Estimating the Effects of Subsidized School Meal Provisions on Child Health: Evidence from the Community Eligibility Provision in Georgia Schools

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Abstract

For many children in the United States, subsidized school meals represent a vital source of reliably available and nutritious food. While a growing interdisciplinary literature provides evidence on the relationship between nutrition assistance programs and a multitude of outcomes, additional work is needed to estimate the effect of subsidized school meals on child health. In this study, we utilize variation caused by the Community Eligibility Provision (CEP) in Georgia's K-12 schools to estimate models of school-level child health measured by the percentage of healthy weight children within a school and average Body Mass Index (BMI) score. We use CEP eligibility as an instrument for CEP participation, an instrument for the percentage of school lunches provided for free or reduced-price, and in the reduced form. Our results suggest that CEP participation increases the percentage of a school's students who fall within the healthy weight range and reduces school-level average BMI scores. We find no evidence to support a deleterious effect from either CEP participation or percentage of free and reduced-price lunch on our school-level child health outcomes. Our results remain consistent for elementary, middle, and high schools, as well as schools located in urban areas, rural areas, and suburbs/towns.

1 Introduction

Children spend a sizable portion of each day in school where they consume between one-third and one-half of their daily calories (Schanzenbach 2009, Briefel et al. 2009). Of these calories, a major portion come from subsidized school meals provided through School Food Programs (SFPs) like the National School Lunch Program (NSLP) and the School Breakfast Program (SBP). The NSLP is the nation's largest SFP and the second largest nutrition assistance program behind the Supplemental Nutrition Assistance Program (SNAP). The NSLP subsidizes meal provisions in over 95% of all U.S. public schools at an annual cost of $13.6 billion dollars.[1] 30.4 million children participated in the NSLP during 2016, 21.6 million of who were from low-income households receiving Free or Reduced-price Lunch (FRL).[2]

For many of the nation's children, these subsidized school meals represent a critical source of reliably available and nutritious food. For the most at-risk children, school meals may be the difference between going through the school day hungry and not. Although the primary goal of SFPs is to improve the nutrition, food security, and health

[1]FRAC 2017

[2]FRAC 2017, USDA 2017

of children, existing empirical evidence suggests that not all of the effects from school meals are beneficial. One pivotal question often raised by researchers and policymakers is to what programs like the NSLP affect child Body Mass Index (BMI) scores. Results are mixed, but existing work suggests that children receiving school lunch are more likely to have higher BMIs than their peers (Millimet et al. 2010, Schanzenbach 2009). With millions of children receiving subsidized school meals each day, the proposed effect of SFPs on weight has caused them to face mounting opposition.

While causal evidence is needed to understand the effect of school meal participation on child weight, most existing studies are purely associational. Like many empirical questions, the primary hurdle to causal estimation has been endogeneity. Children who participate in school meals are likely different than children who do not participate, and children who receive free or reduced-price meals are likely different than ineligible children and eligible non-participants. In cases where these differences are unobservable, the effects captured by estimation will be uncertain. We address the endogeneity in school meal participation by exploiting an exogenous change in free school meal provisions caused by the Healthy Hunger Free Kids Act's (HHFKA's) Community Eligibility Provision (CEP). As opposed to the traditional system where individual families apply for free and reduced-price school meals, the CEP allows eligible schools serving low-income children to provide free lunch and breakfast to all students attending the school, no exceptions. Therefore, the CEP causes a change in school meal provisions that is independent of individual family free or reduced-price meal eligibility or take-up.

The CEP was primarily designed to increase take-up rates among children who were eligible for free or reduced-price school meals but did not participate. One potential reason for the low take-up rate of SFPs involves the child's family. Parents may be unaware of their options regarding nutrition assistance programs or unsure about their personal eligibility. Even if families are aware, they may not fully understand the application process or be able to complete the required paperwork. By providing every student in a school with free meals, the provision targets children who were not adequately reached under the existing system. In addition to the provision of free school meals, the CEP may also remove the stigma attached to children who receive free meals in schools which is another impediment to participation. While many eligible schools chose to enroll in the CEP during its first few years, participation rates are still lower than one might expect. During the 2015-2016 school year, more than 18,000 schools (half of all eligible schools) in nearly 3,000 school districts adopted the CEP, reaching around 8.5 million children nationwide (USDA, 2016).

In this study, we estimate the CEP's effect on child health in the state of Georgie both directly and as an instrument for free school meal provisions. More specifically, we first estimate models of school-level child health outcomes using school CEP eligibility as an instrument for CEP participation. Second, we use CEP eligibility as an instrument free school meal provisions which we proxy for using FRL%. We also estimate the CEP's intent-to-treat effect on school-level measures of child health in the reduced form. Given that the effect of free school meals on child health is likely to vary by school type, we estimate our results separately for elementary schools, middle schools, and high schools, as well as urban schools, rural schools, and schools in suburbs and towns. The study employs data from K-12 schools in the state of Georgia over the 2011-2012 to 2016-2017 school years. Our school-level child health outcomes of interest include the percentage of a school's students in the healthy weight range and school average BMI.

Our results suggest that CEP participation and subsequent increases in free school meal provisions increases the percentage of a school's students who fall within the healthy weight range and reduces school-level average BMI scores. We find no evidence to support a deleterious effect from either CEP participation or the percentage of free and reduced-price lunches on our school-level child health outcomes. Furthermore, we find nearly identical results for our model of CEP participation relative to the effect of changes in free school lunch following participation. This similarity suggests that the change in child health caused by the CEP is likely driven by increases free meal provisions rather than alternative mechanisms like the removal of stigma or changes to the school's revenues/spending. The reduced form results of our intent-to-treat analyses also indicate that CEP eligibility increases healthy weight percentages and reduces average BMI for all school types.

While the use of aggregated measures limits our ability to detect the source of weight changes, a decrease in mean BMI combined with an increase in healthy weight percentage suggests that the change in school-level child weight is most likely driven by overweight or obese children losing weight rather than changes at another portion of a school's weight distribution. Our results also remain robust to a placebo test using future eligibility in a model of health during the pre-CEP period.

Our study represents a significant contribution to the literature by providing causally interpretable estimates of the effect of CEP participation and free school meal provisions on aggregate measures of child health. To our knowledge, we are the first study to estimate the CEP's effect on child health. Our results indicate that free school meals lead to improved health outcomes within schools by increasing the percentage of students in the healthy weight range and reducing average BMI. Our findings suggest that providing additional free school meals may be an effective policy tool in the fight against childhood obesity and overweight. Additionally, we find evidence that the CEP has a differential impact among schools in different location types. While rural schools serve children in Georgia's poorest counties, urban schools are far more likely to participate in the CEP even though their average free meal provision rates were higher on average during the period prior to the CEP's roll-out. Furthermore, while we find a statistically significant effect from the CEP on weight outcomes for urban schools and schools in suburbs/towns, the effect for rural schools in insignificant. Given this heterogeneity in participation and resulting health impacts, the results of our study suggest that a health disparity between disadvantaged children from different areas may develop if the CEP cannot be made effective, feasible, and attractive to schools in all location types.

2 Literature Review

In recent years, a growing literature has explored the various potential mechanisms through which school feeding programs impact child health outcomes. There are two primary channels that researchers have historically focused on. The first channel is food insecurity. Existing evidence suggests that food insecurity leads to poorer subsequent child health outcomes including parent assessed child health (Cook et al. 2006, Kirkpatrick et al. 2010), mental health (Melchior et al. 2012, Whitaker et al. 2006), malnutrition risk (Eicher-Miller et al. 2009), and child weight (Kuku et al. 2012, Gundersen and Kreider 2009). Since children from households with lower incomes are more likely to experience food insecurity, providing free or reduced-price meals in low-income schools may play a significant role in protecting these children and their families from food insecurity. Huang et al. (2015) find that NSLP participation is associated with a reduction in food insufficiency risk of nearly 14%. Moreover, rates of child food insecurity are higher during summer months when children stop receiving meals in school (Huang et al. 2016). In a similar study, Aretga and Heflin (2014) instrument for NSLP participation with child age relative to state Kindergarten cut-off dates and provide evidence that NSLP participation reduces food insecurity.

