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Abstract
In light of the recent rise in childhood obesity, the School Breakfast Program (SBP) and National School Lunch Program (NSLP) have received renewed attention. Using panel data on over 13,500 primary school students, we assess the relationship between SBP and NSLP participation and (relatively) long-run measures of child weight. After documenting a positive association between SBP participation and child weight, and no association between NSLP participation and child weight, we present evidence indicating positive selection into the SBP. Allowing for this is sufficient to alter the results, suggesting a negative (positive) causal effect of the SBP (NSLP) on child weight.

JEL: C31, H51, I18, I28
Keywords: School Breakfast Program, National School Lunch Program, Child Health, Obesity, Program Evaluation

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1 Introduction

As is quite evident from recent media reports, childhood obesity is deemed to have reached epidemic status. Data from the National Health and Nutrition Examination Survey (NHANES) I (1971–1974) and NHANES 2003–2004 indicate that the prevalence of overweight preschool-aged children, aged 2-5 years, increased from 5.0% to 13.9% over this time period.[1] Among school-aged children, the prevalence has risen from 4.0% to 18.8% for those aged 6-11; 6.1% to 17.4% for those aged 12-19 years.[2] Moreover, this rise is not confined to the US; obesity is a global issue (Bleich et al. 2007; Ebbling et al. 2002).

Given this backdrop, policymakers in the US have acted in a number of different directions, particularly within schools. Public Law 108-265 required schools to have a local wellness program by the beginning of the 2006-2007 school year, which must address both nutritional and physical activity goals (Fertig et al. 2006). The CDC has started the KidsWalk-to-School Program to encourage communities to partner with parents and local public safety officials to enable students to safely walk or bicycle to school in groups accompanied by adults.[3] Some schools have banned soda machines and vending machines containing unhealthy snacks, while others have taken aggressive measures to ensure the provision of nutritious meals.[4] Texas reinstated a physical education requirement, which had been previously removed in favor of more academic pursuits (Schanzenbach 2007). In November 2007, the US Department of Health and Human Services (HHS) launched the Childhood Overweight and Obesity Prevention Initiative. The HHS website states: "Our government is working to address one of the greatest dangers to America's young people: childhood overweight and obesity. Nearly one in five school-age children in the United States is overweight and the problem seems to be getting worse. Today, the Department of Health and Human Services is launching a new effort – led by the acting surgeon general – to coordinate and expand our government's existing childhood-overweight and -obesity prevention programs."[5]

Aside from these recent policy developments, two federal programs that have long been in existence have been met with renewed interest: the School Breakfast Program (SBP) and the National School Lunch Program (NSLP). Given the number of children affected and *potentially* affected by these programs, combined with the fact that the infrastructure for these programs is already in existence, it is the relationship between the SBP, NSLP, and child health that we analyze here. Specifically, we have three main objectives. First, assess the relatively long-run relationship between participation in school nutrition programs and

[1] Overweight is defined as an age- and gender-specific body mass index (BMI) greater than the 95^{th} percentile based on growth charts from the Center for Disease Control (CDC).

[2] See http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/prevalence.htm.

[3] See http://www.cdc.gov/nccdphp/dnpa/kidswalk/.

[4] Andersen and Butcher (2006) find that the elasticity of BMI with respect to junk food exposure in schools is roughly 0.1.

[5] See http://www.hhs.gov/news/press/2007pres/11/pr20071127a.html.

child weight using data collected after the most recent, large-scale reforms of the programs. Second, assess the process by which children select into the SBP and NSLP. Finally, assess the impact of such selection on our ability to infer a causal relationship.

Understanding the relationship between school nutrition programs and child weight is clearly important. As the incidence of overweight children has increased, so too has our understanding of the negative consequences that result. First and foremost, overweight children are significantly more likely to become obese adults. Serdula et al. (1993) find that one-third of overweight preschool-aged children and one-half of overweight school-aged children become obese adults. Second, the adverse health effects of obesity include, among others, depression, sleep disorders, asthma, cardiovascular and pulmonary complications, and type II diabetes (Ebbling et al. 2002).

In terms of economic costs, Finkelstein et al. (2003) report that medical spending attributed to obesity was close to \$80 billion, or 9% of total medical expenditures, in the US in 1998. Bill Clinton stated in a speech in 2006: "Four million obese children are Medicaid beneficiaries. Obesity-related hospital costs for children and youth have tripled over the past two decades, from \$35 million in 1981 to \$127 million in 1999. A 2004 Emory University study found that rising obesity rates alone accounted for 27% of the growth in health spending between 1987-2001."[6] Furthermore, Baum and Ford (2004) find that obese adults experience a 0.7-6.3% wage penalty, with females suffering to a greater extent than males, even after controlling for many observable and unobservable attributes of individuals. Bleich et al. (2007) provide a recent overview of the costs and consequences of adult obesity.

To proceed, we utilize panel data on over 13,500 children during early primary school to examine the relatively *long-run* effect of participation in *both* the SBP and NSLP. Specifically, we analyze the relationship between child weight in the spring of third grade and program participation in spring of kindergarten. Analyzing the long-run impact allows us to capture dynamic effects of program participation such as nutritional habit formation and resource reallocation within households. In addition, after assessing the nature of selection into both programs, we examine the sensitivity of the estimated program effects to non-random selection, borrowing several methods from the program evaluation literature.

Our results are striking, yielding three salient findings. First, while SBP participation in kindergarten is *associated* with greater child weight in levels in third grade and a greater change in child weight between kindergarten and third grade for many children, NSLP participation and child weight are *unrelated*. However, we find evidence of *positive* selection into the SBP, particularly for white children, as well as children entering kindergarten in the normal weight range and those with college-educated mothers. Consonant

[6] See http://healthiergeneration.org/uploadedFiles/For_Media/afhg_statement_national_governors_association_02-28-06.pdf.

with Schanzenbach (2007), selection bias does not seem to be a concern when analyzing the NSLP. Finally, in nearly all cases, the positive associations between SBP participation and child weight are found to be extremely sensitive to non-random selection; even a *modest* amount of positive selection is sufficient to eliminate, if not reverse, the initial results. Moreover, allowing for modest positive selection into the SBP leads to a *detrimental* effect of NSLP participation on child weight; ignoring non-random selection into SBP biases the impact of the NSLP toward zero. Thus, admitting even modest positive selection into the SBP implies that the SBP is a *valuable* tool in the current battle against childhood obesity, whereas the NSLP *exacerbates* the current epidemic. The beneficial effect of the SBP, and the deleterious impact of the NSLP, strengthen the findings in Bhattacharya et al. (2006) and Schanzenbach (2007), respectively.

The remainder of the paper is organized as follows. Section 2 provides background information, both on the school nutrition programs themselves, as well as the previous literature. Section 3 presents a simple theoretical framework for thinking about school nutrition programs. Section 4 describes the empirical methodology and the data. Section 5 presents the results, while Section 6 concludes.

2 Background

2.1 Institutional Details

The NSLP was developed gradually, and made permanent by the National School Lunch Act in 1946. The program provides lunch to over 29 million children each school day, covering approximately 99,000 schools (95% of all public and private schools), with 17.5 million students receiving reduced price or free meals.[7] The SBP was established in 1966 by the Child Nutrition Act, and made permanent by subsequent amendments in 1975. During the 2005-2006 school year, the SBP provided breakfast to roughly 9.6 million children in 82,000 schools, with 7.7 million children receiving reduced price or free breakfasts (Cooper and Levin 2006).

As evidenced by these figures, the SBP is under-utilized relative to the NSLP. Roughly 83% of schools participating in the NSLP also participated in the SBP during the 2005-2006 school year, and roughly 45 students qualifying for free or reduced price meals participated in the SBP for every 100 students participating in the NSLP (Cooper and Levin 2006). However, there is significant variation across states. In the 2004-2005 school year, Oregon had the highest relative participation, with nearly 56 free or reduced price SBP participants per 100 NSLP participants; Wisconsin and Illinois each had fewer than 30 participants. That said, SBP participation is on the rise, having increased in all but three states from the 2004-2005

[7] See http://www.fns.usda.gov/cnd/lunch/AboutLunch/NSLPFactSheet.pdf.

school year to the 2005-2006 school year.[8]

The SBP and NSLP are organized in a similar fashion. Both programs are federally funded. Each program is overseen by the Food and Nutrition Service (FNS) of the US Department of Agriculture (USDA), but administered by state education agencies. Schools deciding to participate in the programs must offer meals that meet federal nutritional requirements. In addition, students residing in households with family incomes at or below 130% of the federal poverty line are eligible for free meals, while those in households with family incomes between 130% and 185% of the federal poverty line are entitled to reduced price meals.[9] Eligible children apply directly to the school, with the same application covering both the SBP and NSLP. In addition, children from households that receive aid through food stamps, Temporary Assistance for Needy Families, or the Food Distribution Program on Indian Reservations are automatically eligible for free meals. All other students pay full price, though meals are still subsidized by the federal government to a limited extent. Schools establish their own prices for full price meals, but prices for reduced price meals are capped. Schools have flexibility with respect to the specific foods served, but are constrained by the fact they must operate their meal services as non-profit programs.

Under the SBP, schools are reimbursed $1.35 per free breakfast served, $1.05 per reduced price breakfast served, and $0.24 per full price breakfast served during the 2007-2008 school year. Schools in which at least 40% of students receive free or reduced price *lunch* are reimbursed an additional $0.26 per free or reduced price *breakfast* served. Under the NSLP, schools are reimbursed $2.47 per free lunch served, $2.07 per reduced price lunch served, and $0.23 per full price lunch served. Schools are reimbursed an additional $0.02 per lunch served if at least 60% of the students received free or reduced price lunches two years prior. The NSLP also provides reimbursements for snacks provided during after-school educational or enrichment programs. Both public and private schools are eligible for federal funds. In the 2005 fiscal year, the NSLP cost the federal government roughly $7 billion, while federal expenditures on the SBP in fiscal year 2006 totalled $2 billion.[10]

As stated above, reimbursement is conditional on the meals meeting federal nutritional requirements, established by Congress in 1995 under the "School Meals Initiative for Healthy Children" (SMI). SMI represented the largest reform of the programs since their inception (Lutz et al. 1999). For breakfast, this entails no more than 30% of the meal's calories be derived from fat, and less than 10% from saturated fat. Breakfasts also must provide one-fourth of the Recommended Dietary Allowance (RDA) for protein,

[8] Wisconsin and Illinois experienced the largest increases (over 13%), wereas Arizona, Hawaii, and Lousiana all exprienced a decrease in participation (although the decline in Louisiana is attributable to Hurricanes Katrina and Rita).

[9] For the period July 1, 2007, through June 30, 2008, 130% (185%) of the federal poverty line for a family of four is $26,845 ($38,203). The maximum price allowed for breakfast (lunch) to students qualifying for reduced price is $0.30 ($0.40).

[10] See http://www.frac.org/pdf/cnnslp.PDF and http://www.frac.org/pdf/cnsbp.PDF.

calcium, iron, Vitamin A, Vitamin C, and contain an age-appropriate level of calories. For lunches, the same restrictions on fat apply. However, lunches must provide one-third of the RDA for protein, calcium, iron, Vitamin A, Vitamin C, and an age-appropriate level of calories calories. In addition, all meals are recommended to reduce levels of sodium and cholesterol, as well as increase the level of dietary fiber.

