HHS Public Access

Author manuscript

J Consum Aff. Author manuscript; available in PMC 2018 July 11.

Published in final edited form as:

J Consum Aff. 2017 ; 51(3): 481–500. doi:10.1111/joca.12163.

The Relationship between the School Breakfast Program and Food Insecurity

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Abstract

Food insecurity rates have risen significantly in the United States beginning with the recent recession and remained high. The implications of these high rates are severe in that food insecurity has been associated with a wide range of health, behavioral, social and cognitive difficulties. This paper examines the relationship between the School Breakfast Program (SBP) and food insecurity outcomes. The SBP has the potential to reduce food insecurity because of the direct provision of breakfast to students and the implied income transfer to households. We use state-level cutoffs tied to school-level poverty rates that mandate the provision of the SBP to compare the food security outcomes of students in similar schools, but with different requirements to provide breakfast. Our estimates suggest that state policies requiring schools to offer the SBP have reduced food insecurity for young children.

Food insecurity in the United States is an important and growing issue that became more acute in the recent Great Recession and continues to cause concern. Food insecurity is defined as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (USDA 2012a). The current statistics are stark and show an increasing need to combat child food insecurity through innovative policy responses. For example, in 2010, 14.5% of households (17.2 million) were food insecure, including 5.4% (6.4 million) who had very low food insecurity as measured by reduced food intake and disrupted eating patterns (Coleman-Jensen et al. 2011). The potential for policy intervention is suggested by the large variation in these figures by state—from 7.1% in North Dakota to 19.4% in Mississippi (Coleman-Jensen et al. 2011). The prevalence of food insecurity is higher among households with children, at 20.2%; in nearly half of these households, food insecurity is experienced only among adults. Children were food insecure among 9.8% of households (3.9 million households), which includes 21.6% of all children (Coleman-Jensen et al. 2011). To highlight the trends in food insecurity among children, we note that in 1998, 9.5% of households with children were food insecure. This percentage fell during the economic expansion in the mid-2000s to 8.3% in 2007, but quickly increased to 11.0% in 2008 at the beginning of the recession (Coleman-Jensen et al. 2016). The implications of these high rates of child hunger are severe in that food insecurity has been associated with a wide range

of health, behavioral, social, and cognitive difficulties. For example, food insecurity is associated with lower nutrient intakes (Cook et al. 2004), cognitive problems (Whitaker, Phillips, and Orzol 2006), and behavioral problems (Huang, Matta Oshima, and Kim 2010), among other health issues (Gundersen, Kreider, and Pepper 2011).

In this paper, we provide new evidence on whether the School Breakfast Program (SBP) may be in the position to further reduce food insecurity among children from its current levels. We focus on the SBP because of its administration through schools, its tie with the National School Lunch Program (NSLP), the potential for the program to expand significantly because of its current size to generate substantial reductions in food insecurity among children, and the relatively small knowledge-base of its effects in the research literature. Particularly lacking is research that focuses on estimating causal effects of the SBP on food insecurity.

Access to, and participation in, the SBP has increased in recent decades. In 1990, less than half of schools that participated in the NSLP offered breakfast through the SBP (Food Research and Action Center [FRAC] 2004). By 2011, this figure rose to 88% (FRAC 2012). Based on data from the School Nutritional Dietary Assessment Studies, 10% of students consumed breakfast in school through the SBP in the 1991 to 1992 school year, while 25% of students usually did so in the 2004 to 2005 school year (Burghardt et al. 1993; Gordon et al. 2007). Yet, even after the expansions of the SBP in recent decades, in 2011, less than half of the students who received free or reduced-price lunch in school also received a subsidized breakfast (FRAC 2012); thus, expansions of the availability and participation in the SBP are possible.

Access to the SBP is similar to an increase in household income for households with children receiving subsidized meals (Bhattacharya, Currie, and Haider 2006). Expansions of the SBP have the potential to reduce food insecurity as evidenced by the positive impact on child nutrition (Bhattacharya, Currie, and Haider 2006) and the reduction in skipping breakfast (Bartfeld et al. 2009) when the SBP is available in schools, in addition to the implied income transfer to households whose children receive subsidized meals.

To examine the impact of the School Breakfast Program on food insecurity, we implement a difference-in-differences strategy, which compares differences in child food insecurity both within states and across states in schools with different requirements to provide breakfast at school. Approximately half of the states require some schools to offer breakfast in school through the SBP, and states vary in the thresholds used to define which schools are required to offer breakfast. For example, Virginia requires all schools with a rate of free and reduced-price eligible (FRP) students greater than 25% to offer the SBP, but Massachusetts requires all schools with poverty rates greater than 40% to offer the SBP. This means that a school with a 30% poverty rate in Virginia would be required to offer the SBP, but a similar school in Massachusetts would not, while both a school in Virginia and in Massachusetts with a 40% FRP rate would be required to offer the SBP. Comparing the differences in food insecurity rates among children in the two schools in Virginia to the differences among children in the two schools in Massachusetts would provide an estimate of the influence of being required to offer the SBP on child food insecurity. We generalize this example to

include all students in schools of all poverty levels in states with differing thresholds that require some schools to offer the SBP. Thus, we examine the differences in food insecurity rates for children within states and across states to determine the influence of a state policy requiring schools to offer the SBP.

