**	0.790			
West	0.044		0.241	0.047		0.292	-1.516	*	0.861			
State Variables												
Population Density	0.000		0.000	0.000		0.001	-0.001	*	0.008	-0.001		0.001
Percentage living in urban areas	-0.006		0.004	-0.005		0.005	-0.025	**	0.011	0.006		0.012
Log Income per capita	-1.328	***	0.498	-1.060	***	0.601	1.749		1.325	0.101		1.758
Log Education Expenditures	0.747	*	0.398	0.941	*	0.487	0.246		0.962	-0.035		1.178
Percentage spent on child nutrition	-0.159		0.234	-0.260		0.292	0.365		0.560	-0.245		0.595
Log Health Expenditures	-0.424		0.500	-0.600		0.619	-0.565		1.270	1.057		1.499
Availability of CACFP providers	0.512	***	0.138	0.608	***	0.164	0.118		0.378	0.599	*	0.350

* p<.10, **p<.05, *** p<.01

Table A5. Second Stage Estimation: Probability of being Food Insecure for Table 2

Variables	Overall (n=4250)		Center-Based Care (n=3300)		Head Start (n=450)		Family-Based Care (n=500)	
	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.	dF/dx	S.E.
Age of Child	0.0000	0.0001	0.0000	0.0000	0.0059	0.0060	0.0001	0.0007
Child Race								
Black	-0.0023	0.0012	-0.0009 ***	0.0005	0.0496	0.0738		
Hispanic	-0.0026 *	0.0013	-0.0010 ***	0.0006	-0.0084	0.0725		
Asian	-0.0012	0.0013	-0.0005	0.0003	0.1472	0.2399		
Other race	0.0027	0.0029	-0.0002	0.0004	0.2179 *	0.1505		
Male Child	0.0007	0.0081	0.0000	0.0003	-0.0551	0.0484	0.0424 ***	0.0300
Child Health Status	0.0001	0.0047	-0.0001	0.0001	0.0618 **	0.0270	0.0045	0.0071
Age of Mother	0.0001 **	0.0001	0.0000 **	0.0000	0.0113 ***	0.0035	-0.0006	0.0006
Maternal education								
Less than high school	0.0013	0.0015	0.0006	0.0008	-0.0088	0.0535		
Some college	0.0013	0.0015	0.0012 **	0.0009	-0.0063	0.0564		
College	-0.0003	0.0022	0.0009	0.0009	-0.1531	0.0537		
Mother is married	0.0009	0.0009	0.0007 *	0.0004	-0.0080	0.0564	0.0154 *	0.0143
Number of children in household	0.0007 **	0.0004	0.0002	0.0001	-0.0023	0.0178	-0.0016	0.0030
Number of adults in household	-0.0003	0.0005	-0.0004 **	0.0003	-0.0590	0.0383	-0.0148	0.0150
Income	-0.0025 ***	0.0007	-0.0006 ***	0.0003	-0.0081 ***	0.0018	-0.0011 ***	0.0006
Urban area	0.0016	0.0010	0.0006 **	0.0004	-0.0890	0.0787	-0.0310	0.0427
Region								
Midwest	0.0008	0.0032	-0.0005	0.0006	0.0279	0.2750		
South	-0.0008	0.0030	-0.0003	0.0008	-0.0949	0.2386		
West	0.0000	0.0037	-0.0003	0.0008	-0.0297	0.2283		
State Variables								
Population Density	0.0000	0.0000	0.0000	0.0000	-0.0002	0.0002	0.0000	0.0000
Percentage living in urban areas	0.0001 *	0.0001	0.0000	0.0000	0.0006	0.0036	0.0007 *	0.0006
Log Income per capita	0.0034	0.0074	0.0037	0.0029	0.5301	0.3587	-0.1069 *	0.0843
Log Education Expenditures	-0.0072	0.0064	-0.0004 **	0.0027	-0.1037	0.3309	0.0175	0.0335
Percentage spent on child nutrition	0.0023	0.0032	0.0005	0.0011	0.0629	0.1939	0.0319 *	0.0265
Log Health Expenditures	0.0048	0.0071	0.0023	0.0026	-0.1135	0.4273	0.0119	0.0462
CACFP Participation	-0.0181 ***	0.0070	-0.0051 ***	0.0027	-0.1825	0.3080	-0.0001 *	0.0003
Wald Chi-squared	290.38 ***		202.45 ***		79.62 ***		59.54 ***	