Enforcement of the SMI requirements is handled by requiring states to monitor local school food authorities by conducting reviews at least once every five years. In turn, the FNS monitors state compliance with this review requirement. The FNS has also begun to provide regional and local training to ensure adequate overview.

2.2 Literature Review

Given the size and cost of these programs, each has been studied to some extent over the decades. Devaney and Fraker (1989) use 24-hour dietary recall data from 1980-1981 to assess the impact of SBP participation. The authors find that participation is associated with higher intake of some nutrients. However, contrary to one of the goals of the program, availability of the SBP in schools did not alter the probability that students ate breakfast. In the early 1990s, a series of studies were conducted utilizing the 1992 School Nutrition Dietary Assessment (SNDA-1) study. As part of the study, a random sample of school meals were analyzed, in addition to the diets of children. Gleason (1995) confirms Devaney and Fraker's (1989) finding from a decade earlier that SBP availability is not associated with a higher probability of eating breakfast. Moreover, the author finds that lunches provided under the NSLP derived an average of 38% of food energy from fat, exceeding guidelines, but that program participation will suffer if this figure dips below 32%.

Along these same lines, Burghardt et al. (1995) report that meals provided under the NSLP exceeded guidelines for total and saturated fat and sodium, whereas meals provided under the SBP exceeded guidelines for saturated fat and cholesterol. Gordon et al. (1995) use 24-hour dietary recall data and conclude that both SBP and NSLP participation are associated with higher intake of fat and saturated fat, but also some nutrients. The results of the analyses using the SNDA-1 led to the 1995 SMI discussed above. While the SMI required schools to follow the nutrition guidelines by the 1996-1997 school year, some schools received a waiver until the 1998-1999 school year (Lutz et al. 1999). A second study, the SNDA-2, was collected in 1998-1999. The evidence suggests some effect of the SMI on the nutritional content of meals, but school lunches in particular still have much room for improvement (Schanzenbach 2007).[11]

Since the SNDA study, more recent analyses have focused greater attention on identifying the *causal* impact of SBP or NSLP participation on child health. Gleason and Suitor (2003) use two nonconsecutive

[11] See also http://www.iom.edu/Object.File/Master/31/064/Jay%20Hirschman.IOM%20Presentation.Oct%2026%202005.pdf.

days of 24-hour dietary recall data to obtain fixed effects estimates of NSLP participation. The authors find positive effects on nutrient intakes, but also on dietary fat. Hofferth and Curtin (2005) use data from the 1997 Child Development Supplement of the Panel Study for Income Dynamics (PSID) and find no effect of SBP participation on the probability of being overweight after controlling for NSLP participation. In addition, IV estimates – using public school attendance as the exclusion restriction – indicate no impact of NSLP participation. The authors also conclude that while selection bias is a concern when analyzing the NSLP, it is not for SBP. Bhattacharya et al. (2006) analyze the effects of SBP availability in the school on nutritional intake using NHANES III. The authors employ a difference-in-differences strategy (comparing in-school versus out-of-school periods in schools participating and not participating in the SBP), concluding that SBP availability "has no effect on the total number of calories consumed or on the probability that a child eats breakfast, but it improves the nutritional quality of the diet substantially" (p. 447). Schanzenbach (2007) utilizes panel data methods, as well as a regression discontinuity (RD) approach that exploits the sharp income cut-off for eligibility for reduced-price meals, to assess the impact of the NSLP. She finds that NSLP participation increases the probability of being obese due to the additional calories provided by school lunches. However, she finds little substantive difference between the RD estimates and those based on a panel data approach, suggesting little selection into the NSLP on the basis of unobservables that vary over time and across schools.

Finally, a few studies offer less direct evidence of the possible effects of the SBP and NSLP. For instance, Long (1991) assesses the crowding-out impact of SBP and NSLP benefits on total household food expenditures. The author finds that one dollar of NSLP (SBP) benefits displaces only $0.60 (none) of household food expenditures. Thus, both programs increase the *total value* of food consumed by the household. In addition, the authors finds evidence of positive selection into both programs. Fertig et al. (2006) find that children's weight is inversely related to the number of meals eaten, consonant with prior research indicating that skipping breakfast is associated with higher overall caloric intake (Stauton and Keast 1989; Morgan et al. 1986). von Hippel et al. (2007) show that children are more at-risk of gaining weight during summer vacation than during the school-year. While this is potentially attributable to children's propensity to consume more food while at home, it could also be explained by the lack of access to school meal programs during the summer for non-summer school attendees. Consequently, the indirect evidence suggests a possible beneficial impact of school nutrition programs, which is to some extent at odds with the existing direct empirical evidence, particularly as it relates to the NSLP.

In this paper, we add to this literature in three important ways. First, we assess the *long-run* relationship between participation in *both* the SBP and NSLP program and children's weight after the reforms enacted under the SMI should have been fully implemented. Most prior research (to our knowledge) assesses the contemporaneous relationship between SBP and/or NSLP participation and children's weight, typically focuses on only one of the programs (not both), and uses data from before the changes instituted under the SMI have been fully implemented. Second, we assess the nature of selection into both programs using data on birthweight and weight at the time of entry into kindergarten. Finally, we examine the sensitivity of the estimated program effects to non-random selection.

3 Theoretical Motivation

To provide some context for the empirical analysis, it is useful to think about the intrahousehold resource allocation effects of the SBP and NSLP. Figure 1 illustrates a very simple model. Households maximize utility, $U(c, f)$, where c is non-food consumption and f is food consumption subject to a standard budget constraint (as well as an implicit biological constraint restricting food consumption from falling below some threshold). In the figure, the solid budget constraint represents the initial budget constraint without school-provided nutrition programs. The corresponding optimal consumption bundle is labelled as point A. The dashed budget constraint incorporates the SBP and NSLP assuming children in the household receive an infra-marginal transfer of food for free at school. Thus, the programs lead to a kinked budget constraint, where the kink point lies to the left of point A given the assumption of an infra-marginal transfer (whereby the size of the transfer is less than food consumption without the program).

With an infra-marginal transfer, it is well known that the impact of the transfer is equivalent to pure income transfer in that the result is a parallel shift out of the budget constraint near the original consumption bundle, point A (see, e.g., Jacoby 2002). Since the transfer has only an income effect, the household will respond by increasing consumption of both c and f if and only if both are normal goods. Point B illustrates this possible outcome. However, if the income elasticity of food consumption is zero, then the household may instead move to point C, in which case the household utilizes the savings from the transfer program purely to finance an increase in non-food consumption. This latter possibility is consistent with the findings in Bhattacharya et al. (2006) with respect to the SBP (as participation does not alter total caloric intake), but the former is consonant with the earlier findings in Long (1991) for both programs and Schanzenbach (2007) with respect to the NSLP.[12]

This model, while quite simple, illustrates two key points. First, participation in the SBP and NSLP may or may not increase food consumption. In the event that food consumption does increase, any health benefits of the SBP and NSLP require the nutritional gains from the food provided under these programs

[12] Note, the distinction between the results in Bhattacharya et al. (2006) and Schanzenbach (2007) should not be interpreted as conflicting results across the two studies as the former (latter) focuses on the SBP (NSLP).

to more than compensate for the increase in overall food consumption if child health is to be improved as a result. Second, participation in the SBP and NSLP provides an income benefit to households that allows households to increase their non-food consumption. Such an increase in consumption has theoretically ambiguous health consequences. For example, if the household uses the additional resources to buy a video game machine, the resulting decrease in physical activity may more than offset the health gains from eating a nutritious breakfast and lunch. Alternatively, the household could use the additional income to fund an extracurricular activity. Thus, in the end, the role of the SBP and NSLP in the childhood obesity epidemic – positive or negative – is an empirical question.

4 Empirics

4.1 Methodology

To assess the impact of school nutrition programs on child health, we utilize several estimators. To contrast the estimators in terms of the identification assumptions required, we utilize the potential outcomes framework often adopted in the program evaluation literature. However, here, we are simultaneously considering two treatments: SBP and NSLP participation.

To begin, let y_{1i} and y_{2i} denote child health if the child participates in the SBP only (denoted as $\widetilde{D}_{1i} = 1$) and NSLP only (denoted as $\widetilde{D}_{2i} = 1$), respectively. Let y_{3i} denote child health if the child participates in both programs (given by $\widetilde{D}_{3i} = 1$), and y_{0i} denote child health in the absence of either treatment (corresponding to $\widetilde{D}_{1i} = \widetilde{D}_{2i} = \widetilde{D}_{3i} = 0$). In this set-up, the effect of participating in the SBP only relative to the control of no participation in either program on the health of child i is given by $\tau_{1i} \equiv y_{1i} - y_{0i}$. Similarly, $\tau_{2i} \equiv y_{2i} - y_{0i}$ and $\tau_{3i} \equiv y_{3i} - y_{0i}$ measure the effect on the health of child i of participating in the NSLP only and of participating in both programs, respectively, relative to the control of no participation in either program. However, given the usual missing counterfactual problem, only $y_i = \widetilde{D}_{1i}y_{1i} + \widetilde{D}_{2i}y_{2i} + \widetilde{D}_{3i}y_{3i} + (1 - \widetilde{D}_{1i})(1 - \widetilde{D}_{2i})(1 - \widetilde{D}_{3i})y_{0i}$ is observable.

To proceed, we specify a structural relationship for each potential outcome. Define

$$\begin{aligned} y_{0i} &= \mu_0(x_i) + u_{0i} \\ y_{1i} &= \mu_1(x_i) + u_{1i} \\ y_{2i} &= \mu_2(x_i) + u_{2i} \\ y_{3i} &= \mu_3(x_i) + u_{3i} \end{aligned} \tag{1}$$

where $\mathrm{E}[y_d|x_i] = \mu_d(x_i)$, $d = 0, 1, 2, 3$, and x_i is a vector of observable attributes of child i (including an intercept). u_d captures the impact of unobservable attributes on child health when $D = d$, $d = 0, 1, 2, 3$.

Following Heckman et al. (1999), if one assumes that $\mu_d(x_i) = x_i\beta_d$, $d = 0, 1, 2, 3$, and $\beta_0 = \beta_1 = \beta_2 = \beta_3$ except for the intercept terms, then one obtains the following regression model

$$y_i = x_i\beta_0 + \tau_1\widetilde{D}_{1i} + \tau_2\widetilde{D}_{2i} + \tau_3\widetilde{D}_{3i} + \left[u_{0i} + \widetilde{D}_{1i}(u_{1i} - u_{0i}) + \widetilde{D}_{2i}(u_{2i} - u_{0i}) + \widetilde{D}_{3i}(u_{3i} - u_{0i})\right] \qquad (2)$$

where τ_d, $d = 1, 2, 3$, is the constant treatment effect. Furthermore, if one assumes that the participation in both programs is additive, such that $\tau_3 = \tau_1 + \tau_2$ and $u_{3i} = u_{2i} + u_{1i} - u_{0i}$ for all i, then (2) simplifies to

$$y_i = x_i\beta_0 + \tau_1 D_{1i} + \tau_2 D_{2i} + [u_{0i} + D_{1i}(u_{1i} - u_{0i}) + D_{2i}(u_{2i} - u_{0i})] \qquad (3)$$

where $D_{1i} = 1$ for all SBP participants (zero otherwise) and $D_{2i} = 1$ for all NSLP participants (zero otherwise).[13] In other words, $D_{1i} = 1$ if $\widetilde{D}_{1i} = 1$ or $\widetilde{D}_{3i} = 1$, and $D_{2i} = 1$ if $\widetilde{D}_{2i} = 1$ or $\widetilde{D}_{3i} = 1$.