In order to pursue this identification strategy, we combine state SBP policies and school information with survey information that contains food security status from the National Health and Nutrition Examination Survey (NHANES) using the location of households and the zoned schools for these locations. This represents the first attempt to combine school-level information with this survey, and we describe the process in detail below. Our results suggest that the state policies that require schools to offer the SBP do reduce food insecurity among elementary school children, but not older children.

OVERVIEW OF THE SCHOOL BREAKFAST PROGRAM

The SBP is a federal entitlement program that offers breakfast to any student who attends a school that participates in the program.[1] Thus, provided that breakfast is available in the school, any student may consume the breakfast; the student's household income determines the price paid for the meal.[2] Children from households with income equal to or below 130% of the poverty guidelines are eligible for free meals. Children from households with income equal to or below 185% of the poverty guidelines are eligible for reduced-price meals. The SBP provided subsidized breakfast to over 12 million children in 2011 at a cost of $3 billion (United States Department of Agriculture [USDA] 2012b). Although the SBP is similar to the National School Lunch Program (NSLP), the SBP serves a lower-income population; approximately half of NSLP participants received a free lunch in 2011, while approximately three-quarters of SBP participants received a free breakfast (USDA 2017a, 2017b).

Although the SBP is an entitlement program, the student's school must participate in the program in order for the student to be able to receive breakfast. To increase participation, many states mandate that schools must offer the SBP if the percentage of free and reduced-price eligible students exceeds a state-specific threshold. Data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K) show that nearly all schools in which the state mandate binds (meaning that the percentage of free and reduced-price eligible students exceeds the state-specific threshold and that the school is required to offer breakfast through the SBP) comply with these mandates (Frisvold 2015). In addition, schools that are not required by state law may choose to offer the SBP. Frisvold (2015) demonstrates that schools with a binding mandate are at least 33 percentage points more likely to provide breakfast through the SBP in 2004 and nearly all schools continue to offer breakfast once the requirement initially binds. We use information about these mandates to estimate causal impacts on food insecurity among children.

The availability of the SBP has the potential to reduce food insecurity through two mechanisms. First, the SBP may increase children's total consumption in the morning hours.

[1]For further details about the SBP, see Food Research and Action Center (2012); Fox, Hamilton, and Lin (2004); and Frisvold (2015).
[2]An exception is that schools with a high percentage of free or reduced-price eligible students may adopt community eligibility and not charge for breakfast to reduce the administrative costs of determining eligibility.

Second, even if the SBP does not increase breakfast consumption but merely shifts breakfast consumption from the home to the school, the availability of the SBP could reduce food insecurity because of the implied income transfer. The evidence on the impact of the availability of the SBP on breakfast consumption is mixed, but more evidence supports the possibility that the SBP shifts breakfast consumption from the home to the school. For example, Bhattacharya, Currie, and Haider (2006) and Frisvold (2015) estimate that providing breakfast in schools through the SBP has no impact on eating breakfast, which is consistent with the SBP shifting breakfast consumption from the home to the school, whereas Bartfeld et al. (2009) find that providing breakfast in schools reduces breakfast-skipping among elementary school students in Wisconsin.

The SBP could provide a transfer of resources to the household if public funds instead of household funds are used to provide breakfast for school-aged children. The exact amount of this transfer depends on the number of school-aged children in the household and how much households would have spent on breakfast at home in the absence of the SBP to provide a comparable meal. Due to the economies of scale from providing meals to a large number of students at school, the federal reimbursement rate is potentially a lower bound on the value of the implied income transfer.[3] To provide a guide on the potential amount of the transfer, we use the 2011 reimbursement rate for severe-need schools for free breakfast of $1.76 per meal, finding that a household with two children in school who consume breakfast for five days per week has an additional $74 per month or $665 per school year available for other household purchases.[4] To provide perspective, this amount is approximately 55% of the average monthly Supplemental Nutrition Assistance Program (SNAP) benefit per person in 2011 and 157% of the average monthly Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) food cost per person in 2011.[5] Thus, the SBP could reduce household food insecurity by providing additional resources to households with school-aged children.