The second primary channel is dietary quality. The effect of SFPs on diet quality depends on the quality of school meals relative to what a child would consume were they to bring meals from home. For lower income households, we expect the change in quality from switching to school meals to be positive if low quality processed foods are more affordable and readily available. Smith (2017) compares the effect of NSLP and SBP participation on the diets of children across the distribution of initial diet quality. The author finds that both programs improve the diets of nutritionally disadvantaged children, but the effect varies considerably across the quality distribution and leads to a decrease in diet quality for children towards the distribution's upper tail. Bhattacharya et al. (2006) find that participation in the SBP increases scores on the Healthy Eating Index (HEI), reduces the percentage of calories coming from fat, and reduces the probability of several micronutrient deficiencies. Farris et al. (2014) examine a small survey of school lunches and packed lunches brought from home for Pre-K and Kindergarten students. On average, the authors find packed lunches to be of lower nutritional quality with regards to protein, fiber, calcium, and vitamin A, and higher in fat and calories. If this difference in quality is indeed common across schools, meals provided through the NSLP would provide the nutrition necessary for students while also reducing the intake of foods that are more likely to cause obesity.

Alternatively (albeit before the HHKA's changes to minimum nutrition standards), Campbell et al. (2011) find that participants in the NLSP do not consume higher-quality lunches than children who do not participate in the program. The authors instead suggest that NSLP participants consume a higher quantity of food at lunch and similar amounts for other meals. Furthermore, the authors find that children attending schools that do not participate in the NSLP have dietary outcomes similar to NSLP participants, a finding that is supported by Fox et al. (2010). Other studies find that NSLP participants consume more of their calories at school from low-nutrient, energy-dense foods such as pizza (Briefel et al. 2009, Gordon et al. 2007). At this time, the literature finds mixed results regarding the relative nutritional quality of school meals versus those brought from home.

While school meal provisions have the potential to impact multiple outcomes, body composition is the most commonly used measure in studies evaluating the effect of SFP participation on child health. In general, existing evidence suggests that poverty and poverty-related outcomes have a significant effect on child weight. For example, research shows a robust positive association between early life poverty and adolescent obesity. Lee et al. (2014) find that children who experience poverty by age two are 1.66 times more likely to be obese. Two commonly suggested causes of this relationship are that high-income families have access to better quality sources of food and that low-income individuals are more likely to binge eat when food is available (Alaimo et al. 2001, Basiotis and Lino 2002, Wilde and Ranney 2000).

Childhood obesity poses an even greater risk if we consider its relationship with obesity in adulthood. In a meta-analysis, Simmonds et al. (2016) show a positive association between childhood and adult obesity risk. The authors estimate that obese children and adolescents are roughly *five times* more likely to be obese adults relative to their healthy weight peers. If the relationship between obesity and income stems from low-income individuals eating more low-quality or calorically dense foods on average, then providing nutritionally sound subsidized school meals could play a significant role in reducing childhood obesity. Alternatively, if the differential in obesity is caused by low-income individuals overeating when food is made available, SFPs may lead to worsened child weight outcomes.

Given the negative potential impacts of childhood overweight and obesity on health, it is vital that we understand how school meals affect child bodyweight. Evidence from the medical literature finds that school influences have a significant effect on child dietary intake and health outcomes, particularly BMI (e.g., Briefel et al. 2009; Story et al. 2006). These studies suggest that well-designed interventions allow schools to play a significant role in preventing childhood obesity. Studies from public health have found associational evidence linking childhood obesity to the NSLP and SBP, with participating children being up to 4.5% more likely to be obese relative to non-participants (Li and Hooker 2009).

Some existing studies also attempt to estimate the causal effect of SFP participation on child health. While results are mixed, several studies suggest that participation in school feeding programs may worsen weight outcomes. Capogrossi and You (2017) employ a difference-in-differences (DID) model, coupled with matching, to compare children participating in both the NSLP and SBP to children in only one of the programs. The authors show that participating in only the NSLP increases the probability that children will be overweight, with more prominent effects in the South, Northeast, and rural areas of the country. Schanzenbach (2009) uses the discontinuity in income eligibility for reduced-price lunch to compare children above and below the cutoff. The author finds that students who are eligible for reduced-price school lunch are more likely to be obese relative to their peers. Millimet et al. (2010) also find that NSLP participation leads to an increase in child BMI after controlling for self-selection into the SBP. Alternatively, the authors find that SBP participation reduces child BMI, implying that free breakfast in schools may partially offset the weight differential among children from low- and high-income families.

Other studies suggest that SFPs do not increase obesity and overweight risk among children. Schanzenbach and Zaki (2014) examine short run effects of the Universal Free Breakfast (in cafeteria) and Breakfast in Class programs in a randomized study of 153 schools in 6 districts. The authors find no impact of either program on BMI, other health outcomes, or a child's score on the Bad Behavior Index except among some specific subgroups. Hinrichs (2010) exploits changes in the Federal government's allocation formula used to distribute SFP funds to states. When examining the long run effects, the author finds no effect of school meals on BMI. With a worst-case bounding model that allows for misreporting and self-selection into the NSLP, Gundersen et al. (2009) find that participation in school lunch significantly reduces rates of food insecurity (3.8%), poor health (29%) , and obesity(17%). In the most similar study to our own, Schwartz and Rothbart (2017) exploit variation in NSLP participation caused by the switch to universal free meal provision in New York city. The authors find little evidence that receiving free lunch increases child BMI, and some evidence that NSLP participation improves weight outcomes for non-poor children who are still provided with free meals through the program.

3 The Community Eligibility Provision

While 2010's Healthy Hunger-Free Kids Act (HHKA) affected almost every aspect of school nutrition, one of its primary additions was the Community Eligibility Provision (CEP) which became available nationally in 2014.[3] The provision allows high-poverty schools with an Identified Student Percentage (ISP) of 40% or more to provide free lunch and breakfast through the NSLP and SBP to all students in their school, regardless of

[3]Prior to the program's nationwide roll-out in 2014, the CEP was available in earlier periods for schools in 11 pilot states. Illinois, Kentucky, and Michigan were the first states to offer the provision during 2011; the District of Columbia, New York, Ohio, and West Virginia were added in 2012; and finally, Florida, Georgia, Maryland, and Massachusetts were added in 2013.

personal eligibility.

A school's ISP is the percentage of their student body who are considered "identified". Identified students are children from households that are automatically eligible for free school meals through participation in other government nutrition assistance programs, Head Start or Early Head Start, Medicaid, or by meeting other special criteria (e.g. migrant or homeless child).[4] Individual children are identified through either "direct certification," which relies on data matching, or by an appropriate official who determines eligibility for homeless, migrant, foster care, and Head Start services. The CEP participation decision for each school is made by the school district, and school districts also have the option to enroll all of their schools in the provision. . It is important to note that a school's ISP differs from their FRL%, as Identified Students are only a subset of those who qualify for free or reduced-price meals (Levin and Neuberger, 2013). This discrepancy is by design, as the CEP's primary purpose is to provide at-need children with free school meals who were inadequately reached by the existing system.

The primary motivation for introducing the CEP program was to increase the availability of free school meals to disadvantaged students who were not adequately reached by the existing system. More specifically, the CEP is meant to address the low free and reduced-price meal participation rate among eligible children. Historically, participation in SFPs has been below desired levels for two main reasons. One reason is inadequate information or application support for families. Children who are eligible to apply for subsidized meals through the NSLP and SBP come from disadvantaged families, and parents may be unaware of their options regarding nutrition assistance programs. Without adequate information, parents could be unsure about their eligibility, and if they are, may not fully understand the application process to complete the required paperwork. While school counselors and other designated staff help to identify and enroll eligible students, many children from qualifying families remain unreached.