For OLS estimation of (3) to yield a consistent estimate of τ_1 and τ_2, participation in the SBP and NSLP must be independent of unobservables that impact child health without participating, u_0, conditional on x. Schanzenbach (2007) finds support for this assumption with respect to the NSLP, as she documents that children participating in the NSLP during kindergarten had similar obesity rates as non-participants at the start of kindergarten. Moreover, the participation decisions must also be independent of unobserved, child-specific gains from participation in either program, $u_1 - u_0$ and $u_2 - u_0$.

In contrast, a consistent estimate of τ_1 and τ_2 may be obtained under an alternative set of assumptions given data on outcomes prior to the treatment. In particular, suppose we observe child health for all children prior to exposure to the SBP and NSLP. Given the preceding functional form assumptions, the regression models for child health in the pre-treatment period, $t-1$, and post-treatment period, t, are given by

$$y_{it} = x_i\beta_{0t} + \tau_1 D_{1i} + \tau_2 D_{2i} + [u_{0it} + D_{1it}(u_{1it} - u_{0it}) + D_{2it}(u_{2it} - u_{0it})] \qquad (4)$$

$$y_{i,t-1} = x_i\beta_{0,t-1} + u_{0i,t-1} \qquad (5)$$

where the child attributes, x, are time invariant, but the effects of these attributes are allowed to vary over time. First-differencing yields the following estimating equation

$$y_{it} - y_{i,t-1} = \Delta y_i = x_i\Delta\beta_0 + \tau_1 D_{1i} + \tau_2 D_{2i} + [\Delta u_{0i} + D_{1i}(u_{1it} - u_{0it}) + D_{2i}(u_{2it} - u_{0it})]\,. \qquad (6)$$

OLS estimation of (6) yields a consistent estimate of τ if participation in the SBP or NSLP is uncorrelated with *changes* over time in unobservables impacting child health under no participation in either program,

[13] This turns out to be a necessary restriction as there is not sufficient variation in the data to seperately identify the effect of SBP participation in isolation, τ_1, from SBP participation in conjunction with NSLP participation, τ_3. Thus, in our empirical analysis, we are predominantly identifying the impact of SBP participation using variation in outcomes from children participating in both programs relative to children participating only in the NSLP.

Δu_0, in addition to the previous identification assumptions. Thus, as is well known in models with unobserved effects, identification is achieved even if the treatment assignment is correlated with time-invariant unobservables that impact child health when untreated.

In addition to the preceding parametric estimators, we also estimate the average treatment effect (ATE) of each program using propensity score matching (PSM). Now quite commonplace in economics and other disciplines, it is well known that PSM estimation yields two potential benefits over regression methods (Smith and Todd 2005). First, it is a semi-parametric estimator in that one does not need to specify a functional form for potential outcomes; $\mu_d(x_i)$ is left unspecified for all d. Second, issues of common support are explicitly addressed. Specifically, we estimate the ATE using only those observations for which the estimated propensity score (i.e., the probability of receiving the treatment given x) lies in the intersection of the supports for the treatment and control groups. In contrast, regression estimators – by virtue of the fact that they utilize the entire sample – may extrapolate across observations with very different observable attributes. Aside from these two issues, PSM estimation relies on the same identification assumptions as detailed above.[14]

Finally, because all of the preceding estimators are susceptible to bias from selection on (at least some type of) unobservables, we borrow various strategies from the program evaluation literature to assess the sensitivity of our results to any remaining selection on unobservables. Specifically, for the parametric models, we apply the procedures developed in Altonji et al. (2005). For the PSM models, we assess the sensitivity of the results using Rosenbaum bounds (Rosenbaum 2002). We discuss these in greater detail below.

4.2 Data

The data are obtained from *Early Childhood Longitudinal Study-Kindergarten Class of 1998-99* (ECLS-K). Collected by the US Department of Education, the ECLS-K follows a nationally representative cohort of children throughout the US from fall and spring kindergarten, fall and spring first grade, and spring third grade. The sample includes 17,565 children from 994 schools.

We measure participation in school nutrition programs at the earliest possible date, which is in spring kindergarten.[15] However, we measure the health status of each child either in spring third grade or as the change from fall kindergarten to spring third grade. Not only does the nature of the timing improve the

[14] To implement the PSM estimator, we use kernel weighting with the epanechnikov kernel and fixed bandwidth of 0.10. Standard errors are obtained using 100 repetitions. We perform the analysis twice, once using SBP participation as the treatment (i.e., D_1) and once using NSLP participation as the treatment (i.e., D_2).

[15] The relevant questions were not asked in the fall kindergarten wave.

likelihood that the assumptions required for consistent estimation are met, but it also implies that we are analyzing more of the long-run relationship between child health and participation in the two programs. The long-run impact may differ in magnitude from the contemporaneous effect due to the development of nutritional habits, leading to a cumulative effect. Alternatively, reallocation of resources within households in response to any change in child health that may result from program participation or due to the income effect of program participation may alter the direction and magnitude of the impact.[16]

To measure child health, we utilize data on the age (in months) and gender of each child, as well as data on the weight and height of each child. The data allow us to construct seven measures of child health:

(i) body mass index (BMI) in levels in spring third grade,

(ii) BMI in logs in spring third grade,

(iii) growth rate in BMI (i.e., change in log BMI) from fall kindergarten to spring third grade,

(iv) BMI in percentile in spring third grade,

(v) change in BMI percentile from fall kindergarten to spring third grade,

(vi) indicator for overweight status in spring third grade, and

(vii) indicator for obesity status in spring third grade,

where percentiles are determined based on age- and gender-specific growth charts. In contrast to the definition mentioned in the Introduction, we now define overweight (obesity) as having a BMI above the (85^{th}) 95^{th} percentile for the sake of expositional convenience.[17]

To control for parental and environmental factors, the following covariates are included in x: child's race (white, black, Hispanic, Asian, and other) and gender, child's birthweight, household income, mother's employment status, mother's education, number of children's books at home, mother's age at first birth, an indicator if the child's mother received WIC benefits during pregnancy, region, city type (urban, suburban, or rural), and the amount of food in the household. In some specifications, we also include higher order and interaction terms involving the continuous variables, as well as fall kindergarten measures of child health.[18]

[16] The long-run effect we seek to estimate also reflects, at least to some extent, the short-run impact as well; the correlation coefficients for program participation in spring kindergarten and spring third grade are 0.51 and 0.29 for the SBP and NSLP, respectively.

[17] Percentiles are obtained using the -*zanthro*- command in Stata.

[18] Except for maternal employment, all controls come from either the fall or spring kindergarten survey.

Given the nature of our data, children with missing data for gender and race are dropped from our sample. Missing values for the remaining control variables are imputed and imputation dummies are added to the control set. However, particular care was needed to clean the data on child age, height, and weight. In terms of age, children with missing values in all waves are dropped, while missing ages in particular waves are imputed assuming all fall and all spring interviews were conducted during the same month each wave, and that spring interviews were conducted six months after fall interviews of the same school year. For height, we drop students with missing height in at least three waves, students with missing height in two waves but whose reported height falls at least once over time, and students whose reported height falls at least twice over time. For the remainder of students, we impute missing height or values of height that represented a decline from previously reported height by regressing 'valid' measures of height on age and imputing height. If the imputed value of height still represents a decline in height from previously reported height, the student is dropped. For weight, we begin by identifying suspicious values; those representing large declines or large gains in weight from the previous wave. Then, we drop students with missing weight in at least three waves, students with missing weight in two waves but whose reported weight falls by more than 15 pounds across two waves, and students with missing weight in at least one wave and a suspicious value in at least one other wave. For the remainder of students, we impute missing weight or suspicious values of weight by regressing 'valid' measures of weight on age and imputing weight. If the imputed value of weight is still deemed to be suspicious according to our criteria, the student is dropped. As a final check, we drop students if the resulting 'clean' data on age, height, and weight implied a change in BMI percentile of greater than 80 percentile points (in absolute value) from fall kindergarten to spring third grade.

The final sample contains 13,534 students, of which 5,423 participate in neither the SBP or NSLP, 2,826 participate in both, and 335 (4,950) participate in the SBP (NSLP) only. Table A1 in the appendix provides summary statistics. The average BMI during spring third grade is 18.4, up from 16.3 in fall kindergarten. The average growth rate in BMI over this time span is 11.2%, and the average increase in BMI percentile is 1.3 (from 61.0 to 62.3). Finally, while 11.4% (25.8%) of entering kindergarten children were obese (overweight), 17.1% (32.5%) of third grade students were obese (overweight). Also noteworthy, and particularly relevant for the contrasting the various estimators, is the fact that observable attributes of participants and non-participants in the school nutrition programs do differ, implying that issues of common support may be important. Specifically, participants in both the SBP and NSLP are more likely to be non-white, reside in the south, live in a poor household with a less educated mother, have fewer children's books in the home, and have a mother who was more likely to have given birth while a teenager.

5 Results

5.1 Baseline

The baseline set of parametric results are obtained estimating equations (3) and (6) for each the seven measures of child health using the full sample of children. Eight regression specifications are estimated for each outcome. The specifications vary the control set, x, included in the model and are as follows:

(1) age, gender dummy, four race dummies, two city type dummies, and three region dummies;

(2) previous control set plus three dummies for mother's age at first birth, dummies for whether mother received WIC benefits during pregnancy, and five mother's education dummies;

(3) previous control set plus household income;

(4) previous control set plus two dummies for mother's current employment status;

(5) previous control set plus number of children's books in the household and three dummies for the amount of food in the household;

(6) previous control set plus child's birthweight;

(7) previous control set plus quadratic and cubic terms of all continuous variables, and the complete set of pairwise interactions among the continuous variables; and,

(8) previous control set plus plus the lagged dependent variable (from the fall kindergarten wave), quadratic and cubic terms of the lagged dependent variable (if continuous), and the complete set of pairwise interactions between the lagged dependent variable (if continuous) and the continuous variables included in the previous control set.

Finally, we utilize the control set in specification (8) to estimate the propensity scores (using probit models); the propensity score estimates are then used to obtain the baseline semi-parametric PSM estimates.[19] Results are given in Table 1.

Panel I in Table 1 presents the results using the BMI level from spring third grade to measure child health. The results indicate a statistically significant, positive association between SBP participation and

[19] Millimet and Tchernis (2007) find that propensity score estimators perform better when over-specifying the propensity score equation. Thus, we follow specification (8) and include higher order and interaction terms involving all of the continuous variables. Moreover, note that because specification (8) includes the corresponding measure of child health from fall kindergarten, the exact propensity score model is specific to each outcome measure.