Any potential reduction in food insecurity among individuals within households depends on how the additional resources change the division of resources within households. For example, parents of children who receive school meals may reduce the amount of food provided at home to provide scarce resources to other household members. Additionally, due to the implicit transfer of funds for breakfast, households could reduce their food expenditures and use their resources for other goods, which could potentially partially offset any reduction in food insecurity.

BACKGROUND LITERATURE

Although there are large literatures examining the effects of many food programs, such as SNAP, WIC, and the NSLP, on children's health and development outcomes, less is known

[3]The federal reimbursement rate covers expenses beyond the price of food such as labor costs. Based on the School Lunch and Breakfast Cost Study II, food expenses comprise about half of the costs of preparing school meals: http://www.fns.usda.gov/sites/default/files/MealCostStudyExecSum.pdf.

[4]Note that this is one estimate of the potential implied value of the SBP, which assumes that the federal reimbursement rate is a reasonable estimate of the value to households of the meal, in addition to the assumption stated in the text that the household has two children who consume breakfast for five days per week for each month of the school year.

[5]Sources: http://www.fns.usda.gov/sites/default/files/pd/SNAPsummary.pdf and http://www.fns.usda.gov/pd/wic-program.

about the effects of the SBP. One of the most influential papers in this literature is by Bhattacharya, Currie, and Haider (2006), which used the NHANES III (1988–1994) data and a difference-in-differences strategy to examine the nutritional effects of the SBP on both the school-age child and his/her siblings. Using survey data reporting the availability of school breakfast for each child in the study, the authors compare differences in nutritional outcomes based on availability and on summer vs. non-summer month of survey. The authors find that the availability of the SBP is related to better nutrition. While the total caloric intake was the same across children, the SBP increased scores on the healthy eating index and reduced the percentage of calories from fat, reduced micronutrient deficiencies, and increased fiber. The authors also found evidence that preschool children (the siblings) and adults had healthier diets when the SBP was available.

Our paper extends the Bhattacharya, Currie, and Haider (2006) paper in a number of ways. First, expanding on their emphasis on the nutritional effects of the SBP, we focus on examining the SBP's effects on food insecurity. Second, we use a different identification strategy. Third, we use more recent data. The nutritional quality of school breakfasts has likely improved since the NHANES III data collection period (1988–1994), because federal legislation, through the enactment of the School Meals Initiative for Healthy Children (SMI) in 1995, requires that school breakfasts be consistent with the Dietary Guidelines for Americans.

This project is also related to Frisvold (2015), which utilizes information about state mandates to determine the impact of the availability of the SBP on academic achievement using data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K) and the National Assessment of Educational Progress (NAEP). Our paper uses similar identifying variation, but builds upon Frisvold (2015) by examining state mandates over a longer time period (1999–2010 instead of 2003–2004) and by focusing on the impact on food insecurity.

Also closely related to this project is Bartfeld et al. (2009), which examines the impact of the availability of the SBP on food insecurity among third grade students in 2002 using ECLS-K data and whether a state has a mandate as an instrument for the availability of the SBP. Bartfeld et al. (2009) conclude that the availability of the SBP reduces marginal food security by 14 percentage points. Our paper builds upon Bartfeld et al. (2009) by examining state mandates over a longer time period, using information on the levels of the state mandates for identifying variation, and using an alternate data source of information on food insecurity; one limitation of using ECLS-K data is the lower prevalence of food insecurity compared to other national datasets.

Overall, whereas there is important research examining the effects of SBP on children's health and developmental outcomes, we extend this previous research by using additional causal methods, recent data, and focus on children's food security as key outcomes of interest in order to more directly craft policy interventions to reduce the recent higher rates of food insecurity among children.

RESEARCH METHODS

In order to examine the causal effects of the SBP on children's food security, we use a difference-in-differences (DD) design following Frisvold (2015). The key idea is that state mandates requiring schools to provide breakfast contain specific thresholds that are tied to the proportion of students eligible for free or reduced-price (FRP) meals. We leverage this variation by merging information on the proportion of FRP students with our individual-level data (NHANES) that contain food security data.

