Participation in the National School Lunch Program and Food Security: A regression discontinuity design analysis of transitions into kindergarten

Colleen Heflin and Irma Arteaga
University of Missouri
Extended Abstract

The impact of food insecurity on children's development is well documented. 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 & Haider, 2004; Cook & Frank, 2008; Duncan, Brooks-Gunn & Klebanov, 1994; Pollit, 1994; Morgane, Austin-LaFrance, Bronzino, et al., 1993; Scholl, 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 include susceptibility to infections, slowed cognitive development, slow growth, susceptibility to chronic diseases, girls are at higher risk of having low-birth weight babies; and other non-health related problems such as reduced school performance, increase school dropouts and reduced productivity during adulthood (Hoddinott, Beherman, Maluccio, Flores & Martorell, 2008).

During schooling years, food insecurity is associated with poor school performance and academic achievement (Roustit, Hamelin, Grillo, Martin & Chauvin, 2010; Maluccio et al., 2006; Cook & Frank, 2008). Neurologists and psychologists suggest that the impact of food insecurity on learning can be attributed to two mechanisms. First, there is a direct effect on cerebral functioning, which defines child's cognitive abilities. Second, there is an indirect effect on physical and psychological health that contributes to distraction, absenteeism and low motivational abilities for learning. Thus, the evidence indicates that the effects of nutritional inadequacy persist across childhood but that the causal mechanisms may vary at different periods of biological, cognitive and social development.

The federal food and nutritional safety net designed to address the serious issue of childhood food insecurity is currently a patchwork. Program services may be delivered in the form of vouchers, (near) cash supplements, or directly as food. Services may be available to specific members of the household only or to the entire household. In addition to household income eligibility, children's eligibility for a specific program may depend upon their age and the income level of others in their day-care or school. The result of this hodge-podge of food and nutritional programs is that different households with similar income levels and numbers of children, may be receiving substantially different bundles of food assistance. The Supplemental Nutrition Assistance Program (SNAP) is the sole program that provides consistent nutritional assistance across the life course.

While variation may occur across the entire childhood period, there is a significant transition in the types of food and nutrition programs for which children qualify as children reach age five and become age eligible to enter kindergarten. Before age five, children are age eligible for WIC and may receive nutritional assistance through child care programs such as the Child

and Adult Care Food Program (CACFP). After age five, children are no longer eligible for WIC and are much less likely to have contact with a child care center that participates in CACFP. Preliminary analyses by the Arteaga, Heflin and Gable (2012) using the Early Childhood Longitudinal Study-Birth Cohort and similar methods to those proposed here suggest that household food insecurity increases by 7-14 percent when children reach month 61 and age out of eligibility for the WIC program. We seek to explore whether the increase in household food insecurity is temporary until the children are able to access the the National School Lunch and School Breakfast Programs, which are the main sources of nutritional supplementation for school-aged children.

The NSLP and SBP are administered at the school level, with upwards of 97% of public schools participating in NSLP. Participation for the NSLP and SBP can be based on categorical eligibility, community eligibility or income eligibility. Children can be categorical eligible for participation based on their household participation in other federal means-tested programs, such as SNAP or TANF. Income eligibility is established by demonstrating that gross household income is below 130 percent of the federal poverty line for free meals, or between 130 and 185 percent of the poverty line for reduced meals. Finally, schools with at least 40 percent of their students qualifying for free meals based on categorical eligibility can qualify for community eligibility in which meals are provided free to all children in Illinois, Kentucky and Michigan. The NSLP also provides snacks to children during after-school programs. However, additional variation in the value of the nutritional benefit occurs through the school schedule (number of instruction days; traditional calendar with summers off versus year-round with a month off every 3 months); and the availability of the Summer Food Service Program, which serves meals during "vacation" months.   In fiscal year 2011, over 31 million students received a free or reduced-price lunch daily; 12.1 million students received breakfast. However, according to Dahl and Scholz (2011), participation rates among eligible children are only 50 percent for the SBP and 75 percent for the NSLP.

While both SNAP and NSLP provide food resources for children who enter school and age out of WIC, it is unclear the extent to which NSLP provides a good substitute for the nutritional benefits available through participation in WIC. With two-thirds of households with food insecurity among children reporting participation in the free or reduced-price school lunch program in the last 30 days (Nord 2009), it is somewhat surprising that evaluations of the effectiveness of participation in the NSLP do not indicate positive results for child outcomes (Dunifon and Kowaleski-Jones 2003).

In part, the potential benefit of the NSLP and SBP depends on how school districts administer kindergarten, since children must be present at school to access meals provided on-site. In 1998-99, 56 percent of US kindergartners attended full-day programs. However, there is significant variation in full-day attendance by region (most common in south- 84 percent; least common in west-38 percent and northeast-37 percent), race (79 percent Black, 49 percent White, 46 percent Hispanic, and 40 percent Asian) and family income level (62 percent of children whose families below the federal poverty line attended full-day programs compared with 51 percent of children from more affluent families).