BMI, robust across all specifications. Specifically, in specifications (2) through (7), SBP participation during kindergarten is associated with an increase in third grade BMI of nearly 0.30 points. Conditioning on BMI during fall kindergarten – specification (8) – reduces the point estimate by roughly one-third, to 0.21. However, the PSM estimate (column (9)), which also conditions on BMI during fall kindergarten, is 75% larger in magnitude, indicating roughly a 0.35 point increase. Participation in the NSLP, on the other hand, has a statistically insignificant association with third grade BMI in all specifications, including the PSM model. Results using log BMI as the dependent variable (Panel II) are similar; a robust, positive association between SBP participation and BMI (with the PSM estimate being 75% larger in magnitude), and a statistically insignificant association between NSLP participation and BMI. The point estimates indicate that SBP participation is associated with a 1.0-1.7% increase in third grade BMI *ceteris paribus*.

Panel III reports the results using the change in log BMI from fall kindergarten to spring third grade as the dependent variable (i.e., BMI growth rate). As this corresponds to the model presented in (6), the assumptions needed to infer a causal relationship are weaker. The pattern of results, however, is unchanged, and the magnitudes of the estimates are very similar to those found in specification (8) in Panel II. As such, two implications are noteworthy. First, once BMI upon kindergarten entry is incorporated into the model – either as a covariate or differenced from third grade BMI as the dependent variable – the association between SBP participation and BMI is essentially unaffected by the inclusion of the various control sets. Thus, there appears to be little selection on observables aside from lagged child weight. Second, the higher cross-sectional estimates in Panel II (specifications (1) through (7)) suggest there is *positive selection* into the SBP on the basis of lagged children's BMI.

Panel IV and V examine the association between the nutrition programs and third grade BMI in percentile (Panel IV), as well as the change in BMI percentile from fall kindergarten to spring third grade (Panel V). As in Panels II and III, there continues to be a robust positive and statistically significant association between SBP participation and BMI percentile, with the point estimates from the PSM estimator about 50-66% larger in magnitude. Specifically, SBP participation is associated with a 1.5-2.5 increase in BMI percentile once positive selection into the SBP on the basis of initial BMI percentile is addressed. Finally, there continues to be no statistically significant association between NSLP participation and BMI percentile in levels or changes.

The final results are presented in Panels VI and VII, where the dependent variables are indicator variables taking on the value one for children designated as overweight and obese in third grade, respectively. Regression estimates – representing marginal effects – are obtained using probit models. The estimates are positive across all specifications for SBP participation in both panels, but not always statistically significant. In terms of the higher specifications, the association is statistically significant in specification

(8) in Panel VI, but not Panel VII; the PSM estimates are statistically significant in both panels. However, in contrast to the previous outcomes, the PSM estimates are now smaller in magnitude. Nonetheless, the point estimates consistently suggest that SBP participation is associated with a 3-7% higher probability of being overweight or obese in third grade. None of the NSLP coefficients are statistically distinguishable from zero at the usual confidence levels.

In sum, the baseline results from the full sample suggest a remarkably robust positive association between SBP participation and child weight in the relative long-run, with no corresponding detectable association between NSLP participation and child weight. The positive association between SBP participation and child weight contrasts with the results in Bhattacharya et al. (2006) and Hofferth and Curtin (2005), but is consonant with the analysis in Long (1991). The lack of a relationship between NSLP participation and child weight also diverges from Schanzenbach (2007). However, before placing too much stock in these results, we need to assess the extent to which they are likely to represent a causal relationship. As stated above, conditioning on child weight in fall kindergarten eliminates about one-third of the positive association between SBP participation and child weight in third grade, indicating fairly strong positive selection on previous child weight in *levels*. If there is also positive selection on the basis of expected future *changes* in child weight, then the results thus far will not represent a causal relationship. To explore these concerns, we undertake a number of sensitivity analyses.

5.2 Sensitivity Analysis

5.2.1 Heterogeneous Program Effects

Our initial sensitivity analysis relaxes the assumption implicit in (3) and (6) that school nutrition programs (and the control variables) have identical effects across children. We allow for heterogeneous effects along three dimensions: risk type (i.e., child weight at kindergarten entry), mother's education, and race. While dividing the sample along various observable dimensions may not go a long way toward addressing any remaining selection bias, it does help in defining more homogeneous samples. Moreover, it also highlights any interesting differences at least in the associations between participation in school nutrition programs and child weight. In the interest of brevity, we report results using only specifications (7) through (9).

At-Risk Children To begin, we divide the sample into three sub-groups, defined on the basis of their BMI percentile upon entering kindergarten: students entering kindergarten with a BMI below the 85^{th} percentile ('normal' weight), students with a BMI between the 85^{th} and 95^{th} percentiles ('overweight'), and students with a BMI above the 95^{th} percentile ('obese'). Table 2 displays the results.[20]

The results indicate that the inferences drawn from the full sample are driven primarily by the sample of children entering kindergarten in the normal weight range (Panel A), and to a lesser extent the sample of children entering kindergarten obese (Panel C). In addition, relative to the full sample results, the PSM estimates in (9) for these two sub-samples are more similar to the regression estimates obtained using specification (8). This is consonant with a greater similarity of the treatment and control groups in terms of observable attributes in this sub-sample. Coefficient estimates for NSLP remain statistically insignificant across all sub-samples and outcome measures.

Since children entering kindergarten overweight or obese are the most likely targets of any policies designed to combat the recent rise in childhood obesity, Panel D presents the results of our models estimated on the combined sample of children in these two categories. All coefficient estimates for both programs are statistically insignificant.

The other noteworthy finding is that even within sub-samples defined by risk type, there is still evidence of positive selection into the SBP. For children entering kindergarten in the normal weight range, conditioning on initial child weight reduces the magnitude of the positive associations by roughly 25%. For children who are obese upon entering kindergarten, the extent of positive selection is smaller, but still persists.

Mother's Education Next, we divide the sample into four groups based on mother's education: children whose mother's education is less than high school or is missing, high school, some college, and bachelor's degree and above. The results are given in Table 3. Again, we find that the full sample results are attributable to only some of the sub-groups; here, it is children with a mother with only a high school diploma (Panel B) or some college, but not a bachelor's degree (Panel C). Specifically, we obtain a robust positive and statistically significant association between SBP participation and child weight, particularly in Panel C using specification (8). Moreover, when the SBP coefficients are statistically significant in Panels B and C, the coefficients in Panel C are roughly twice as large in magnitude. Lastly, there is still evidence of positive selection within these relatively homogeneous sub-samples; controlling for child weight upon kindergarten entry tends to reduce the magnitude of the associations by more than 25%.

In terms of the NSLP coefficients, we now obtain a negative and statistically significant association between NSLP participation and child weight in Panel C (some college, but not a bachelor's degree). The

[20] Throughout the remainder of the paper, in many cases there are no results for specification (8) in the sub-samples defined by risk type. Since the samples are defined on the basis of fall kindergarten overweight and obesity status, one cannot include fall kindergarten values of the dependent variable as a covariate since it is constant. Thus, only specification (7) can be estimated.

effects, albeit statistically significant, are between one-third and one-half the magnitude (in absolute value) of the corresponding SBP coefficient.

Race Using statistics obtained from NHANES III over the period 1988-1994 and NHANES 2003-2004, the CDC finds substantive differences in the prevalence and growth in overweight children by race.[21] For boys aged 12-19 years, the proportion of non-Hispanic white children with a BMI exceeding the 95^{th} percentile based on age- and gender-specific growth charts increased from 11.6% to 19.1%. The corresponding figures for non-Hispanic black boys are 10.7% and 18.5%, while the figures are 14.1% and 18.3% for Mexican-Americans. Thus, while the latter group was initially higher in the earlier time period, the proportion has increased most slowly for this group. For girls aged 12-19 years, a different pattern emerges. Non-Hispanic white children with a BMI exceeding the 95^{th} percentile rose from 7.4% to 15.4%, while rates for non-Hispanic black girls increased from 13.2% to 25.4%. Finally, rates increased from 9.2% to 14.1% for Mexican-Americans. Given the disparities across racial lines, we assess whether school nutrition programs are associated with differential levels of child health across the three largest racial groups in the data: non-Hispanic white, non-Hispanic black, and Hispanic students.

The results are presented in Table 4. The positive association between SBP participation and child weight is statistically significant across some of the outcome measures for both white (Panel A) and black (Panel B) students, with the effects of comparable magnitude across the two racial groups. The SBP coefficients are never statistically significant for Hispanic students (Panel C). However, closer inspection reveals an important difference across white and black children. Specifically, when using the level outcome measures (BMI, BMI percentile, overweight status, or obesity status), the coefficients are larger in specification (7) relative to specification (8) for white children, but smaller for black children. Similarly, the coefficients decline in magnitude when moving to the growth outcome measures (BMI growth and the change in BMI percentile) using specification (7) for white children, but increase for black children. This pattern of results indicates positive selection into the SBP on the basis of weight by white children, but some negative selection into the SBP by black children (although many of coefficients are statistically insignificant). The NSLP coefficients are never statistically significant for any race.

Summation Allowing for heterogeneous effects of school nutrition programs along several observable dimensions indicates some important differences in the association between SBP participation and child weight; the lack of an association between NSLP participation and child weight is nearly universal (along the dimensions explored). With respect to SBP participation, the positive association with child weight is

[21] See http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/prevalence.htm.

most strongly attributable to children entering kindergarten in the normal weight range (and to a lesser extent obese), children with a mother of moderate education (at least high school, but less than a four-year college degree), and white and black children. However, there is still evidence of positive selection into the SBP within most of these relatively homogeneous sub-samples; there is mild evidence of negative selection by black children. Thus, the extent to which the estimates represent causal findings is still questionable.

5.2.2 Non-Random Selection into School Nutrition Programs

Allowing for heterogeneous effects of the programs does not appear sufficient to address the question about whether the relationships documented thus far are causal in nature. Our remaining analyses focus more concretely on this question.

School Fixed Effects To start, we follow the strategy employed in Schanzenbach (2007) and re-estimate our parametric models including school fixed effects.[22] The benefit of including school fixed effects is that it accounts for potential non-random selection into schools based on the availability of school nutrition programs. Illustrating the importance of such selection bias, Schanzenbach (2007) obtains statistically insignificant effects of contemporaneous NSLP participation on child weight in first grade when omitting school fixed effects, but positive and statistically significant effects once school fixed effects are included.

The results using specifications (7) and (8) are presented in Table A2 in the appendix. In the interest of brevity, we simply note that the majority of the results from Tables 1-4 are unchanged. The most noteworthy difference is that now the SBP coefficients are statistically insignificant in the sub-sample of children with mothers with only a high school education. The lack of any substantive change in the NSLP coefficients – seemingly at odds with Schanzenbach (2007) – is reconciled below.