There are three important considerations for these state mandates to plausibly affect food security. These are described in detail in Frisvold (2015) and briefly mentioned here. First, these mandates need to influence whether schools offer breakfast through the SBP. Frisvold (2015) finds that elementary schools required to offer the SBP because the percentage of FRP students exceeds the state threshold are at least 33 percentage points more likely to offer breakfast through the SBP than elementary schools that are not required to offer the SBP. We verify this relationship with NHANES data as described below. Additionally, based on the longitudinal ECLS-K data, Frisvold (2015) finds that once schools begin to offer breakfast because of a state requirement, they all continue to offer breakfast in future years even if no longer required to do so. Second, schools must not be able to precisely manipulate the percentage of free and reduced-price eligible students in the school to fall just above or below the threshold. Since these thresholds are known in advance, this type of manipulation is possible. However, direct certification of students as eligible for free school meals based on participation in SNAP or TANF using administrative records reduces this possibility, and Frisvold (2015) does not find evidence suggesting that schools manipulate the percentage of FRP students around the state thresholds. Third, state thresholds must not have been chosen so that specific schools fall above or below the threshold or chosen in response to the food security status of the households of these schools. Since most states developed these mandates by the early 1990s, it is unlikely that the specific threshold values could be chosen based on later household food security rates, particularly since measures of food security had yet to be created.[6] Additionally, Frisvold (2015) demonstrates that the thresholds of the state requirements in 2004 are uncorrelated with the economic conditions of the state in 1990.

Using these state mandates as an identifying source of variation, we compare the likelihood that a child is food insecure within a state among schools with different percentages of FRP students (and, thus, differences in whether the school is above or below the threshold for the state mandate) and across states among schools with similar percentages of FRP students but with different state-mandated thresholds. An important identifying assumption for this approach is that the relationship between child food insecurity and the percentage of FRP students in the school would be similar in states with different thresholds in the absence of the requirement to offer the SBP. As a result, differences in food insecurity across schools

[6]As shown in Table 1, 23 states had a mandate in 2002. These 23 states had a mandate in 1997. Twenty of the states had a mandate in 1993. Fifteen states had a mandate in 1991, with three states (Arkansas, Louisiana, and Oregon) adopting mandates in 1991 and Minnesota introducing a mandate in 1989. This increase in state policies follows the introduction of the incentives in the Child Nutrition Act of 1989 that allocated federal resources to states to offset the start-up costs of implementing the SBP in schools (Frisvold 2015).

with different percentages of FRP students within a state with a low threshold mandating the SBP would provide an appropriate counterfactual of the differences across schools within a state with a higher threshold. Frisvold (2015) provides evidence consistent with this identifying assumption for student achievement.

Specifically, we estimate the difference-in-differences regression:

$$Y_{ijst} = \delta_1 P_{jst} + \delta_2 Z_{jst} + \pi X_{ijst} + \tau_s + \varphi_t + \nu_{ijst} \quad (1)$$

where Y_{ijst} is a measure of the food security status of student i in school j in state s in year t. P_{jst} denotes a set of dummy variables indicating whether the percentage of FRP students in the school is greater than or equal to each of the levels used to define the mandated thresholds.[7] τ_s represents state fixed effects, which control for the level of the mandated threshold and constant state characteristics, X is a vector of individual and school characteristics, φ_t represents year fixed effects, and ν is a stochastic error term. State mandates require that school j in state s in year t provides breakfast through the SBP if the percentage of FRP students, FRP_{jst}, is greater than or equal to the state-specific threshold, t_{st}, such that $Z_{jst} = 1\{FRP_{jst} \geq t_{st}\}$. δ_1 represents the relationships between different levels of the percentage of FRP students in the school and food insecurity among children, the state dummy variables capture the influence of the differences in state mandates and other state characteristics, and δ_2, which is the coefficient of interest, represents the influence of a binding state mandate on food insecurity among children. Thus, this specification compares students in schools with similar percentages of FRP students, but with different requirements about whether to participate in the SBP based on the state mandates, and students in schools with different percentages of FRP students but with the same state mandate.

DATA

In order to examine our research questions, we combine information across multiple datasets to merge household-/individual-level data from the National Health and Nutrition Examination Surveys 1999–2010 (NHANES), which contain food security information, with additional datasets that measure policy variation at the state and school levels. NHANES is a nationally representative survey that contains self-reported information on school breakfast availability and a vast amount of information on food security and nutritional intake. A benefit of NHANES is the large sample of school-aged children; however, NHANES collects survey data from approximately only 15 counties per year.[8]

We examine the relationship between state requirements and attending a school that offers school breakfasts, the relationship between state requirements and school breakfast consumption, and the relationship between state requirements and food insecurity. By examining a large dataset with information on food security that enables us to link school-

[7]The levels of these thresholds are 10%, 20%, 25%, 30%, 33%, 35%, 40%, 80%, and 85%, as shown in Table 1.

[8]Due to the policies granting access to the restricted geographic identifiers in the NHANES data, we are unable to disclose which counties or states are included in the sample or how the geographic representation of the NHANES sample is correlated with states' SBP policies.

level information, we provide a comprehensive picture of the relationship between the SBP and food insecurity.