Research Objectives

This paper contributes to the prior literature on food insecurity by exploring the effect of nutritional policy on household and child food insecurity. While on-going research by Arteaga, Heflin and Gable (2012) examine the impact on household food insecurity of losing eligibility for WIC, here we propose to examine the change in household and child food security as children enter kindergarten and are able to access the NSLP and NSB programs. Specifically, we exploit a discontinuity in school-based nutritional program participation directly related to the age of children. In order to access the NSLP and NSB programs, children must be enrolled in formal kindergarten programs (i.e. not Headstart or other forms of child care), usually as part of an elementary school system. Kindergarten enrollment in largely based on age eligibility, which varies by state. For example, in order to begin their kindergarten year, Alaska requires children to reach age 5 on or before August 15, Connecticut requires children to reach age 5 on or before January 1, while New Jersey just states that children need to be older than age 4 (National Center for Education Statistics). Additional state variation exists in terms of the availability of full-time and part-time kindergarten programs. Thus, we bring our focus to a single research questions: *As children become age eligible for kindergarten enrollment, how does access to NSLP and NSB program influence child and household food insecurity?*

Research Methods and Data Analysis

Analysis of this research question will rely upon data from the Current Population Survey Food Security Supplement (CPS-FSS). The CPS-FSS is a nationally representative survey of about 50,000 households in the United States conducted by the US Census Bureau annually since 1995. This project will pool data from the 2001-2010 time period, in which the FSS is consistently fielded in the December survey. The data includes information on household and child food security, food expenditures, use of public and private food assistance programs including participation in the National School Lunch Program and National Breakfast Program.

The Current Population Survey is a good data choice for this project because it has a large sample size. About 2,500 children, who are 4-6 years old, at or below 185% of the poverty level are interviewed every year, or an expected sample size of about 25,000 children. In contrast, other datasets such as the Panel Study of Income Dynamics (n=approximately 2000) and the Early Childhood Longitudinal Survey (approximately 3500) have much smaller sample sizes. The large sample size will allow for greater power in picking up local average treatment effects of the impact of NLSP participation on child food insecurity. Additionally, the sample size makes it possible to look for the presence of heterogeneous treatment effects by urban/rural residence, region, and race. Many public policies work better in some places than other or are more effective for some populations than others. Our large sample size allows us to determine the overall average treatment effect of NSLP on childhood food insecurity but also to probe for differential treatment effects.

In order to examine the impact of the NLSP on household and child food insecurity, we will estimate the causal effect of the transition into kindergarten using a regression discontinuity (RD) design. The RD design uses the fact that kindergarten entry produces sharp differences in access to school nutrition programs for children on either side school participation. Since the observed and unobserved determinants of school nutrition programs and food insecurity are

likely to trend smoothly across kindergarten participation threshold, we can use the estimates of discontinuous jumps in school nutritional program participation and food insecurity at kindergarten entry to identify the causal effect of school nutrition program participation on food insecurity. The RD design also addresses concerns about endogeneity that can be raised as a criticism if we were using other research designs. By implementing an RD design using kindergarten entry, we can be confident that our results are not biased by unobserved factors that determine this age cut-off.

To assess the impact of school nutrition programs on child and household food insecurity, we will estimate the following model:

$$Y_{ij} = (1-W_{ij}) \cdot Y_{ij}(0) + W_{ij} \cdot Y_{ij}(1) = \begin{cases} Y_{ij}(0) & \text{if } W_{ij}=0 \\ Y_{ij}(1) & \text{if } W_{ij}=1 \end{cases}$$

Where $Y_{ij}(0)$ is the outcome (food security) without exposure to the school nutrition program and $Y_{ij}(1)$ is the outcome (food security) given exposure to the school nutrition program, W_{ij} denotes the treatment received, with $W_{ij}=0$ if unit i living in state j was not exposed to the school nutrition program, and $W_{ij}=1$ otherwise. In the sharp design the assignment W_{ij} is a deterministic function of one of the covariates, the forcing (or treatment-determining) variable X_{ij}, in our case, age. The constant term c_j, denotes the cut-off, which is the age at kindergarten entry in state j:

$$W_{ij}=1 \ \{X_{ij} \geq c_j\}$$

In this RD design we look at the discontinuity in the conditional expectation of the outcome given the covariate to uncover an average causal effect of the treatment which is interpreted as the average causal effect of the treatment at the discontinuity point.

As a robustness check, we will estimate the causal effect of the transition in school nutritional programs on household and child food insecurity on part-time and full-time kindergarten as well as participation in the NBP. In order to test for heterogeneous treatment effects, we will replicate our analysis on separate samples split by urban/rural residency , region, and racial identity of the children.

Application of Research Results

Results from this study will inform policy-makers in understanding the contribution of the NSLP program to food security, and the impact of the transition from preschool to kindergarten on child and household security. Our proposed analyses uses the nationally representative Current Population Survey Food Security Supplement from 2001-2010 to provide a comprehensive picture of how participation in the NSLP shapes the contours of food security at the child and household level over the course of childhood. Given the heightened scrutiny that all social spending is facing in today's political climate, research is needed that speaks directly to the effectiveness of nutritional assistance program in reducing food insecurity. Furthermore, our exploration of heterogeneous treatment effects by urban/rural residence allow us to speak to the issue of if the NSLP program is more effective in some places than in others in the United States in addressing childhood food insecurity.