Pre-Program Health Outcomes While there does not appear to be any measurable selection bias at the school-level conditional on the covariates, we next examine selection at the child-level in greater detail. To do so, we again follow the strategy employed in Schanzenbach (2007) and re-estimate our parametric models using weight (in pounds) at kindergarten entry as the dependent variable (in both levels and logs). In addition, since our regression models using the change in child weight from fall kindergarten to third grade are robust to selection on level differences in child weight, but not selection on differences in expected weight growth, we also use the change in weight from birth to kindergarten entry as the dependent variable (in both levels and growth rates). Each regression includes the controls from specification (7), with the addition of child height measured during fall kindergarten (along with corresponding higher order and

[22] We now estimate the models for overweight status and obesity status using a linear probability model.

interaction terms), except for the models using the change in weight from birth, in which case the control variables involving child birthweight are omitted.[23] The results are reported in Table 6.

Using the full sample, while all four coefficients on SBP participation are positive – consonant with the pattern of results above – the only statistically significant coefficient is in Panel IV (growth rate for child weight). Thus, there is equally, if not stronger, evidence of positive selection into SBP on the basis of weight trajectories from birth through kindergarten (as opposed to just the level of weight at the time of kindergarten entry). None of the coefficients on NSLP participation are statistically significant in the full sample.

Examining the different sub-samples indicates that the positive selection into the SBP is driven predominantly by white children, children entering kindergarten in the normal weight range, and children with mothers with at least some college. Interestingly, this coincides nearly identically to the population sub-groups with the statistically significant, positive associations in Tables 2-4. The exception being that many of the results in Table 4 are statistically significant for children with mothers with a high school education, but not with mothers with a four-year college degree. However, the statistically significant results for the high school educated sub-group disappeared in the previous sensitivity analysis (once we include school fixed effects).

Lastly, there is some evidence of negative selection into the SBP by children entering kindergarten overweight, as well as black children. This pattern of differential selection across white and black children is consonant with our previous interpretation of the results in Table 4. However, now the coefficients for the sub-sample of black children are always statistically significant.

In terms of the NSLP results across the various sub-groups, we do obtain some modest evidence of positive selection into the program. In particular, there is some evidence of positive selection among children entering kindergarten obese, as well as white and black children. However, the results predominantly suggest that any positive selection into the NSLP is on the basis of weight in levels, not intertemporal changes in weight.

The evidence of positive selection into the SBP in the full sample, and in the sub-samples of white children, children entering kindergarten in the normal weight range, and children with well educated mothers suggests that the statistically significant SBP effects in Tables 1-4 overstate the causal relationship between SBP participation and child weight. Equally important, however, not only does positive selection into the SBP bias the regression coefficients on SBP participation upward, it also biases the regression coefficients on NSLP participation downward given the positive covariance between SBP and NSLP participation. Thus, despite the lack of overwhelming evidence of any direct selection bias associated with NSLP

[23] We include controls for child height since the dependent variables are now based on measures of weight, rather than BMI.

participation, failure to address selection into the SBP will lead to biased estimates of the NSLP effect.[24] To quantify exactly how sensitive the results are to selection into the SBP program, we turn to several methods proposed in the evaluation literature useful for assessing sensitivity to selection on unobservables.

Bivariate Probit Model To assess the impact of positive selection into the SBP, we employ the bivariate probit model utilized in Altonji et al. (2005).[25] The model is given by

$$\begin{aligned} y_i &= \mathrm{I}(x_i\beta_0 + \tau_1 D_{1i} + \tau_2 D_{2i} + \varepsilon_i > 0) \\ D_{1i} &= \mathrm{I}(x_i\lambda_0 + \lambda_2 D_{2i} + \upsilon_i > 0) \end{aligned} \tag{7}$$

where $\mathrm{I}(\cdot)$ is the indicator function, $\varepsilon, \upsilon \sim N_2(0,0,1,1,\rho)$, y is a binary measure of child health (overweight or obesity status), and D_1 and D_2 represent SBP and NSLP participation, respectively, as in (3). The correlation coefficient, ρ, captures the correlation between unobservables that impact child weight and the likelihood of SBP participation; $\rho > 0$ implies positive selection on unobservables.

Given the bivariate normality assumption, the model is technically identified even absent an exclusion restriction. However, to assess the role of selection into the SBP without formally relying on the distributional assumption, Altonji et al. (2005) constrain ρ to different values and examine the estimates of the remaining parameters. Here, we set ρ to 0, 0.1, ..., 0.5, representing increasingly strong levels of positive selection on unobservables into the SBP. The results for the full sample using specifications (7) and (8) are presented in Table 6. The results by population sub-group are relegated to the appendix, Table A3.[26]

The results are quite dramatic. First, across both specifications, both outcomes, and all data samples (the full sample and the various sub-samples), the positive effect of SBP participation disappears when $\rho = 0.1$, and is negative and statistically significant in many cases, including in the full sample (Table 6).[27] When ρ increases to 0.2, the effect of SBP is negative and statistically significant in every sub-sample (Table A3). Second, consistent with our earlier claim that positive selection into the SBP biases the effect of NSLP participation downward, the coefficients on NSLP increase as ρ increases; in most cases, the positive coefficient on NSLP participation is statistically significant for $\rho = 0.2$ or 0.3. In the full sample (Table 6), the effect of NSLP is positive and statistically significant at conventional levels if $\rho = 0.2$.

[24] For simplicity, consider the simple regression model $y = \alpha + x\beta + \varepsilon$, where x includes only SBP and NSLP participation dummies. The expectation of the OLS estimate of β is $\beta + (x'x)^{-1}x'\varepsilon$. Assuming $\text{Cov}(SBP, \varepsilon) > 0$, $\text{Cov}(NSLP, \varepsilon) = 0$, and $\text{Cov}(SBP, NSLP) > 0$, one can show that $\widehat{\beta}_{SBP}$ ($\widehat{\beta}_{NSLP}$) is biased up (down).

[25] A similar strategy is used in Frisvold (2007) to assess the impact of Head Start participation on childhood obesity.

[26] We pool together some of sub-samples given difficulty in the bivariate probit model converging.

[27] Further analysis reveals that the effect of SBP becomes negative and statistically significant in the full sample when ρ is 0.07 or 0.08 (depending on the outcome and the control set).

Thus, the bivariate probit models indicate, first and foremost, that the positive associations documented earlier between SBP participation and child weight are *extremely* sensitive to selection on unobservables; even a modest amount of positive selection eliminates, and even reverses, the results. While we do not know the true value of ρ, a value around 0.1 does not seem unreasonable, particularly since factors such as parental height, weight, and marital status are not included in the set of observables. Moreover, we did estimate the bivariate probit models using the full sample and control set (7) without constraining ρ; thus, the models are identified solely from the parametric assumption. For overweight status, $\widehat{\rho} = 0.13$; for obesity status, $\widehat{\rho} = 0.32$.

Equally important, allowing for positive selection into the SBP indicates that NSLP participation leads to greater child weight. Thus, conditioning on SBP participation, but allowing for positive selection into the SBP, yields NSLP program effect estimates that are consistent with the contemporaneous relationship documented in Schanzenbach (2007) using alternative methodologies. Our findings are also consistent with findings from the SNDA-2 analysis of school meals conducted in 1998-1999 (discussed in Section 2.2). The SNDA-2 study found that the average percent of calories derived from fat (saturated fat) was 34% (12%), which still exceeds the requirements instituted under the SMI. Breakfasts, on average, met the SMI requirements, deriving 26% (9.8%) of calories from fat (saturated fat).[28] Moreover, the FNS found that even a dietitian could not select a low fat lunch provided by the NSLP in between 10% and 35% of all schools.

Extent of Selection on Unobservables Altonji et al. (2005) offer an alternative method for assessing the role of unobservables, applicable to continuous outcomes as well. Intuitively, the idea is to assess how much selection on unobservables there must be, relative to the amount of selection on observables, to fully account for the positive association between SBP participation and child weight under the null hypothesis of no average treatment effect.

The (normalized) amount of selection on unobservables is formalized by the ratio

$$\frac{\mathrm{E}[\varepsilon|D_1 = 1] - \mathrm{E}[\varepsilon|D_1 = 0]}{\mathrm{Var}(\varepsilon)} \tag{8}$$

where D_1 denotes SBP participation as above and ε captures unobservables in the outcome equation (representing the full error term in (3) and (6)). Similarly, the (normalized) amount of selection on observables is formalized by the ratio

$$\frac{\mathrm{E}[x_o\widetilde{\beta}|D_1 = 1] - \mathrm{E}[x_o\widetilde{\beta}|D_1 = 0]}{\mathrm{Var}(x_o\widetilde{\beta})} \tag{9}$$

[28] See also http://www.iom.edu/Object.File/Master/31/064/Jay%20Hirschman.IOM%20Presentation.Oct%2026%202005.pdf.

where x_o is the set of observable controls included in the outcome equation (representing both x and D_2 in (3) and (6)) and $\widetilde{\beta}$ is the corresponding parameter vector. The goal is to assess how large (8) must be relative to (9) to fully account for the positive association between SBP and child weight documented in Tables 1-4.

To begin, express actual SBP participation as

$$D_{1i} = x_{oi}\lambda + \upsilon_i \tag{10}$$

and substitute this into (3) or (6). Equation (3), for example, becomes

$$y_i = x_{oi}(\widetilde{\beta} + \tau_1\lambda) + \tau_1\upsilon_i + \varepsilon_i. \tag{11}$$

The probability limit of the OLS estimator of τ_1 in (11) is given by

$$\begin{aligned} \text{plim}\,\widehat{\tau}_1 &= \tau_1 + \frac{\text{Cov}(\upsilon,\varepsilon)}{\text{Var}(\upsilon)} \\ &= \tau_1 + \frac{\text{Var}(D_1)}{\text{Var}(\upsilon)}\left\{\text{E}[\varepsilon|D_1 = 1] - \text{E}[\varepsilon|D_1 = 0]\right\}. \end{aligned} \tag{12}$$

Under the assumption that the degree of selection on observables – given by (9) – is equal to the degree of selection on unobservables – given by (8) – the bias term in (12) is

$$\frac{\text{Cov}(\upsilon,\varepsilon)}{\text{Var}(\upsilon)} = \frac{\text{Var}(D_1)}{\text{Var}(\upsilon)}\left\{\frac{\text{E}[x_o\widetilde{\beta}|D_1 = 1] - \text{E}[x_o\widetilde{\beta}|D_1 = 0]}{\text{Var}(x_o\widetilde{\beta})}\text{Var}(\varepsilon)\right\}. \tag{13}$$

Under the null hypothesis that $\tau_1 = 0$, $\widetilde{\beta}$ can be consistently estimated from (11) using either OLS or a probit model and constraining τ_1 to be zero. Using the estimated $\widetilde{\beta}$ and variance of the residual (which is unity when (11) is estimated via probit), along with sample values of $\text{Var}(D_1)$ and $\text{Var}(\upsilon)$ yields an estimate of the asymptotic bias under equal degrees of selection on observables and unobservables.

Dividing the unconstrained estimate of τ_1 from (11) by (13) indicates how much larger the extent of selection on unobservables needs to be, relative to the extent of selection on unobservables, to entirely explain the treatment effect. If this ratio is small, the implication is that the treatment effect is highly sensitive to selection on unobservables. As discussed in Altonji et al. (2005), if one conceptualizes the set of variables included in x_o as a random draw of all factors affecting child weight (with the remaining factors being captured by ε) and no factor (observed or unobserved) plays too large of role in the determination of child weight, then the treatment effect should be interpreted as not robust if the ratio is less one.