We construct measures of food insecurity based on the USDA's food security scales. For households with children, NHANES includes 18 questions to assess food security status with 10 questions asked about adults and eight questions asked about children. These questions ask whether adults and children reduced the size of meals, skipped meals, did not eat throughout the day, or lost weight because of insufficient resources. Households with at least eight positive responses are classified as having very low food security, households with at least three positive responses are classified as having low food security and are food insecure, and households with at least one positive response are classified as having marginal food security (USDA 2012a). We focus our analysis on the household measures of food security for children. Children in households with at least one out of eight positive responses have marginal food security, with at least two positive responses have low food security, and with at least five positive responses have very low food security. Although the labels for these terms have changed over time, the measurement has remained constant.

To construct the key policy variation in the SBP across states, we use data from the Common Core of Data (CCD) and the Food Research and Action Center. The key to our identification strategy is to compare students in schools that are mandated to provide school breakfasts with students in similar schools that are not mandated. The mandates vary by state and are a function of the proportion of students eligible for free and reduced price meals in each school. Therefore, we need data reflecting the state mandates and data reflecting the proportion of students eligible in each school. The CCD is a database available from the National Center for Education Statistics that includes student information collected from administrative records maintained by state education agencies. The CCD provides information on the number of students eligible for free and reduced price lunch and the total number of students in the school for the universe of public elementary and secondary schools since 1999.

Information about state mandates is available from the School Breakfast Scorecards for each year for each grade between 1999 and 2010 from the Food Research and Action Center (FRAC). We cross-referenced and supplemented the information about these mandates directly with the state statutes. These mandates require schools to offer breakfast as part of the SBP if the percentage of FRP students is equal to or greater than a specific threshold. Table 1 displays the state thresholds for elementary and high schools for the 2001 to 2002 and 2009 to 2010 academic years. As shown in Table 1, 23 states imposed a mandate in 2002, whereas 27 states implemented a mandate by 2010.

In order to implement our identification strategy, it is necessary to combine the state-level data on SBP requirements and the school-level data on the percentage of FRP students in the school with the NHANES. Because NHANES data do not include school identification codes of the children in the household, we use census blocks to merge the CCD data to restricted-access NHANES data using information about which census blocks correspond to each school's catchment area.[9] In order to measure the likely school catchment area for each household, we used data from the School Attendance Boundary information System

(SABINS), which has selected areas for 2009–2010 to 2011–2012 school years (we use 2009–2010 in this paper, which is the only available information for GIS boundary files) (College of William and Mary and the Minnesota Population Center 2011).[10] The schools covered in the SABINS data represent approximately 70% of the children enrolled in public schools in the U.S. We also supplemented the SABINS data with school boundary files from Washington and Arkansas that are publically available. Since the SABINS data contain the NCES school identification codes used by the CCD, we merged the SABINS school data with the CCD to measure school-level rates of free and reduced-price lunch eligibility.[11] We then merged the SABINS catchment information (and CCD information) with the NHANES data at the census block level, allowing multiple schools to be included for each block. Based on the age(s) of the children in the NHANES households, we matched the children to their most likely school using an estimate of the child's grade level (there are separate crosswalk files from SABINS for each grade level). In the small proportion of cases where there was more than one potential school, we used average values across potential schools.

By merging the state-level and school-level data with the NHANES data, we are able to determine whether a state mandate that schools offer the SBP binds—meaning that the school is required by law to offer breakfast through the SBP—for the locally zoned school that the individual in the NHANES survey most likely attended based on the number of years of schooling completed and whether the individual is currently attending school.[12][13] In some cases, the locally zoned school will differ from the school that the student actually attended. When these schools differ, the measure based on the locally zoned school reflects potential exposure to the SBP and abstracts from household decisions about private schools, charter schools, magnet schools, and other forms of school choice.

The NHANES survey also includes measures of whether breakfast is available in school and whether the student eats breakfast at school, which are self-reported by the parent. In an attempt to solicit information specifically about the SBP, instead of food from vending machines or other foods at school that could substitute for breakfast, NHANES asks parents whether the school serves "a complete breakfast that costs the same every day" (NHANES 2010). If the school does offer breakfast, parents are asked how many times per week the student eats a complete breakfast at school. Although the wording of these questions could minimize measurement error because of misclassifying any breakfast food as equivalent to the SBP, other forms of measurement error are possible. Parents whose children do not consume breakfast in school may be unaware of the availability of breakfast and this nonclassical measurement error can bias the estimates. Measurement error for this reason could be more likely among parents with older children, as participation in the SBP is more common for younger students and parents with younger students are better able to report the

[9]This level of geography is available only through the Census Research Data Centers.
[10]SABINS data, available at http://www.sabinsdata.org, come from a variety of sources. The GIS files are created using information provided by individual schools, districts, and states in combination with TIGER/Line census block data that the U.S. Census Bureau creates.
[11]We thank Rozalynn Klaas at the Applied Population Laboratory at the University of Wisconsin–Madison for help merging the SABINS data.
[12]Important limitations of these data include that we only have school boundary files for one year and boundaries are not always stable across years.
[13]As shown in Table 1, the thresholds for Indiana and Ohio changed during this period. We merge the current state thresholds for that school year to students and households.

food consumption of children (Gordon et al. 2007).[14] Thus, although we examine the impact of SBP state mandates on the availability of the SBP and breakfast consumption, because of the potential measurement error concerns, we do not scale the estimates for food insecurity by the corresponding estimate on the availability of the SBP. Instead, we interpret the primary results as reflecting the impact of SBP state mandates on food insecurity among children.