Alternatively, the CEP allows schools to provide meals to all children regardless of

[4]Specifically, students can be "identified" if (i) their families are SNAP, TANF, or FDPIR recipients, (ii) the student is a Head Start or Early Head Start participant, (iii) the student is a migrant, runaway, homeless, or foster child, or (iv) the student is on Medicaid.

student eligibility. By participating in the CEP, schools offer both their students who may have been eligible and not participating and who did not individually qualify free meals through the NSLP and SBP. Additionally, students who receive reduced-price meals begin receiving free meals once their school begins participating in the CEP. In addition to providing free meals to students, CEP participating schools are no longer required to collect and process individual NSLP and SBP applications which reduces costs and administrative burden. Non-eligible and non-participating schools continue under the existing system, determining student eligibility through the usual NSLP and SBP free and reduced-price meal applications.

Another reason for both low SFP enrollment and student utilization is the stigma attached to receiving free meals in school (Askelson, 2017). In theory, providing school-wide free meals through the CEP removes stigma children may face from receiving free meals. When every child in a school receives meals for free, no one child can be singled out as low-income by their peers in the lunch line and no child is denied a meal due to a negative account balance (USDA, 2016). In the past, New York City and several other large urban school districts have made breakfast free for all students regardless of their family income. Studies show that such universal free meal provisions increase breakfast participation (Ribar and Haldeman 2013; Leos-Urbel et al. 2013). Since its introduction, early evidence suggests that the CEP is correlated with significantly higher levels of school meal participation (Logan et al. 2014). This evidence implies that the CEP significantly impacts the number of students consuming school meals and ensures that every child has at least two healthy meals available to them each day.

Alternatively, while the CEP is meant to remove student level stigma surrounding free school meals, schools themselves may face stigma by choosing to enroll in the provision. The potential effects from school level stigma are not as well understood. For example, participating in the CEP may serve as a signal of low quality to parents or other educational institutions if they associate free meal provision rates with a lower quality education. On the other hand, parents with children who do not individually qualify for free meals through the NSLP and SBP may choose to enroll their child in a CEP participating school rather than a comparable non-participating school if they adequately value the free meals.

For a CEP eligible school, the final decision of whether or not to participate is made by the school's district. During the 2014-15 school year, 14,000 schools (1 in 10 nationwide) in 2,200 school districts (1 in 7 nationwide) participated in the program. Of these, 7,000 schools served the nation's highest-poverty level children, implying that 3 in 5 of all such schools participated in the CEP nationwide (Neuberger et al. 2015).In the following 2015-2016 school year, more than 18,000 schools (half of all eligible schools) in nearly 3,000 school districts adopted the CEP, reaching nearly 8.5 million children (USDA, 2016).[5]

With regards to the CEP's effect on health, we expect the change in free school meal provisions to affect child health outcomes at three primary margins. The first is children who were ineligible for free or reduced-price meals during the pre-CEP period. If these children were bringing meals from home rather than buying school meals, making school meals free may incentivize them to switch to the now cheaper option. There is also a chance that children could begin consuming their new free meals in addition to what is brought from home. The second margin is students who were already eligible for free or reduced-price meals but chose not to participate. Depending on why families choose not to enroll their children, we expect different changes following CEP participation. For example, if certain low-income families were unaware of their eligibility, we would expect them to switch to the new free meals. Alternatively, if eligible children did not participate because they preferred meals brought from home, we may expect no change. Finally, the third margin is children who were eligible for reduced-price, but not free, meals during the pre-CEP period. While the average cost of a reduced-price meal may seem negligible, it is possible that offering free meals will be enough to induce participation in school meals.

[5]In Georgia, 53% of all eligible districts participated in the CEP and 89% of the state's high poverty schools participated.

4 Data

Our study utilizes several sources of data from schools in Georgia over the 2011-2012 to 2016-2017 school years.[6] Data include variables related to school-level child health outcomes, CEP participation and eligibility, percent of Free and Reduced-price Lunches (FRL%), and student sociodemographic variables. Data on child health outcomes come from the FitnessGram. Each year, K-12 public schools in Georgia are required to participate in the FitnessGram, a collection of tests administered by a physical education instructor measuring the physical fitness, height, and weight of children attending the school. FitnessGram data aggregated at the school-level are available for the 2011-2016 period from the Georgia Department of Education (GaDOE).[7] Our primary outcomes of interest from the FitnessGram relate to child body composition. While the FitnessGram also includes other tests like curl-ups and sit-and-reach, we do not examine them in this study. For the FitnessGram's physical/athletic tests, children have direct control over their effort (and to a lesser extent, there performance), but the same is not true for BMI which is objectively measured by the test's administrators. We restrict our primary dataset to include schools which are observed in all six years, giving us a balanced panel of 2,145 schools.[8]

Changes in mean BMI at the school-level are difficult to interpret and compare both within and across groups of schools serving children of different ages. One contributing reason is that only observing the mean makes it impossible to identify where in the weight distribution a change in average BMI comes from. For example, either obese or underweight children losing weight can cause an identical decrease in mean BMI with very different implications. The second issue is that BMI score interpretations vary considerably with child age and gender. For instance, a change of 1 BMI point for a child in Kindergarten is more significant relative to the same change for a high school senior.

[6] Throughout the paper, we reference each school year as the year when students return to school, i.e. 2011-2012 is referred to as simply 2011, 2012-2013 as 2012, etc.

[7] Data can be found on the GaDOE website for the 2011-2014 school years: http://www.gadoe.org/Pages/Home.aspx. Data for the 2015 and 2016 school years were obtained through an open data request.

[8] Including the unbalanced portion of our panel does not meaningfully change our results.

To remove some of this ambiguity, we also use a variable on the percentage of children at each school who fall "In the Healthy Fitness Zone" (InHFZ%) of BMI for their age and gender. A child is in the BMI healthy fitness zone if their BMI score falls within the 5th-85th percentile range as determined by the Centers for Disease Control and Prevention (CDC).[9] Compared to the CDC's measure, InHFZ% is equivalent to the percentage of healthy weight children at a school. Unlike mean BMI score, changes in InHFZ% have direct implications for child health. An increase (decrease) in InHFZ% directly relates to an improvement (worsening) of school-level health regardless of where in the weight distribution the change takes place. Going one step further, the combination of changes in mean BMI and InHFZ% suggests additional information. If mean BMI decreases and InHFZ% increases, then the dominant change in weight most likely comes from overweight and obese children losing weight and moving into the healthy weight range. This interpretation does not imply that other weight changes are not occurring elsewhere in the BMI distribution, but it does allow us to identify the probable source of the change.

We collect CEP participation and eligibility data for the 2014, 2015, and 2016 school years from the Center on Budget and Policy Priorities (CBPP) who gathers and provides the data in a joint effort with the Food Research and Action Center (FRAC).[10] The USDA began requiring that each state submit a list containing the CEP eligibility, participation status, and ISP of all schools and districts in 2014. Therefore, even though Georgia was a pilot state for the CEP in 2013, information is only available for the 2014 school year onwards. We therefore exclude the 2013 school year from our analysis. Our final CEP dataset includes variables indicating which Georgia schools are eligible to participate in the CEP program, which schools choose to participate in the program, and each school's ISP.

Data on school FRL% for the 2012-2016 school years are collected from GaDOE.[11] Alternatively, FRL% data for the 2011 school year are not available through GaDOE. We instead use the National Center for Education Statistics' (NCES') Common Core of Data

[9] *See* Plowman and Meredith (2013).
[10] Data are available through the CBPP's website: https://www.cbpp.org.
[11] Data are available directly from the GaDOE website: http://www.gadoe.org/Pages/Home.aspx

(CCD) for 2011.[12] Data on FRL% from GaDOE are censored from above and below at 95% and 5%, respectively. Since CEP participation guarantees that all school meals are provided for free to students, we change the FRL% of participating schools in the post period from 95% to 100%.

Data used to identify each school's location type (i.e. urban, rural, suburban, etc.) also come from the CCD data. We collect school-level revenue, expenditure, and average student sociodemographic data for the entire analysis period through The Governor's Office of Student Achievement (GOSA).[13] Finally, county level data on poverty percentages by age range and median household income for each year come from the Census Bureau's Small Area Income and Poverty Estimates (SAIPE) program.