The results for the full sample are shown in Table 7; the results for the various sub-groups are relegated to the appendix, Table A4.[29] For the full sample, and for all the sub-samples, the implied ratio is

[29] For consistency, we pool together some of the sub-samples as in Table A3.

rarely greater than 0.5. Thus, if the (normalized) amount of selection on unobservables is even half the (normalized) amount of selection on observables, the positive effects of SBP participation are completely explained. The sole exception is in the sub-sample of children with mothers with low education (Table A4, Panel IIA), where the implied ratio for BMI in levels and logs is around one. Consequently, this analysis confirms the bivariate probit findings; even a modest amount of selection on unobservables is sufficient to explain the entire positive association between SBP participation and child weight.

Rosenbaum Bounds Our final method of assessing the role of selection on unobservables is to return to the PSM estimates reported in Tables 1-4 and utilize Rosenbaum bounds (Rosenbaum 2002). While there exist other methods of assessing the sensitivity of PSM estimates to selection on unobservables, Rosenbaum bounds are computationally attractive and also offer an intuitively appealing measure of the way in which unobservables enter the model (Ferraro et al. 2007).

Let π_i represent the odds of child i receiving the treatment (e.g., participating in the SBP); $\pi_i/(1-\pi_i)$ is the odds ratio. Assume the log odds ratio can be expressed as a generalized function of observables, x_i, and a binary, unobserved term, α_i. Formally,

$$\ln\left(\frac{\pi_i}{(1-\pi_i)}\right) = \kappa(x_i) + \gamma\alpha_i \tag{14}$$

Thus, the relative odds ratio of two observationally identical children is given by

$$\frac{\frac{\pi_i}{(1-\pi_i)}}{\frac{\pi_j}{(1-\pi_j)}} = \frac{\exp\{\kappa(x_i) + \gamma\alpha_i\}}{\exp\{\kappa(x_j) + \gamma\alpha_j\}} = \exp\{\gamma(\alpha_i - \alpha_j)\} \tag{15}$$

which differs from unity if γ or $\alpha_i - \alpha_j$ is non-zero. Moreover, since α is binary, $\alpha_i - \alpha_j \in \{-1, 0, 1\}$, and

$$\frac{1}{\exp\{\gamma\}} \leq \frac{\pi_i(1-\pi_j)}{\pi_j(1-\pi_i)} \leq \exp\{\gamma\} \tag{16}$$

If $\Gamma \equiv \exp\{\gamma\} = 1$, as it would in a randomized experiment or in non-experimental data free of bias from selection on unobservables, the model is said to be free of hidden bias; controlling for selection on observables would yield an unbiased estimate of the treatment effect. Higher values of Γ imply an increasingly important role of unobservables in the treatment selection process. For example, $\Gamma = 2$ implies that observationally identical children can differ in their relative odds of treatment by a factor of two. Rosenbaum bounds use bounds on the distribution of Wilcoxen's signed rank statistic under the null of zero treatment effect using different values of Γ. This leads to bounds on the significance level of a one-sided test for no treatment effect.

Table 8 reports the upper bound on the p-value of the null of zero average treatment effect for different values of Γ using the full sample. The results for the different population sub-groups are relegated to Tables

A5 (SBP) and A6 (NSLP) in the appendix. Intuitively, if the upper bound on the p-value is less than, say, 0.10 for reasonably large values of Γ, then the treatment effect is said to be robust to hidden bias.

Panel I in Table 8 indicates that the positive effects of SBP participation in the full sample are sensitive to hidden bias if $\Gamma \geq 1.4$ for all outcomes except obesity status, and $\Gamma \geq 1.8$ for the final outcome (obesity status). Thus, if observationally identical children differ in their odds of participating in the SBP by roughly 50%, the program effect is sensitive to hidden bias. In the PSM literature, $\Gamma = 1.4$ is usually interpreted as 'small', implying that our PSM estimates of the average treatment effect of SBP participation is not free from hidden bias. The estimated effects of NSLP participation exhibit even greater sensitivity to hidden bias. These findings are consistent with the prior results obtained using the methods utilized in Altonji et al. (2005).

When splitting the sample by risk type, we find the effects of SBP to be sensitive to hidden bias if $\Gamma \geq 1.4$ for most outcomes for children entering kindergarten overweight or obese; for children entering in the normal weight range, some of the treatment effects are more insensitive to hidden bias. However, this is the sample for which there was strong evidence of positive selection into the SBP (Table 5). Splitting the sample by mother's education or race fails to yield much evidence of treatment effects insensitive to hidden bias. Lastly, across the majority of outcomes and data samples, the average treatment effects of NSLP are found to be sensitive to hidden bias; p-values are predominantly above 0.10 if $\Gamma \geq 1.4$.

Summation The analysis contained herein yields a fairly consistent picture of the effects of school nutrition programs. First, SBP participation is likely related to unobservables correlated with trajectories for child weight (in addition to child weight in levels), whereas there is almost no evidence that NSLP participation is affected by selection on unobservables. Second, ignoring this selection biases estimates of the average treatment effect of SBP (NSLP) participation upward (downward) regardless of whether one examines measures of child weight in levels or changes. Finally, allowing for even modest positive selection into the SBP is sufficient to yield a negative (positive) causal affect of SBP (NSLP) participation on child weight. Thus, consonant with the results in Bhattacharya et al. (2006) and Schanzenbach (2007), we find that the SBP is not a contributing factor to the current obesity epidemic, and may actually constitute a valuable tool, but the NSLP is contributing to the current epidemic.

6 Conclusion

Given the vast research on the importance of breakfast in maintaining a healthy lifestyle, as well as the nutritional requirements imposed on schools seeking reimbursement under the SBP and the NSLP, these programs are viewed by many as one potential component of any attempt to reverse the increase in prevalence of childhood obesity. That said, empirical research on the impact of these programs on child weight subsequent to the required implementation of the reforms instituted under the School Meals Initiative for Healthy Children has been lacking. Using panel data on over 13,500 students from kindergarten through third grade, we assess the relatively long-run relationship between SBP and NSLP participation and child weight.

Our results are striking, and yield three primary conclusions. First, there is a strong, positive *association* between SBP participation in kindergarten and child weight in third grade and weight gain between kindergarten and third grade for many children. There is no association between NSLP participation and child weight in third grade. However, we find evidence of positive selection into the SBP, particularly for white children, as well as children entering kindergarten in the normal weight range and those with college-educated mothers. Consonant with Schanzenbach (2007), selection bias does not seem to be much of a concern when analyzing the NSLP. Finally, assuming this positive selection in the SBP is even modest in magnitude, the *causal* relationship between SBP participation and child weight becomes negative and statistically meaningful. Moreover, in this case, the *causal* relationship between NSLP participation and child weight becomes positive. Thus, admitting even modest positive selection into the SBP implies that the SBP is a *valuable* tool in the current battle against childhood obesity, whereas the NSLP *exacerbates* the current epidemic.

These results complement the previous findings in Bhattacharya et al. (2006) and Schanzenbach (2007), confirming the positive (negative) effects of the SBP (NSLP) using data after the reforms of the late 1990s, employing alternative empirical methodologies, and examining more long-run measures of child health.

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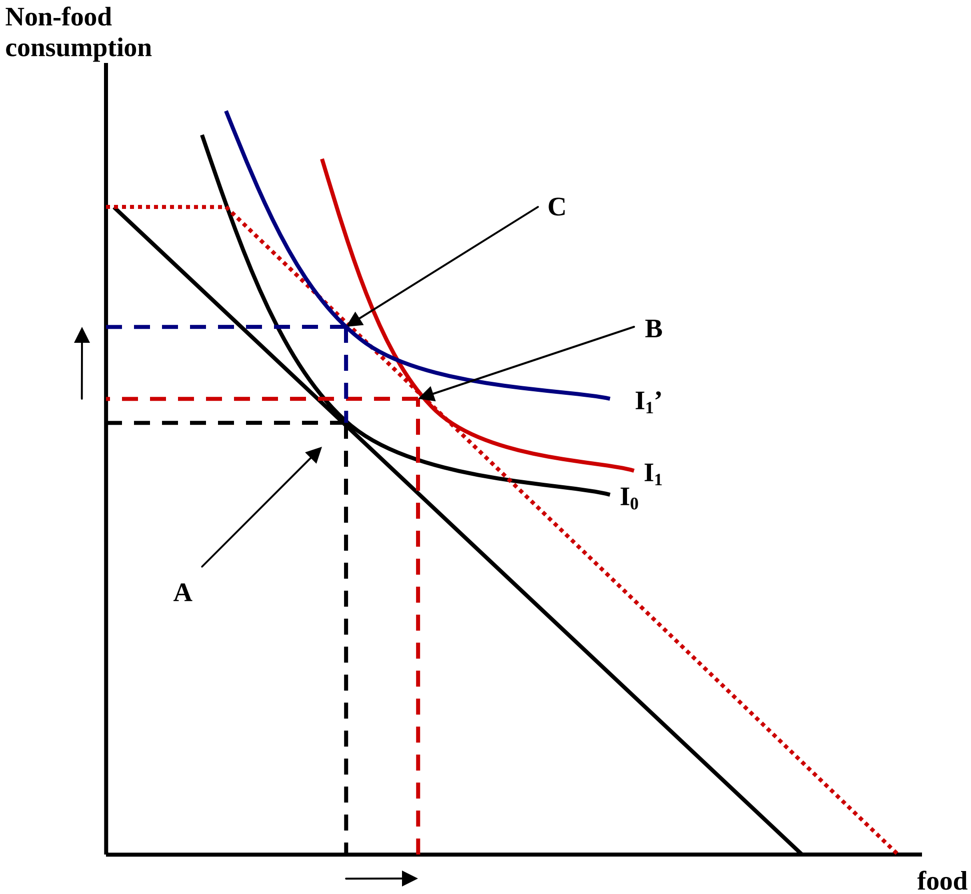

Figure 1. Theoretical Impact of Infra-Marginal Food Transfer Programs on Food and Non-Food Consumption.

NOTES: A – initial consumption point prior to food transfer program. B – final consumption point with food transfer program assuming food and non-food consumption are normal goods. C – final consumption point with food transfer program assuming non-food consumption is a normal good and the income elasticity of food consumption is zero.