For the NHANES 1999–2010 waves, we restrict the sample to the 11,829 individuals between the ages of 6 and 16 who are in school with non-missing food security information and non-missing information on the availability of school breakfast.[15] We then restrict the sample to the 3,847 observations that include state of residence and the percentage of free and reduced-price eligible students in the local schools. Most of these observations (7,642) are excluded because no school is assigned to the census block.[16] Further, we restrict the sample to the 2,734 individuals in states requiring some, but not all, schools to provide breakfast through the SBP. Although Frisvold (2015) demonstrates that the levels of the state thresholds are uncorrelated with state characteristics prior to the adoption of these policies, whether a state has a mandate is correlated with prior state economic conditions.[17] As a result, we restrict attention to individuals in states with a partial mandate to minimize policy endogeneity related to the adoption of state mandates about the SBP. The characteristics of these students are shown in Table 2. As shown in the table, the characteristics of individuals in the analysis sample are similar to the characteristics of individuals in the entire sample. Thus, while the sample restrictions significantly reduce the size of the sample, the observable characteristics of the analysis sample remain comparable to the larger sample of students from the NHANES survey.

RESULTS

Table 3 displays the difference-in-differences estimates based on equation (1) using NHANES data for all children, students in households with incomes less than 185% of the poverty line, children ages 6–11 (elementary school ages), and children ages 11–16.[18] These estimates suggest that children who attend schools that are required to offer breakfast through the SBP are (overall) 11 percentage points more likely to attend a school that offers breakfast through the SBP and 25 percentage points more likely for students in low-income households. This estimate is larger for elementary school students at 42.7 percentage points and small and insignificant (7.1 percentage points) for older students. The estimate for elementary school students is similar to the estimate of 33 percentage points from Frisvold

[14]For example, Gordon et al. (2007) report that, in the 2004 to 2005 school year, 31.2% of elementary school students usually participated in the SBP, while only 16.3% of high school students did.

[15]Among individuals between the ages of 6 and 16 who are in school, 454 do not have information about the availability of school breakfast and 325 do not have information on food security.

[16]This is due to incomplete coverage of the SABINS and school boundary data.

[17]We replicate the analysis from Frisvold (2015) and also find that the economic characteristics of the state in 1990 are uncorrelated with the levels of the state mandates shown in Table 1 for both elementary and high schools in 2002 and 2010. However, we are not able to examine whether the food insecurity rates in 1990 are correlated with the later state mandates, since food insecurity rates are not available for this period.

[18]In the reported estimates, we include the parent's highest level of education, whether the parents are married, whether the parents are divorced, and the income/poverty ratio as additional covariates. Because of missing data on these variables, the sample size falls to 2,205. The results are similar when we exclude these covariates and estimate the regressions for the sample size of 2,734.

(2015) for fifth grade students in 2004 using ECLS-K data. Table 3 also shows some small increases for reports of eating breakfast for the full sample and low-income sub-sample, but these average results differ substantially by age of the child. The results show large increases (54 percentage points) for elementary school children and no effect for older children.

Table 3 also presents estimates of impacts of state SBP policies on food security outcomes. The DD estimates for all children and children in low-income households suggest that a binding state mandate reduces the likelihood of having very low food security among children. For all children, the reduction in the likelihood of very low food security is 2 percentage points. Since the baseline rate of very low food security is 2%, this estimate represents a 100% reduction. However, since schools continue to offer the SBP once the state mandate initially binds, these estimates represent the cumulative exposure of students to the SBP.[19] The estimates for very low food security for the low-income sub-sample are larger, but not statistically significant. The estimates for the other categories of food security are more mixed and not statistically significant. However, the overall estimate masks larger and statistically significant estimates for young children along each of the margins of food insecurity and small and not statistically significant effects for older children. Thus, the estimates consistently suggest that state policies requiring schools to offer the SBP reduce food insecurity among elementary school students.