Summary statistics over the 2011-2016 school years for our dependent variables of interest, independent variables of interest, and control variables are shown in Table 1. As Table 1 shows, the mean BMI for our analysis is approximately 20.35. Unlike adult BMI which has a direct interpretation across age/gender, a child BMI score of 20.35 falls within the obese weight category for a six-year-old boy and the healthy weight category for a 14-year-old boy. As an alternative view, our InHFZ% variable shows that roughly 58.88% of Georgia students participating in the FitnessGram fall within the healthy weight category over the sample period, implying that 41.12% of children are some combination of underweight, overweight, and obese. Our "Ever CEP Eligible" variable show us that roughly 47% of Georgia's K-12 schools were eligible for the CEP at some point during the 2014-2016 period. Our "Ever CEP Participating" variable indicates that approximately 26.87% of all schools participated in the CEP at some point during the post-period, implying a CEP take-up rate of roughly 57%. The set of control variables used in our models include: Number of Students, Percent Black Students, Percent White Students, Percent Migrant Students, Percent Special Education Students, Percent ESL Students, and Percent Gifted Students.

Figure 1, Figure 2, and Figure 3 provide graphical illustrations of the across-year change in FRL%, mean InHFZ%, and mean BMI, respectively, for both ever CEP eligi-

[12]Data are available directly through the CCD website: https://nces.ed.gov/ccd/pubschuniv.asp.
[13]Data are available directly from the GOSA website: https://gosa.georgia.gov/downloadable-data.

ble and never eligible schools.[14] Figure 1 shows that the eligible group's average FRL% is considerably higher than that of the never eligible group in all periods. As we would expect, there is also a sizable increase in the eligible group's average FRL% beginning in the 2013 school year while the rate remains nearly constant for the never eligible group over the post-treatment period.

Figure 2 shows that there is considerably more disagreement between the InHFZ% of the never eligible and eligible groups, with the never eligible group having a higher percentage of healthy weight children on average for all years. Figure 2 also shows that the InHFZ% of both groups increased beginning in the 2015 school year. This increase is caused by a change in the CDC's healthy weight cutoff values beginning in 2015, leading to more children falling within the 5th-85th percentile range. Since the INHFZ% change affects both types of schools simultaneously and identically, any impact on our results should be removed with the use of year fixed effects.

Finally, Figure 3 shows us that the mean BMI of CEP eligible schools is larger than that of never eligible schools during both the 2011 and 2012 years. The average BMI of both school types also decreased from 2011 to 2012 with similar negative percent changes. Interestingly, the average BMI level of CEP eligible schools begins to fall below that of never eligible schools starting in the 2013 school year which is the first year Georgia implemented the provision as a pilot state. The average BMI of both school types continues to decrease during 2014 and 2015, but increases in 2016 to roughly 2014 levels.

5 Methodology

The primary model used in our analysis is a two-stage least squares instrumental variables model (2SLS-IV). Given the panel structure of our data, we also control for school- and year-level sources of time-invariant unobserved heterogeneity using fixed effects. The first

[14]While CEP eligibility can vary for schools from year to year during the post-period, we define our "eligible" group in this case to be schools who are eligible for the program in at least one post-treatment year and the "never eligible" group to be schools who are never eligible in the post-period.

stage of our 2SLS-IV model for school i in year t is given as:

$$X_{it} = Z_{it}\gamma + \phi ELIG_{it} + \alpha_i^1 + \lambda_t^1 + v_{it} \tag{1}$$

where X_{it} is either CEP participation or FRL%, Z_{it} is a vector of time-variant control variables, $ELIG_{it}$ is a binary variable equal to 1 if school i is eligible to participate in the CEP in year t and 0 otherwise, α_i^1 captures school-level sources of time-invariant unobserved heterogeneity, λ_t^1 captures year-level sources of unobserved heterogeneity, and v_{it} is the first stage model's normally distributed idiosyncratic error term.

The second stage of our 2SLS-IV model is then given as:

$$Y_{it} = Z_{it}\beta + \delta X_{it} + \alpha_i^2 + \lambda_t^2 + e_{it} \tag{2}$$

where Y_{it} is either INHFZ% or mean BMI, and all other variables are defined as they are in equation (1).

Estimation of our model involves replacing X_{it} in equation (2) with its predicted value from equation (1), $\hat{X}_{it}$. In addition to the relevance condition which can be tested through the results of our first stage model, proper estimation of our effect of interest, δ, requires that the standard excludability assumption hold. For our model using CEP eligibility as an instrument for CEP participation, it is unlikely that CEP eligibility affects child health outcomes through some mechanism other than participation. The same assumption is unlikely to hold for our use of CEP eligibility as an instrument for FRL% under the strict interpretation of δ being the effect of increased free and reduced-price lunch percentage on Y since the CEP makes breakfast free to students as well. We instead view the change in FRL% caused by CEP eligibility as a proxy for general free school meal provisions, implying that δ partially captures the effect of both free lunch and breakfast on school-level health.

Aside from our use of CEP eligibility as an instrument for X_{it}, the panel dimension of our data allows us to remove unobserved sources of time-invariant school- and year-level heterogeneity from our model using fixed effects. This is crucial to our estimation, as school and year factors which are unobserved in the data almost certainly influence both Y_{it}, X_{it}, and $ELIG_{it}$. Potential examples of these unobserved effects include school institutional practices, style and layout of cafeteria, the School Food Association tasked with administration of a school's lunch program, availability of school counseling and nursing services, and year specific economic conditions. Most importantly, schools with higher ISP's necessarily have more students from families enrolled in qualifying government assistance programs. Under the assumption that the overall share of students at a school enrolled in these programs does not change across the pre- and post-CEP period with eligibility, the effect from program participation on our school-level health outcomes is removed using fixed effects.

In addition to our 2SLS-IV estimations, we also estimate the reduced form effect of CEP eligibility on InHFZ% and mean BMI using a difference-in-differences (DID) model. Our DID model is given as:

$$Y_{it} = Z_{it}\eta + \theta ELIG_{it} + \alpha_i + \lambda_t + u_{it} \tag{3}$$

where Y_{it}, Z_{it}, and $ELIG_{it}$ maintain the same interpretation they are given in (1) and (2), α_i captures school-level sources of time-invariant unobserved heterogeneity, λ_t captures year-level sources of unobserved heterogeneity, and u_{it} is the reduced form model's normally distributed idiosyncratic error term. The results of our DID model show the effect of offering schools the ability to participate in the CEP, but abstracts away from the effect of actual participation or free school meal provision on student health, thus giving us an intent-to-treat effect.

6 Results

Beginning with our model using CEP eligibility as an instrument for participation, Table 2 shows the estimated effect of CEP eligibility on CEP participation from our model's first stage for the full sample of schools, elementary schools, middle schools, and high schools. For the full sample of schools, we estimate that CEP eligibility increases CEP participation by roughly 48.9 percentage points conditional on our set of control variables and school/year fixed effects. Similar results also hold for schools serving children of different ages, with elementary schools seeing the smallest effect and high schools seeing the largest effect at 41 and 61 percentage points, respectively.

Moving on to our model's second stage, Table 3 shows the estimated effect of instrumented CEP participation on InHFZ% and mean BMI for the full sample of schools and schools serving students of different ages. Starting with Panel A of Table 3, we find that participating in the provision is found to increase the percentage of healthy weight students by roughly 1.06 percentage points for the full sample. While statistically insignificant, the magnitude of our estimate for elementary schools is similar at roughly 0.94 percentage points. The effect is largest for middle schools with a predicted increase in InHFZ% from participation of about 2.47 percentage points. Alternatively, we estimate a negative, yet statistically insignificant, effect of CEP participation on InHFZ% for high schools.