Table 1. Full Sample Results

	(1) b/se	(2) b/se	(3) b/se	(4) b/se	(5) b/se	(6) b/se	(7) b/se	(8) b/se	(9) b/se
I. BMI: Levels									
School	0.401*	0.300*	0.272*	0.283*	0.291*	0.291*	0.290*	0.209*	0.353*
Breakfast	(0.088)	(0.091)	(0.091)	(0.091)	(0.092)	(0.091)	(0.092)	(0.056)	(0.120)
School	0.088	0.051	0.041	0.035	0.035	0.045	0.040	-0.004	-0.022
Lunch	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)	(0.075)	(0.046)	(0.095)
II. BMI: Logs									
School	0.020*	0.015*	0.014*	0.014*	0.015*	0.015*	0.014*	0.010*	0.017*
Breakfast	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.003)	(0.007)
School	0.004	0.002	0.002	0.001	0.001	0.002	0.002	-0.001	-0.001
Lunch	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.005)
III. BMI: Growth Rates									
School	0.013*	0.011*	0.010*	0.010*	0.010*	0.010*	0.010*	0.010*	0.014*
Breakfast	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
School	0.001	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
Lunch	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
IV. Percentile BMI: Levels									
School	2.657*	2.134*	1.999*	2.092*	2.173*	2.167*	2.114*	1.478*	2.178*
Breakfast	(0.686)	(0.709)	(0.712)	(0.712)	(0.715)	(0.708)	(0.714)	(0.510)	(1.023)
School	0.361	0.196	0.150	0.105	0.120	0.205	0.187	-0.258	-0.023
Lunch	(0.585)	(0.586)	(0.587)	(0.587)	(0.588)	(0.582)	(0.582)	(0.415)	(0.672)
V. Percentile BMI: Changes									
School	1.116†	1.027‡	0.939‡	0.976‡	0.987‡	0.990‡	1.009‡	1.475*	2.462*
Breakfast	(0.524)	(0.538)	(0.541)	(0.541)	(0.543)	(0.542)	(0.548)	(0.510)	(0.826)
School	-0.337	-0.301	-0.331	-0.341	-0.331	-0.352	-0.350	-0.257	-0.151
Lunch	(0.447)	(0.445)	(0.446)	(0.446)	(0.446)	(0.446)	(0.447)	(0.415)	(0.479)
VI. Probability of Being Overweight									
School	0.083*	0.057‡	0.051	0.054‡	0.054‡	0.054‡	0.050	0.070†	0.031†
Breakfast	(0.030)	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)	(0.032)	(0.036)	(0.016)
School	0.008	-0.003	-0.005	-0.007	-0.007	-0.004	-0.004	-0.013	-0.005
Lunch	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.030)	(0.012)
VII. Probability of Being Obese									
School	0.095*	0.060‡	0.049	0.053	0.053	0.051	0.055	0.064	0.036*
Breakfast	(0.033)	(0.034)	(0.034)	(0.035)	(0.035)	(0.035)	(0.035)	(0.041)	(0.013)
School	0.039	0.024	0.020	0.018	0.016	0.018	0.015	0.032	-0.002
Lunch	(0.029)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.035)	(0.009)

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Marginal effects reported in Panels VI and VII. Additional controls in each model:

(1) age, gender dummy, four race dummies, 2 city type dummies, and 3 region dummies;

(2) previous control set plus 3 dummies for mother's age at first birth, dummies for whether mother received WIC benefits during pregancy, and 5 mother's education dummies;

(3) previous control set plus household income;

(4) previous control set plus 2 dummies for mother's current employment status;

(5) previous control set plus number of children's books in the household and 3 dummies for the amount of food in the household;

(6) previous control set plus child's birthweight;

(7) previous control set plus quadratic and cubic terms of all continuous variables, and the complete set of pairwise interactions among the continuous variables; and

(8) previous control set plus the lagged dependent variable (from the fall kindergarten wave), quadratic and cubic terms of the lagged dependent variable (Panels I -- V only), and the complete set of pairwise interactions between the lagged dependent variable and the continuous variables included in the previous control set.

Column (9) reports separate propensity score matching estimates for school breakfast and school lunch using the variables from model (8) in the propensity score model (estimated via probit). Standard errors from 100 bootstrap repetitions. N = 13,534. See text for more details.

Table 2. Results: Children by Risk Type Entering Kindergarten

	A. Normal Weight Range			B. Overweight Entering Kindergarten			C. Obese Entering Kindergarten			D. Overweight or Obese Entering Kindergarten		
	(7)	(8)	(9)	(7)	(8)	(9)	(7)	(8)	(9)	(7)	(8)	(9)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
I. BMI: Levels												
School	0.305*	0.243*	0.270*	-0.030	0.001	0.203	0.547†	0.452†	0.446‡	0.272	0.177	0.533†
Breakfast	(0.067)	(0.059)	(0.101)	(0.182)	(0.176)	(0.319)	(0.263)	(0.199)	(0.251)	(0.189)	(0.131)	(0.250)
School	0.031	-0.009	0.035	-0.064	-0.104	-0.182	0.267	0.156	0.208	0.060	0.016	-0.140
Lunch	(0.054)	(0.047)	(0.060)	(0.152)	(0.146)	(0.188)	(0.239)	(0.181)	(0.278)	(0.164)	(0.113)	(0.183)
II. BMI: Logs												
School	0.017*	0.013*	0.015*	-0.003	-0.002	0.007	0.021†	0.018†	0.018	0.010	0.006	0.023*
Breakfast	(0.004)	(0.003)	(0.006)	(0.009)	(0.008)	(0.015)	(0.010)	(0.008)	(0.012)	(0.008)	(0.006)	(0.009)
School	0.001	-0.001	0.002	-0.003	-0.005	-0.009	0.011	0.006	0.009	0.002	0.000	-0.007
Lunch	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)	(0.009)	(0.009)	(0.007)	(0.012)	(0.007)	(0.005)	(0.009)
III. BMI: Growth Rates												
School	0.013*	0.013*	0.017*	-0.003	-0.002	0.006	0.016†	0.018†	0.017†	0.006	0.006	0.012‡
Breakfast	(0.003)	(0.003)	(0.005)	(0.008)	(0.008)	(0.014)	(0.008)	(0.008)	(0.008)	(0.006)	(0.006)	(0.007)
School	0.000	-0.001	0.001	-0.004	-0.005	-0.009	0.006	0.006	0.012	0.000	0.000	-0.002
Lunch	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.005)	(0.005)	(0.006)
IV. Percentile BMI: Levels												
School	3.077*	2.198*	2.397†	-0.870	-0.606	-0.427	0.524	0.558	0.417	-0.081	-0.179	0.816
Breakfast	(0.798)	(0.668)	(1.108)	(1.001)	(0.985)	(1.535)	(0.460)	(0.435)	(0.549)	(0.620)	(0.557)	(0.836)
School	0.334	-0.182	0.390	-0.822	-1.032	-1.458	0.294	0.125	0.389	-0.343	-0.424	-0.651
Lunch	(0.637)	(0.533)	(0.707)	(0.835)	(0.818)	(0.912)	(0.418)	(0.395)	(0.559)	(0.538)	(0.483)	(0.613)
V. Percentile BMI: Changes												
School	1.608†	2.195*	3.211*	-0.791	-0.606	-0.559	0.503	0.558	0.401	-0.147	-0.179	0.227
Breakfast	(0.716)	(0.668)	(0.987)	(0.977)	(0.985)	(1.447)	(0.437)	(0.435)	(0.517)	(0.559)	(0.557)	(0.655)
School	-0.303	-0.183	0.042	-0.969	-1.032	-1.448‡	0.191	0.125	0.416	-0.397	-0.424	-0.534
Lunch	(0.571)	(0.533)	(0.634)	(0.815)	(0.818)	(0.867)	(0.397)	(0.395)	(0.587)	(0.485)	(0.483)	(0.586)
VI. Probability of Being Overweight												
School	0.124*		0.032†	-0.121		-0.064	0.122		0.021‡	-0.046		0.016
Breakfast	(0.042)		(0.015)	(0.084)		(0.045)	(0.157)		(0.011)	(0.065)		(0.021)
School	-0.011		0.000	-0.029		-0.017	0.089		0.015	-0.016		-0.012
Lunch	(0.035)		(0.009)	(0.070)		(0.028)	(0.140)		(0.015)	(0.057)		(0.016)
VII. Probability of Being Obese												
School	0.155†		0.021†	-0.015		0.065	0.096		0.043	0.032		0.101*
Breakfast	(0.061)		(0.009)	(0.085)		(0.046)	(0.103)		(0.027)	(0.058)		(0.026)
School	0.008		0.001	0.042		-0.010	0.055		0.013	0.027		-0.019
Lunch	(0.053)		(0.005)	(0.071)		(0.027)	(0.089)		(0.029)	(0.050)		(0.020)

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. N = 10,039 (Sample A); 1,954 (Sample B); 1,541 (Sample C); and 3,495 (Sample D). See Table 2 for additional details.

Table 3. Results: Children by Mother's Education

	A. Less than a High School or Missing			B. High School			C. Some College			D. At Least A Bachelor's Degree		
	(7)	(8)	(9)	(7)	(8)	(9)	(7)	(8)	(9)	(7)	(8)	(9)
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
I. BMI: Levels												
School	0.128	0.140	0.138	0.342†	0.206†	0.313	0.514*	0.377*	0.291	0.251	-0.101	0.184
Breakfast	(0.210)	(0.131)	(0.254)	(0.159)	(0.097)	(0.191)	(0.172)	(0.103)	(0.224)	(0.269)	(0.170)	(0.364)
School	-0.318	-0.136	-0.211	0.236	0.136	0.110	-0.150	-0.139‡	-0.176	0.144	0.063	0.099
Lunch	(0.250)	(0.157)	(0.335)	(0.148)	(0.090)	(0.207)	(0.131)	(0.078)	(0.163)	(0.126)	(0.079)	(0.120)
II. BMI: Logs												
School	0.007	0.007	0.005	0.016†	0.009‡	0.015‡	0.026*	0.020*	0.011	0.011	-0.007	0.009
Breakfast	(0.010)	(0.007)	(0.012)	(0.008)	(0.005)	(0.009)	(0.009)	(0.005)	(0.012)	(0.014)	(0.009)	(0.018)
School	-0.014	-0.007	-0.010	0.011	0.006	0.006	-0.008	-0.008‡	-0.010	0.007	0.003	0.005
Lunch	(0.012)	(0.008)	(0.018)	(0.007)	(0.005)	(0.009)	(0.007)	(0.004)	(0.007)	(0.007)	(0.004)	(0.006)
III. BMI: Growth Rates												
School	0.006	0.007	0.003	0.010†	0.009‡	0.015†	0.019*	0.020*	0.012	-0.002	-0.007	0.006
Breakfast	(0.007)	(0.007)	(0.008)	(0.005)	(0.005)	(0.006)	(0.006)	(0.005)	(0.009)	(0.009)	(0.009)	(0.013)
School	-0.007	-0.007	-0.011	0.008	0.006	0.006	-0.008‡	-0.008‡	-0.009‡	0.002	0.003	0.004
Lunch	(0.008)	(0.008)	(0.010)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
IV. Percentile BMI: Levels												
School	0.920	0.089	-1.051	1.974‡	1.480‡	2.610‡	3.636*	2.819*	0.353	1.828	-0.458	3.017
Breakfast	(1.532)	(1.111)	(1.592)	(1.184)	(0.848)	(1.471)	(1.333)	(0.947)	(1.891)	(2.398)	(1.709)	(3.180)
School	-0.706	0.065	-1.160	1.330	0.522	0.760	-1.272	-1.395‡	-1.466	0.535	-0.002	0.260
Lunch	(1.829)	(1.325)	(2.260)	(1.099)	(0.787)	(1.172)	(1.015)	(0.721)	(1.036)	(1.121)	(0.799)	(1.022)
V. Percentile BMI: Changes												
School	-0.783	0.085	-0.263	1.192	1.479‡	3.066†	2.381†	2.817*	1.478	-0.259	-0.459	2.521
Breakfast	(1.182)	(1.111)	(1.278)	(0.918)	(0.849)	(1.261)	(1.011)	(0.947)	(1.486)	(1.836)	(1.709)	(2.746)
School	0.623	0.065	-0.830	0.242	0.523	0.720	-1.373‡	-1.395‡	-1.519‡	-0.205	-0.001	0.177
Lunch	(1.411)	(1.325)	(1.521)	(0.852)	(0.787)	(1.078)	(0.769)	(0.720)	(0.832)	(0.858)	(0.799)	(0.902)
VI. Probability of Being Overweight												
School	0.057	0.126‡	0.025	0.082	0.087	0.047†	0.057	0.077	-0.006	-0.015	-0.127	-0.013
Breakfast	(0.067)	(0.076)	(0.031)	(0.052)	(0.059)	(0.021)	(0.059)	(0.066)	(0.023)	(0.110)	(0.130)	(0.049)
School	-0.043	-0.030	-0.022	0.047	0.042	0.012	-0.065	-0.081	-0.025	0.022	0.003	0.000
Lunch	(0.081)	(0.091)	(0.037)	(0.049)	(0.056)	(0.020)	(0.045)	(0.051)	(0.016)	(0.053)	(0.061)	(0.016)
VII. Probability of Being Obese												
School	0.026	0.116	0.013	0.088	0.061	0.022	0.074	0.111	0.028	0.142	-0.062	0.01
Breakfast	(0.074)	(0.086)	(0.023)	(0.058)	(0.069)	(0.017)	(0.066)	(0.078)	(0.026)	(0.121)	(0.147)	(0.034)
School	-0.044	-0.046	-0.020	0.074	0.126‡	0.017	-0.067	-0.085	-0.026	0.084	0.128‡	0.014
Lunch	(0.089)	(0.103)	(0.030)	(0.055)	(0.066)	(0.015)	(0.052)	(0.061)	(0.016)	(0.064)	(0.074)	(0.012)