DISCUSSION AND CONCLUSION

In this paper, we examine the impact of the availability of the SBP on food insecurity by merging restricted-access NHANES data with school-level poverty data and state policy information. Overall, the estimates suggest that the SBP reduces food insecurity rates for elementary school aged children. Indeed, the results for these children are very large in magnitude. Specifically, we find that access to the school breakfast program reduces the likelihood of indicating low food security by over 15 percentage points. To place the results in context, Bartfeld et al. (2009) find that the availability of the SBP reduced marginal food security among elementary school children by 14 percentage points. Evaluating a different program (WIC), Kreider, Pepper, and Roy (2016) find that participation reduces food insecurity by at least 3.6 percentage points using NHANES data; however, the upper bounds of their estimate extend up to 51.9 percentage points. It is possible that our estimates are biased due to limitations with the NHANES data, which contain information only from households living in a small number of counties in the U.S. These counties may not be representative of the average effects of the School Breakfast Program on food insecurity in the U.S. Another limitation with the data is that we have incomplete coverage of information that can link school catchment assignments with the household census block locations. Future work could partially examine these issues by deploying data on food insecurity from the Current Population Survey.

On balance, our results suggest improvements in the food security status of young children due to requiring the provision of breakfast at school. The lack of effects for older children

[19]Unfortunately, the sample size limits our ability to document how the impacts on food insecurity vary by grade and by the number of years that students have been potentially exposed to the SBP.

may reflect a higher perceived stigma of eating breakfast at school for junior high and high school aged children. Future policy directions for the School Breakfast Program might include further expansions for elementary school children as a way to reduce food insecurity as well as a need for further experimentation of ways to increase take-up for older children before expanding the program at the high school level.

Acknowledgments

We thank Judi Bartfeld, Katie Fitzpatrick, participants at the Agricultural and Applied Economics Association, American Society of Health Economists, Association for Education Finance and Policy, Penn State Census Research Data Center, and UKCPR grant progress report conferences, and seminar participants at the University of Minnesota for helpful comments. We thank Rachelle Hill, Ajay Yesupriya, Jing Tian, and Melissa Banzhaf for their assistance in accessing the restricted-use NCHS data. We thank Taehoon Kim, Emily Leslie, Sean Lewis-Faupel, and Mike McLaughlin for helpful research assistance and Rozalynn Kraus for help with ArcGIS. This project was supported with a grant from the University of Kentucky Center for Poverty Research (UKCPR) through funding by the U.S. Department of Agriculture, Food and Nutrition Service, contract number AG-3198-B-10-0028 and support from the Institute for Research on Poverty at the University of Wisconsin-Madison. The research in this paper was conducted while the authors were Special Sworn Status researchers of the U.S. Census Bureau at the Minneapolis Census Research Data Center and WiscRDC at the University of Wisconsin-Madison. This paper has been screened to insure that no confidential data are revealed. The findings and conclusions in this paper are those of the authors and do not necessarily represent the views of the Research Data Center, the National Center for Health Statistics, the Centers for Disease Control and Prevention, the Census Bureau, the UKCPR, or any agency of the Federal Government.

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J Consum Aff. Author manuscript; available in PMC 2018 July 11.

TABLE 1

Overview of State School Breakfast Program Requirements

	2001–2002			2009–2010		
State	**State Has a Requirement**	**Threshold for Elementary Schools**	**Threshold for High Schools**	**State Has a Requirement**	**Threshold for Elementary Schools**	**Threshold for High Schools**
AL	0	.	.	0	.	.
AK	0	.	.	0	.	.
AZ	0	.	.	0	.	.
AR	1	0.2	0.2	1	0.2	0.2
CA	0	.	.	0	.	.
CO	0	.	.	0	.	.
CT	1	0.8	.	1	0.8	.
DE	0	.	.	0	.	.
DC	0	.	.	1	0	0
FL	1	0	.	1	0	.
GA	1	0.25	0.4	1	0.25	0.4
HI	0	.	.	0	.	.
ID	0	.	.	0	.	.
IL	0	.	.	1	0.4	0.4
IN	1	0.25	0.25	1	0.15	0.15
IA	1	0	0	0	.	.
KS	1	0.35	0.35	1	0.35	0.35
KY	0	.	.	0	.	.
LA	1	0.25	0.25	1	0.25	0.25
ME	0	.	.	0	.	.
MD	1	0	.	1	0	.
MA	1	0.4	0.4	1	0.4	0.4
MI	1	0.2	0.2	1	0.2	0.2
MN	1	0.33	0.33	1	0.33	0.33
MS	0	.	.	0	.	.
MO	1	0.35	0.35	1	0.35	0.35