If we consider the pre-CEP freed school meal provision environment and food autonomy of schools serving students of different ages, the results of Panel A seem unsurprising. First, elementary schools had the highest level of pre-CEP FRL% among the ever-eligible group, implying that the effect of offering free meals to all students may be smaller since more students were already participating in reduced price school meals in the first place. Second, under the assumption that high school students have greater food autonomy, we may expect to see little to no effect from offering them free meals if they prefer alternative options.[15]

Moving now to Panel B of Table 3, we see that CEP participation is estimated to have a negative effect on mean BMI for the full sample of schools and all schools serving different grade types at various levels of statistical significance. For the sample of all schools, CEP participation is estimated to decrease mean BMI by about 0.171 BMI

[15]Throughout this study, we use food autonomy to refer to a student's autonomy in making their own daily food consumption choices. Autonomous decisions range from students preparing their own meals from home to students leaving campus to buy fast food for lunch.

points. For a 6 year old boy, this change translates into a little less than half a pound of body weight; while a decrease of 0.171 corresponds to slightly over a pound of body weight for a 17 year old boy. Therefore, while the magnitude of the estimated mean BMI decrease is largest for elementary schools, second largest for middle schools, and smallest for high schools, the effective decrease in actual weight for different school types is ambiguous. Alternatively, we see that our level of statistical significance is highest for elementary schools, smaller for middle schools, and at an insignificant level for high schools. While this may be the effect of statistical power since our sample size deceases in a similar fashion, it may also be the result of food autonomy increasing with the age of a school's students. Alternatively, the weight of younger children is likely to change faster in the short run given a shock like the CEP.

Looking now to our model using CEP eligibility as an instrument for FRL%, Table 4 shows the results of our model's first stage for the full sample of schools and by school grade type. Our results indicate that CEP eligibility has a substantial and highly significant effect on FRL% for the full sample and each school grade type. For the full sample of schools, CEP eligibility is estimated to increase FRL% by roughly 10.39 percentage points. Relative to the full sample, the change in FRL% attributed to CEP eligibility is smallest for elementary schools at 7.35 percentage points, second largest for middle schools at 11.74 percentage points, and largest for high schools at 18.26 percentage points. The most obvious reason why elementary schools see a smaller effect of CEP eligibility on FRL% relative to the sample of middle and high schools is due to differences in FRL% during the pre-treatment period. More specifically, the average FRL% during the 2011 and 2012 school years for elementary schools was 81% relatively to the pre-period average levels for middle and high schools at 77% and 71%, respectively. When interpreting these results, it is important to consider the realistic potential for increases in FRL% among the CEP eligible group. Even though pre-period FRL% does not directly determine each school's ISP, CEP eligible schools naturally provide more free or reduced-price lunches on average during the pre-treatment period.[16] Given that FRL% cannot exceed a value

[16]The average FRL% for the never eligible and eligible groups during the pre-treatment period are 45% and 79%, respectively.

of 100%, participating in the CEP will change FRL% less for eligible schools.

Table 5 shows the estimated effects of instrumented FRL% on InHFZ% and mean BMI for the full sample of schools, elementary schools, middle schools, and high schools. Beginning with Panel A of Table 5, we find that a one percentage point increase in FRL% increases the percentage of healthy weight students for the full sample of schools by 0.05 percentage points. Given that adoption of the CEP necessarily implies that FRL%=100, the average change in FRL% from participation at a pre-treatment mean of 79% implies that the CEP is expected to change InHFZ% by roughly 1.05 total percentage points. This effect is extremely similar to the corresponding change in InHFZ% from CEP participation of 1.06 percentage points found in Table 3. After calculating the same relative change for elementary schools, middle schools, and high schools, we find that the implied average change in FRL%'s effect on InHFZ% following CEP participation is effectively the same in magnitude and level of statistical significance as our results from Panel A of Table 3. These results suggest that the CEP's effect on free meal provisions represent the provision's full effect on a school's percentage of healthy weight students.

Looking to Panel B of Table 5, we estimate that increases in FRL% lead to lower levels of mean BMI at the school-level for the full sample of schools and schools serving students of different grade types. Similar to Panel A, we find that the change in mean BMI from the implied change in FRL% following CEP participation is extremely similar in magnitude and statistical significance to the estimated effects of CEP participation in Panel B of Table 3. Together, we estimate the overall results of Tables 3 and 4 as evidence that the effect of CEP participation on school-level child weight outcomes is most likely driven by changes in free school meal provisions. While it may be the case that changes in either the stigma surrounding free and reduced-price meal participation or school spending/revenue caused by the CEP affects child health, we find little difference between our results using instrumented participation and FRL% which we would expect to be different if these alternative mechanisms produced large effects on health.

Table 6 shows the estimated intent-to-treat effect of CEP eligibility on InHFZ% and mean BMI for the full sample of schools and schools of different grade types produced by our DID model. Since our intent-to-treat estimation only looks at the estimated effect of being eligible for treatment, the effects are similar in direction and statistical significance to the results of our 2SLS-IV models, but they are smaller in magnitude. Once again, we do not find statistically significant evidence to support the theory that the CEP worsens school-level child health outcomes.

Due to the likelihood that the effect of free school meals on child health may differ across dimensions other than the age of students a school serves, we also estimate our 2SLS-IV and generalized DID models separately by school location type. Using data from the CCD, we assign schools either an "urban", "rural", or "suburban/town" classifier. The primary reasons why we would expect the relationship between school meals and child health to differ for schools in different areas *a priori* relate to food insecurity and institutional beliefs/practices. For example, disadvantaged children attending an urban school may be more likely to live in a food desert, which in turn may imply that the nutritional quality of meals, rather than their caloric content, is the greatest concern. It may also be the case that families in rural areas are less likely to enroll their child in a nutrition assistance program due to stigma or personal beliefs regarding government assistance programs.

Looking at the pre-treatment period mean FRL% of CEP eligible schools by location type, rural schools provide roughly 72% of their lunches at free or reduced-price while urban schools have an average pre-treatment FRL% of approximately 84%. The fact that the average pre-period FRL% of urban schools is 12 percentage points higher than rural schools is especially surprising when we consider the fact that CEP eligible schools in rural counties serve a poorer population of students on average. More specifically, the county-level pre-treatment period poverty rate for CEP eligible schools in rural counties is roughly 4 percentage points higher than that of urban schools and their median household income is nearly 11 percentage points lower. Additionally, CEP eligible schools in suburbs/towns are located in counties with the lowest average poverty rates and the highest median household incomes, but they have a pre-treatment period average FRL% of roughly 81% which is 9 percentage points higher than the poorer rural schools.

The reason why rural schools offered fewer free and reduced-price lunches during the pre-treatment period than their observable poverty indicators suggest is unclear. One possible cause is that rural schools are smaller or can spend less on each student, implying that the administrative burden of enrolling children in the NSLP is a more binding constraint. When examining this possibility more closely, however, we find that CEP eligible rural schools are slightly larger and only spend roughly 5% less per full time enrolled student relative to urban schools during the pre-treatment period. Regardless of why rural schools seem to serve a smaller percentage of their meals at a free or reduced-price, it is likely that these differences will ultimately affect the take-up and subsequent effect of the CEP on child health.

Beginning with the first stage results of our primary model, Table 7 shows the estimated effect of CEP eligibility on CEP participation by location type. The effect is statistically significant below the 1% level for schools in all location types which one would expect. What is more surprising is the fact that the largest effect of eligibility on participation occurs for schools in urban areas rather than rural areas or suburbs/towns where the provision can cause the most change in the percentage of free meals served on average.

Moving to Table 8, we see that instrumented CEP participation has a statistically significant positive effect on the InHFZ% of urban schools, with an estimated change of 2.6 percentage points following participation. While the effect of participation on InHFZ% is positive for rural schools and schools in suburbs/towns, it is not statistically significant. Alternatively, the effect of CEP participation on mean BMI score is only statistically significant for suburbs/towns. These results suggest that while the percentage of healthy weight children increases following participation in the CEP for urban schools, some children are gaining weight while others are losing weight, leading to an insignificant overall effect on mean BMI. For schools in suburbs and towns, children are losing weight following participation in the CEP, but they are not moving into the healthy weight range on average. Surprisingly, CEP participation does not have a statistically significant effect on either InHFZ% or mean BMI for rural schools even though they had the lowest average

FRL%'s during the pre-CEP period. Nevertheless, the results of Table 8 still find no evidence supporting a deleterious effect from CEP participation.

Table 9 shows the first stage estimations for the effect of CEP eligibility on FRL% by school location type. Unsurprisingly, the effect of eligibility on FRL% is largest for rural schools with an increase of roughly 12.3 percentage points. Urban schools see the second largest effect from eligibility at 10.4 percentage points, and suburbs/towns see the lowest at 8.4 percentage points.