* p<.10, **p<.05, *** p<.01

Table A6. Second Stage Estimation: Probability of being Food Insecure for Table 3

Variables	Overall (n=4250)			Center-Based Care (n=3300)			Head Start (n=450)			Family-Based Care (n=500)		
	dF/dx		S.E.	dF/dx		S.E.	dF/dx		S.E.	dF/dx		S.E.
Quality of meals	-0.0003		0.0003	-0.0002	*	0.0001	0.0054		0.0063	0.0000		0.0000
Age of Child	0.0000		0.0012	0.0000		0.0000	0.0071	*	0.0041	0.0000		0.0000
Child Race												
Black	-0.0046	***	0.0016	-0.0010	**	0.0006	-0.0477		0.0493			
Hispanic	-0.0049	***	0.0018	-0.0012	***	0.0007	-0.0443		0.0513			
Asian	-0.0021		0.0013	-0.0006		0.0004	-0.0068		0.1069			
Other race	0.0026		0.0031	0.0001		0.0007	0.0910		0.0932			
Male Child	-0.0005		0.0093	0.0000		0.0003	-0.0509		0.0358	0.0000		0.0002
Child Health Status	0.0009	*	0.0006	0.0000		0.0002	0.0671	***	0.0184	0.0000		0.0000
Age of Mother	0.0002	***	0.0001	0.0001	**	0.0000	0.0037	*	0.0022	0.0000		0.0000
Maternal education												
Less than high school	0.0011		0.0016	0.0003		0.0007	-0.0043		0.0376			
Some college	0.0026		0.0020	0.0010		0.0009	-0.0247		0.0395			
College	0.0041		0.0040	0.0009		0.0010	-0.0280		0.1177			
Mother is married	0.0013		0.0010	0.0008	*	0.0005	-0.0390		0.0384	-0.0001		0.0003
Number of children in household	0.0006		0.0048	0.0001		0.0002	0.0127		0.0130	0.0000		0.0000
Number of adults in household	-0.0008		0.0007	-0.0006	**	0.0004	-0.0542	**	0.0238	0.0000	*	0.0001
Income	-0.0030	***	0.0008	-0.0008	***	0.0004	-0.0620	***	0.0119	0.0000	***	0.0001
Urban area	0.0028	**	0.0012	0.0079	**	0.0049	0.0199		0.0454	0.0000		0.0003
Region												
Midwest	0.0018		0.0042	-0.0001		0.0009	-0.0720		0.1395			
South	0.0042		0.0037	0.0000		0.0011	-0.1336		0.1495			
West	-0.0012		0.0036	0.0001		0.0014	-0.1487		0.1100			
State Variables												
Population Density	0.0000		0.0000	0.0000		0.0000	-0.0002	*	0.0015	0.0000		0.0000
Percentage living in urban areas	0.0011		0.0001	0.0000		0.0000	0.0013		0.0030	0.0000		0.0000
Log Income per capita	0.0206	**	0.0097	0.0037		0.0034	0.4546	*	0.2702	0.0004		0.0018
Log Education Expenditures	-0.0133	**	0.0076	-0.0047	*	0.0033	-0.1288		0.2244	-0.0001		0.0002
Percentage spent on child nutrition	0.0038		0.0039	0.0058		0.0015	0.0618		0.1261	0.0001	**	0.0023
Log Health Expenditures	0.0081		0.0086	0.0038		0.0035	-0.1693		0.3215	0.0000		0.0001
CACFP Participation	-0.0088	***	0.0065	-0.0046	***	0.0027	-0.1312		0.4083	0.0204	*	0.0195
Wald Chi-squared	290.69	***		187.13	***		83.92	***		36.54	***	

* p<.10, **p<.05, *** p<.01