State	2001–2002			2009–2010		
	State Has a Requirement	Threshold for Elementary Schools	Threshold for High Schools	State Has a Requirement	Threshold for Elementary Schools	Threshold for High Schools
MT	0	.	.	0	.	.
NB	0	.	.	0	.	.
NV	0	.	.	0	.	.
NH	0	.	.	0	.	.
NJ	0	.	.	1	0.2	0.2
NM	0	.	.	1	0.85	.
NY	1	0	0.4	1	0	0.4
NC	0	.	.	0	.	.
ND	0	.	.	0	.	.
OH	1	0.33	0.33	1	0.2	0.2
OK	0	.	.	0	.	.
OR	1	0.25	0.25	1	0.25	0.25
PA	0	.	.	0	.	.
RI	1	0	0	1	0	0
SC	1	0	0	1	0	0
SD	0	.		0	.	
TN	1	0.25	0.4	1	0.25	0.4
TX	1	0.1	0.1	1	0.1	0.1
UT	0	.	.	0	.	.
VT	0	.	.	1	0	0
VA	1	0.25	0.25	1	0.25	0.25
WA	1	0.4	0.4	1	0.4	0.4
WV	1	0	0	1	0	0
WI	0	.	.	0	.	.
WY	0	.	.	0	.	.

Notes: A threshold of zero means that all schools are required to provide breakfast through the SBP. *Sources* are the FRAC (1999–2010) and Frisvold (2015).

TABLE 2

Descriptive Statistics

	All Students	Students in States with a Partial Mandate
Household very low food security	0.084 (0.278)	0.087 (0.282)
Household low food security	0.256 (0.436)	0.266 (0.442)
Households with marginal food security	0.371 (0.483)	0.372 (0.483)
Child with very low food security	0.020 (0.140)	0.020 (0.142)
Child with low food security	0.168 (0.374)	0.174 (0.379)
Child with marginal food security	0.245 (0.430)	0.249 (0.432)
Household with very low food security among adults	0.080 (0.271)	0.081 (0.273)
Household with low food security among adults	0.221 (0.415)	0.225 (0.418)
Households with marginal food security among adults	0.359 (0.480)	0.362 (0.481)
SBP is offered in school	0.825 (0.380)	0.883 (0.322)
Child eats school breakfast	0.494 (0.500)	0.495 (0.500)
Percent FRP eligible in school (current)		52.786 (26.395)
State mandate threshold		22.947 (10.892)
Distance to the threshold		43.737 (29.710)
Child attends a school above the threshold		0.903 (0.295)
Age	12.314 (2.801)	12.473 (2.801)
Female	0.501 (0.500)	0.476 (0.500)
Black	0.302 (0.459)	0.384 (0.487)
Hispanic	0.382 (0.486)	0.320 (0.466)
Other race/ethnicity	0.048 (0.214)	0.042 (0.201)
Parent’s highest level of education	12.506 (2.548)	12.632 (2.541)
Parents are married	0.648 (0.478)	0.625 (0.484)
Parents are divorced	0.194 (0.395)	0.211 (0.408)
Income/poverty ratio	2.052 (1.514)	2.105 (1.507)
Sample size	11,829	2,734

Notes: Standard deviations in parentheses below the means. *Source* is the NHANES 1999–2010.

TABLE 3

The Impact of SBP Requirements on the Availability of Breakfast, Breakfast Consumption in School, and Food Security Status

	All Students / Households	Students / Households with Income<185%	Students Ages 6–11	Students Ages 11–16
SBP is available	0.112 (0.073)	0.250 ** (0.096)	0.427 ** (0.213)	0.071 (0.082)
Observations	2,205	1,166	732	1,473
Eats school breakfast	0.027 (0.044)	0.050 (0.096)	0.541 *** (0.095)	−0.056 (0.053)
Observations	1,933	1,078	650	1,283
Child with very low food security	−0.020 * (0.011)	−0.025 (0.035)	−0.054 ** (0.026)	−0.016 (0.013)
Observations	2,205	1,166	732	1,473
Child with low food security	−0.032 (0.037)	0.033 (0.096)	−0.159 ** (0.078)	−0.002 (0.051)
Observations	2,205	1,166	732	1,473
Child with marginal food security	−0.032 (0.033)	0.076 (0.145)	−0.099 * (0.053)	−0.017 (0.038)
Observations	2,205	1,166	732	1,473

Notes: Standard errors, which are shown in parentheses, allow for clustering within states. The estimates correspond to the coefficients of the variable denoting that the school is required to offer the SBP. Additional variables not shown include state fixed effects, dummy variables denoting whether the percentage of FRP students in the school exceeds each of the levels used to define the state mandates (10%, 20%, 25%, 30%, 33%, 35%, 40%, and 80%), age, gender, race/ethnicity (black, Hispanic, and other race, with white excluded), poverty to income ratio, parent's education, parents' marital status, grade, and the percentage of FRP students in the school. Each panel and column represents the estimates from separate regressions. *Source* is the NHANES 1999–2010.

* p<0.10,

** p<0.05,

*** p<0.01