Table 10 shows our results from the second stage model instrumenting for FRL% with CEP eligibility. Similar to our primary results by school grade type, we find the implied average change in FRL% following CEP participation to cause extremely similar effects to those of Table 8 on both InHFZ% and mean BMI for all school location types. This lends further support to the case where the CEP's driving effect on health is caused by free school meal provisions rather than other mechanisms.

Finally, Table 11 shows the results of our DID model by school location type. Similar to our primary results, we find that while smaller in magnitude, the intent-to-treat effect of CEP eligibility on both InHFZ% and mean BMI is the same sign and general level of statistical significance for all school location types relative to our instrumental variable results from Table 8.

7 Sensitivity Analysis

We now turn to tests of the validity of our instrument and the sensitivity of our results to various specifications. Specifically, we perform a placebo test using data from the pre-treatment period. In placebo testing the primary analysis is replicated using a pseudo outcome that is expected *not* to be affected by the treatment (Athey and Imbens, 2017). In other words the true value of the point estimate for the pseudo outcome should be zero. Rejecting the null hypothesis in this case brings the credibility of the original analyses into question. Various pseudo outcomes have been used in the literature for such testing. These include, but are not restricted to, lagged outcomes (Imbens, Rubin and Sacerdote, 2001;Imbens, 2015), covariates in regression discontinuity designs (Lee, 2008) and difference in average outcomes of two comparison groups after adjusting for pretreatment variables (Heckman and Hotz, 1989; Imbens and Rubin, 2015; Rosenbaum, 1987). For the purpose of our analysis we use pre-period (or lagged) outcomes as the pseudo outcomes in our test.

Our falsification test involves designating the group of schools that were eligible to participate in the CEP at some point during the 2014-2016 period, and indicating a false post-treatment period of 2012. We then estimate our placebo test using a DID model with only year and school fixed effects.[17]

Table 12 shows the results of our pseudo test using future CEP eligibility status as a false treatment indicator for schools during the pre-CEP period. Our results indicate no statistically significant effect of our false treatment on either InHFZ% or mean BMI except for the InHFZ% of elementary schools which is found to be statistically significant at the 10% level. This finding implies that there were potential differences in the pre-trends of InHFZ% among the group that would eventually be eligible for the CEP and the group that would not be. Besides this specific result, our falsification test suggests that the pre-trend outcome levels between the eligible and ineligible groups we not statistically different prior to treatment.

8 Conclusion and Discussion

In this study, we estimate the effect of the Community Eligibility Provision (CEP) on school-level measures of child health in the state of Georgia. We use CEP eligibility as an instrument for both CEP participation and the subsequent change in free school meal provisions as measured by free and reduced-price lunch percentage (FRL%). We also measure the intent-to-treat effect of CEP eligibility on our child health outcomes in a

[17]Our approach can be likened to comparing the pre-trends in InHFZ% and mean BMI for the ever and never eligible groups. Finding an effect of CEP eligibility for schools during the pre-period would suggest that there were differences in the pre-trends of our two groups prior to the CEP's introduction.

difference-in-differences model. Our school-level child health outcomes of interest are the percentage of students at each school who fall within the healthy weight range for their age and gender (InHFZ%) mean Body Mass Index (BMI) score.

Our primary results suggest that the CEP increases the percentage of a school's students who fall within the healthy weight range and reduces school-level average BMI. We find no evidence to support a deleterious effect from either CEP participation or the subsequent change in free meal provisions on our school-level child health outcomes. The effect of CEP participation and FRL% differs in statistical significance and magnitude across schools serving children of different ages, with the largest effect on InHFZ% occurring for middle schools and on mean BMI for elementary schools. We do not find a statistically significant effect of either CEP participation or FRL% on the school-level health outcomes of high schools. One possible reason for the lack of impact on high schools is increased food autonomy which implies that high school students have more control over their daily food choices, making them less likely to be forced into eating school meals. Another possibility is that the weight outcomes of older students is less responsive to changes in the food environment over the short run.

In addition to our primary results, we also estimate the CEP's effect on child health separately for schools in urban areas, rural areas, and suburbs/towns. Again, we find no evidence supporting a deleterious effect from CEP participation, free school meal provisions, or CEP eligibility for schools in any location type. We estimate a relatively large and significant increase in InHFZ% following CEP participation, but do not find a significant change in mean BMI. Alternatively, we find no significant change in InHFZ% for schools in suburbs/towns even though the program has a significant negative effect on their mean BMI's. Most interestingly, we find no statistically significant effect from free school meal provisions or CEP participations on the outcomes for rural schools in Georgia even though they had the most to gain from the program relative to their poverty level and low rate of pre-CEP period FRL%.

While we use FRL% as a measure of general free school meal provisions rather than just lunch, our results for FRL% stand in contrast to those of Schanzenbach (2009) and

Millimet et al. (2010) who find that school lunch participation increases child weight. The most likely cause of this discrepancy is the nested effect of additional free school breakfast within FRL%. Since we cannot differentiate between the effects of NSLP and SBP participation, the positive effect of FRL% and CEP participation on health may be driven by changes in breakfast rather than lunch. Alternatively, Schwartz and Rothbart (2017) find similar evidence of a positive effect from the universal free school lunch program on the health of non-poor eight graders in New York City, even though universal free breakfast had been in place for years prior.

Another potential reason why our results differ from those finding a detrimental effect of school meals on weight is changes to school meal quality. In addition to creating the CEP, 2010's Healthy Hunger Free Kids Act(HHFKA) also changed the nation's minimum nutrition standards for school meals. Prior to the HHFKA's revised standards, meals served in school may have been of lower quality relative to meals brought from home. If so, increased meal participation could lead to the negative health effects observed by existing studies.

The variations in free school meal provisions caused by the CEP also occur at different margins than other sources of variation caused by changes in things like family income eligibility. Most notably, the CEP affects children who were already eligible for free meals but chose not to participate, *and* children living in families with incomes above the free and/or reduced-price eligibility range. Furthermore, CEP participation removes child-level self-selection into free school meal programs entirely, implying that the negative health effects found in existing studies may be due to adverse selection into school meals under the traditional system.

Given that our results suggest increased free school meal provisions through the CEP leads to improved school-level outcomes of child health, an important question then becomes what factors determine school participation? While not explicitly presented here, results from a simple model of CEP participation gives some insight into possible determinants. Interestingly, schools with higher levels of FRL% in the pre-treatment period are less likely to sign up for the CEP. This relationship may be due to schools who already have the vast majority of their students receiving free or reduced-price meals deciding that the small increase in free meal provisions caused by the CEP is not worth the effort. This stands in contrast to the assumption that high FRL% schools are more likely to sign up because the CEP removes the administrative burden of collecting and processing free and reduced-price meal applications. Looking to our results for schools in areas with high average pre-treatment FRL%'s suggests that these schools may still experience significant changes in student health from CEP participation they may not be aware of.

Unsurprisingly, CEP eligible schools with identified student percentages below 62.5% are also found to participate less often. Since schools offering free meals through the CEP with ISPs between 40% and 62.5% only have a portion of their meals reimbursed by the USDA at the free rate, our model results suggest that cost does play a role in each school's participation decision. Furthermore, we find that schools with higher ISPs within the 40%-62.5% range are more likely to participate which also indicates that program cost plays a significant role. If barely eligible schools are kept from participating in the CEP because of reimbursement rates, our results suggest that the USDA may be able to significantly improve child health by changing their current reimbursement scheme.

County-level poverty also seem to play a complex role in a school's CEP participation decision. For example, we find that the overall percentage of a school's county living in poverty is negatively related to CEP participation, indicating that schools in counties that are poorer overall are less likely to adopt the provision on average. While this relationship may again be due to schools with higher pre-treatment period FRL%'s deciding that switching to the CEP will not cause a significant enough change to be worthwhile, our results indicate that the poorest counties do not have more children receiving free school meals on average. Alternatively, schools in counties with higher levels of child poverty are more likely to participate, implying that the distribution of poverty within a school's county plays a part in their CEP decision.

In relation to poverty, we find that schools in urban areas are more likely to participate in the program than schools in suburbs/towns while rural schools are not. Rural schools in Georgia have the lowest pre-treatment period average FRL% and serve children in the state's poorest counties. Therefore, the low uptake rate among rural schools stands in contrast to the CEP's primary goal of providing free school meals to children who were not adequately reached by the existing system. Alternatively, we do not find a statistically significant effect of CEP participation on child health in rural counties, implying that there is heterogeneity in the effect of free school meal provisions on health for schools in different areas. If disadvantaged schools in different areas continue to participate at different rates, the CEP may cause an unintended disparity in child health.

While the results of our study provide important evidence regarding the CEP's effect on school-level measures of child health, future research is needed to understand the effect of free school meals on health at the child-level. As spoken to throughout our study, school-level measures of health only identify certain moments of the underlying child-level distribution, making it impossible to determine where an effect is coming from. A promising avenue for future research will be to estimate the effects of school meal programs on health for children from different sociodemographic and economics groups. Furthermore, our study ignores other mechanisms through which free school meal provisions may improve or harm the lives of children and their families. One such mechanism is the CEP's removal of child-level stigma surrounding the receipt of free meals in school. Given the similarity of our results using CEP participation and FRL% however, we believe that the CEP's effect on health is driven by the subsequent increase in free school meal provisions.

Finally, additional work is needed to better understand the possible interactions, decisions, and outcomes schools face when choosing whether or not to participate in the CEP. Aside from the observable determinants of participation, one possible factor which we have not seen considered in the literature is school-level stigma. If schools choose not to adopt the CEP because they feel that it will negatively effect their public perception, our results indicate that the choice may come at the expense of forgone improvements to student health.

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Tables and Figures

Table 1: Variable Summary Statistics 2011-2015

	Mean	StD	Min	Max	Count
Percent Students In Healthy Fitness Zone	58.8829	10.50884	1.468395	92.08196	8797
Mean Body Mass Index Score	20.35342	2.271943	14.97	27.245	8797
Percent Free and Reduced Price Lunches	63.01572	26.27345	5	100	8797
Ever CEP Eligible	.4719791	.4992426	0	1	8797
Ever CEP Participating	.268728	.4433233	0	1	8797
Number of Students	866.0832	476.374	75	4192	8797
Percent Black Students	33.3666	27.9022	0	100	8797
Percent White Students	46.4439	28.46677	0	99	8797
Percent Migrant Students	.3065818	1.324643	0	24	8797
Percent Special Education Students	10.94864	3.395237	0	30	8797
Percent ESL Students	5.633546	9.702705	0	79	8797
Percent Gifted Students	10.70596	8.405446	.1	74.3	8797

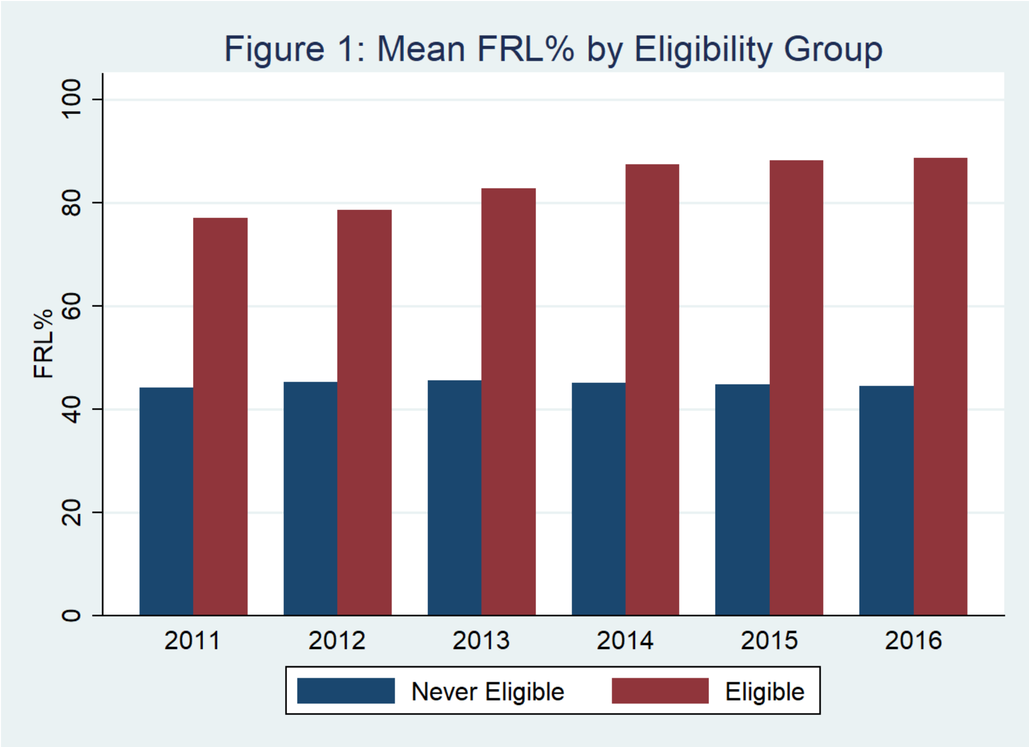

Figure 1: Mean FRL% by Eligibility Group
FRL%
0
20
40
60
80
100
2011
2012
2013
2014
2015
2016
Never Eligible
Eligible

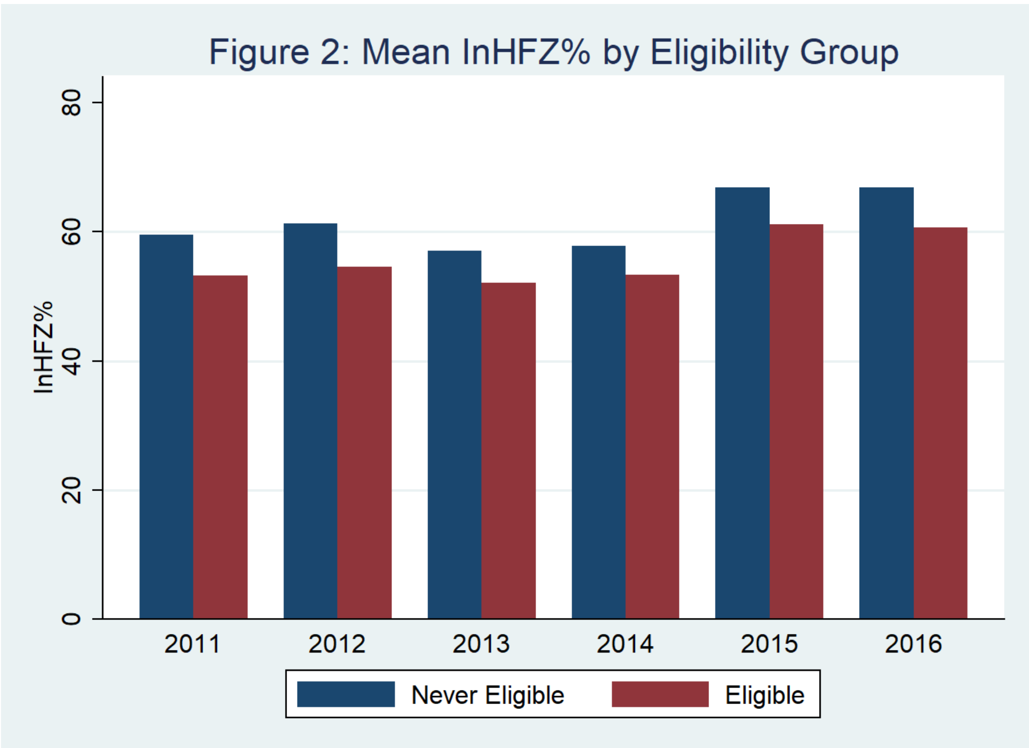

Figure 2: Mean InHFZ% by Eligibility Group
InHFZ%
0
20
40
60
80
2011
2012
2013
2014
2015
2016
Never Eligible
Eligible

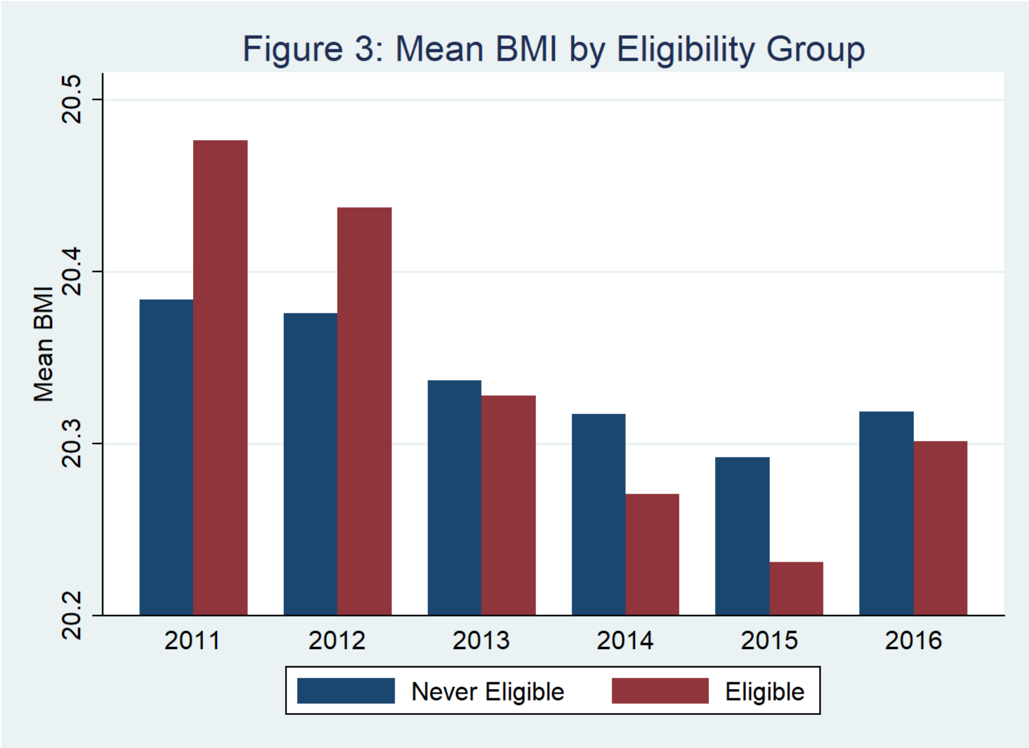

Table 2: Estimated Effect of CEP Eligibility on CEP Participation by School Grade Type

	CEP Participation			
	All Schools	Elementary Schools	Middle Schools	High Schools
CEP Eligibility	0.489***	0.420***	0.544***	0.611***
	(0.1799)	(0.0238)	(0.0412)	(0.0535)
F-stat	80.37	33.47	24.11	19.26
N	7431	3946	1481	1092

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: 2SLS-IV Estimated Effect of CEP on InHFZ% and Mean BMI by School Grade Type

	All Schools	Elementary Schools	Middle Schools	High Schools
Panel A: Percent of Students in Healthy Fitness Zone				
	All Schools	Elementary Schools	Middle Schools	High Schools
CEP	1.06*	0.941	2.47*	−0.72
	(0.57)	(0.76)	(1.52)	(1.46)
Panel B: Mean Body Mass Index Score				
	All Schools	Elementary Schools	Middle Schools	High Schools
CEP	−0.171***	−0.198**	−0.145*	−0.0576
	(0.0514)	(0.0835)	(0.0885)	(0.1257)
N	7416	3922	1480	1091

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Estimated Effect of CEP Eligibility on FRL% by School Grade Type

	Percentage of Free and Reduced-price Lunch			
	All Schools	Elementary Schools	Middle Schools	High Schools
CEP Eligible	10.39***	7.350***	11.74***	18.26***
	(0.1799)	(0.603)	(1.049)	(2.05)
F-stat	59.93	32.52	18.30	11.07

N	7431	3946	1481	1092

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: 2SLS-IV Estimated Effect of FRL% on InHFZ% and Mean BMI by School Grade Type

Panel A: Percent of Students in Healthy Fitness Zone				
	All Schools	Elementary Schools	Middle Schools	High Schools
FRL%	0.05*	0.05	0.11*	−0.02
	(0.03)	(0.04)	(0.07)	(0.05)
Panel B: Mean Body Mass Index Score				
	All Schools	Elementary Schools	Middle Schools	High Schools
FRL%	−0.008***	−0.0114**	−0.0067*	−0.0019
	(0.0024)	(0.0048)	(0.0041)	(0.0042)
N	7416	3922	1480	1091

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Reduced Form Effect of CEP Eligibility on In-HFZ% and Mean BMI by School Grade Type

Panel A: Percent of Students in Healthy Fitness Zone				
	All Schools	Elementary Schools	Middle Schools	High Schools
CEP Eligible	0.52*	0.396	1.34	−0.439
	(0.51)	(0.37)	(0.89)	(0.97)
Panel B: Mean Body Mass Index Score				
	All Schools	Elementary Schools	Middle Schools	High Schools
CEP Eligible	−0.0835***	−0.0834**	−0.0787	−0.0352
	(0.0295)	(0.0835)	(0.0885)	(0.1257)
N	7416	3922	1480	1091

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Estimated Effect of CEP Eligibility on CEP Participation by School Location Type

	CEP Participation		
	Urban	Rural	Suburbs/Towns
CEP Eligible	0.749***	0.482***	0.402***
	(0.0427)	(0.0296)	(0.0258)
F-stat	88.44	27.87	25.95

N	851	3145	3435

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: 2SLS-IV Estimated Effect of CEP on InHFZ% and Mean BMI by School Location Type

Panel A: Percent of Students in Healthy Fitness Zone			
	Urban	Rural	Suburbs/Towns
CEP	2.60**	0.52	1.05
	(1.3)	(0.86)	(1.03)
Panel B: Mean Body Mass Index Score			
	Urban	Rural	Suburbs/Towns
CEP	−0.0676	−0.114	−0.236***
	(0.1086)	(0.0804)	(0.0897)
N	840	3142	3434

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Estimated Effect of CEP Eligibility on FRL% by School Location Type

	Percentage of Free and Reduced-price Lunch		
	Urban	Rural	Suburbs/Towns
CEP Eligible	10.40***	12.32***	8.395***
	(1.6178)	(0.8685)	(0.7109)
F-stat	18.02	25.49	30.87
N	851	3145	3435

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: 2SLS-IV Estimated Effect of FRL% on In-HFZ% and Mean BMI by School Location Type

Panel A: Percent of Students in Healthy Fitness Zone			
	Urban	Rural	Suburbs/Towns
FRL%	0.19**	0.02	0.05
	(0.09)	(0.03)	(0.05)
Panel B: Mean Body Mass Index Score			
	Urban	Rural	Suburbs/Towns
FRL%	−0.0049	−0.0045	−0.0113***
	(0.0078)	(0.0031)	(0.0043)

N	840	3142	3434

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Reduced Form Effect of CEP Eligibility on InHFZ% and Mean BMI by School Location Type

Panel A: Percent of Students in Healthy Fitness Zone			
	Urban	Rural	Suburbs/Towns
CEP Eligible	1.95**	0.25	0.42
	(0.98)	(0.47)	(0.46)
Panel B: Mean Body Mass Index Score			
	Urban	Rural	Suburbs/Towns
CEP Eligible	−0.0506	−0.0551	−0.0949**
	(0.0932)	(0.0446)	(0.0424)
N	851	3145	3435

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Falsification Test of Future CEP Eligibility on InHFZ% and Mean BMI During 2011 and 2012 by School Grade Type.

Panel A: Percent of Students in Healthy Fitness Zone				
	All Schools	Elementary Schools	Middle Schools	High Schools
CEP Eligible 2012	−0.34	−0.63*	−0.41	0.24
	(0.24)	(0.36)	(0.45)	(0.51)
Panel B: Mean Body Mass Index Score				
	All Schools	Elementary Schools	Middle Schools	High Schools
CEP Eligible 2012	−0.0136	0.0703	0.0264	−0.0279
	(0.0332)	(0.0445)	(0.0629)	(0.0706)
N	2937	1556	588	431

Robust standard errors in parentheses. Control variables include number of students, percent black students, percent white students, percent migrant students, percent special education students, percent ESL students, percent gifted students, and year/school fixed effects.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$