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. N = 1,982 (Sample A); 4,030 (Sample B); 4,311 (Sample C); and 3,211 (Sample D).
See Table 2 for additional details.

Table 4. Results: Children by Race

	A. White			B. Black			C. Hispanic		
	(7)	**(8)**	**(9)**	**(7)**	**(8)**	**(9)**	**(7)**	**(8)**	**(9)**
	b/se	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**	**b/se**
I. BMI: Levels									
School	0.473*	0.207†	0.356†	0.052	0.307†	0.278	-0.011	0.122	0.215
Breakfast	(0.132)	(0.083)	(0.171)	(0.237)	(0.140)	(0.270)	(0.204)	(0.120)	(0.264)
School	0.139	0.042	0.040	0.056	-0.150	-0.662	-0.177	-0.128	-0.221
Lunch	(0.088)	(0.055)	(0.086)	(0.296)	(0.175)	(0.468)	(0.204)	(0.119)	(0.264)
II. BMI: Logs									
School	0.023*	0.009†	0.016‡	0.002	0.013‡	0.012	0.001	0.008	0.012
Breakfast	(0.007)	(0.004)	(0.009)	(0.011)	(0.007)	(0.013)	(0.010)	(0.006)	(0.013)
School	0.007	0.002	0.002	0.002	-0.010	-0.034‡	-0.009	-0.008	-0.009
Lunch	(0.004)	(0.003)	(0.005)	(0.014)	(0.009)	(0.021)	(0.010)	(0.006)	(0.013)
III. BMI: Growth Rates									
School	0.012*	0.009†	0.016†	0.010	0.013‡	0.013	0.006	0.008	0.005
Breakfast	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)	(0.008)	(0.006)	(0.006)	(0.007)
School	0.003	0.002	0.001	-0.006	-0.010	-0.019	-0.008	-0.008	-0.007
Lunch	(0.003)	(0.003)	(0.003)	(0.009)	(0.009)	(0.012)	(0.006)	(0.006)	(0.008)
IV. Percentile BMI: Levels									
School	2.487†	0.951	1.988	0.802	1.714	1.556	0.713	1.528	1.370
Breakfast	(1.100)	(0.791)	(1.492)	(1.621)	(1.163)	(1.660)	(1.447)	(1.012)	(1.756)
School	0.990	0.048	0.043	0.381	-1.292	-3.098	-0.834	-1.242	-1.060
Lunch	(0.732)	(0.526)	(0.719)	(2.026)	(1.454)	(2.595)	(1.444)	(1.010)	(1.720)
V. Percentile BMI: Changes									
School	0.554	0.948	2.451†	1.504	1.711	1.512	1.481	1.526	1.134
Breakfast	(0.852)	(0.791)	(1.175)	(1.249)	(1.163)	(1.374)	(1.077)	(1.012)	(1.089)
School	-0.281	0.048	-0.184	-1.951	-1.292	-1.745	-1.288	-1.242	-0.902
Lunch	(0.567)	(0.526)	(0.625)	(1.561)	(1.454)	(1.978)	(1.076)	(1.010)	(1.280)
VI. Probability of Being Overweight									
School	0.067	0.040	0.027	-0.035	-0.012	-0.012	-0.014	0.035	0.027
Breakfast	(0.049)	(0.055)	(0.022)	(0.073)	(0.083)	(0.028)	(0.064)	(0.074)	(0.030)
School	0.004	-0.030	-0.011	0.076	0.091	-0.001	0.012	-0.002	-0.010
Lunch	(0.034)	(0.038)	(0.012)	(0.091)	(0.105)	(0.042)	(0.065)	(0.075)	(0.026)
VII. Probability of Being Obese									
School	0.142†	0.108‡	0.041†	-0.043	0.063	0.012	-0.011	0.027	0.019
Breakfast	(0.055)	(0.065)	(0.019)	(0.081)	(0.093)	(0.024)	(0.070)	(0.085)	(0.026)
School	0.033	0.071	0.007	0.084	0.022	-0.041	-0.045	-0.071	-0.020
Lunch	(0.039)	(0.046)	(0.010)	(0.102)	(0.116)	(0.044)	(0.071)	(0.085)	(0.027)

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. N = 7,832 (Sample A); 1,865 (Sample B); and 2,356 (Sample C). See Table 2 for additional details.

Table 5. Selection into School Nutrition Programs

	Full Sample	Risk Type				Mother's Education				Race		
		Normal Weight	Overweight	Obese	Overweight or Obese	Less Than High School or Missing	High School	Some College	Bachelor's Degree or Above	White	Black	Hispanic
	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
I. Weight (lbs.)												
School	0.038	0.069	-0.365†	-0.213	-0.090	-0.214	0.053	0.376	0.469	0.307	-0.320	-0.585‡
Breakfast	(0.154)	(0.091)	(0.164)	(0.512)	(0.328)	(0.334)	(0.267)	(0.288)	(0.467)	(0.217)	(0.392)	(0.350)
School	0.133	0.056	-0.090	0.744	0.242	-0.191	0.120	0.039	0.184	0.296†	0.027	0.084
Lunch	(0.125)	(0.073)	(0.137)	(0.466)	(0.284)	(0.399)	(0.248)	(0.220)	(0.218)	(0.145)	(0.489)	(0.349)
N	13534	10039	1954	1541	3495	1982	4030	4311	3211	7832	1865	2356
II. Weight (lbs.): Change in Levels												
School	0.066	0.098	-0.305‡	-0.198	-0.073	-0.192	0.052	0.417	0.552	0.359‡	-0.366	-0.477
Breakfast	(0.154)	(0.091)	(0.165)	(0.510)	(0.328)	(0.334)	(0.268)	(0.288)	(0.465)	(0.217)	(0.394)	(0.350)
School	0.135	0.057	-0.120	0.717	0.196	-0.160	0.098	0.062	0.153	0.293†	0.142	0.086
Lunch	(0.125)	(0.073)	(0.138)	(0.461)	(0.284)	(0.398)	(0.249)	(0.219)	(0.218)	(0.145)	(0.491)	(0.348)
N	13534	10039	1954	1541	3495	1982	4030	4311	3211	7832	1865	2356
III. Weight (lbs.): Logs												
School	0.001	0.002	-0.007†	-0.004	-0.002	-0.002	0.001	0.007	0.011	0.006	-0.006	-0.010
Breakfast	(0.003)	(0.002)	(0.003)	(0.008)	(0.005)	(0.006)	(0.005)	(0.005)	(0.009)	(0.004)	(0.007)	(0.007)
School	0.003	0.001	-0.001	0.012‡	0.004	-0.003	0.003	0.000	0.004	0.007†	0.003	0.002
Lunch	(0.002)	(0.002)	(0.003)	(0.007)	(0.005)	(0.008)	(0.005)	(0.004)	(0.004)	(0.003)	(0.009)	(0.007)
N	13534	10039	1954	1541	3495	1982	4030	4311	3211	7832	1865	2356
IV. Weight (lbs.): Growth Rates												
School	0.011*	0.013*	0.004	-0.003	0.004	0.006	0.009	0.017†	0.036*	0.026*	-0.016	0.005
Breakfast	(0.004)	(0.004)	(0.007)	(0.009)	(0.007)	(0.009)	(0.007)	(0.007)	(0.012)	(0.005)	(0.010)	(0.009)
School	0.002	0.001	-0.006	0.012	0.003	0.000	-0.001	0.005	-0.002	0.004	0.023‡	-0.002
Lunch	(0.003)	(0.003)	(0.006)	(0.009)	(0.006)	(0.010)	(0.006)	(0.005)	(0.006)	(0.004)	(0.012)	(0.009)
N	13534	10039	1954	1541	3495	1982	4030	4311	3211	7832	1865	2356

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Other controls include those from specification (7) in Table 2, except all terms involving child's birthweight are omitted in Panels II and IV. In addition, all regressions include controls for child's height in fall kindergarten (plus higher order and interaction terms). See Table 2 and text for details.

Table 6. Sensitivity Analysis: Bivariate Probit Results with Different Assumptions Concerning Correlation Among the Disturbances

	Correlation of the Disturbances											
	Specification (7)						Specification (8)					
	ρ = 0	ρ = 0.1	ρ = 0.2	ρ = 0.3	ρ = 0.4	ρ = 0.5	ρ = 0	ρ = 0.1	ρ = 0.2	ρ = 0.3	ρ = 0.4	ρ = 0.5
	A. Probability of Being Overweight											
School	0.050	-0.117*	-0.284*	-0.449*	-0.614*	-0.778*	0.070†	-0.097*	-0.264*	-0.431*	-0.598*	-0.766*
Breakfast	(0.032)	(0.031)	(0.031)	(0.031)	(0.030)	(0.029)	(0.036)	(0.035)	(0.035)	(0.034)	(0.034)	(0.033)
School	-0.004	0.023	0.052†	0.082*	0.113*	0.145*	-0.013	0.015	0.044	0.074†	0.106*	0.139*
Lunch	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.026)	(0.030)	(0.030)	(0.029)	(0.029)	(0.029)	(0.029)
	B. Probability of Being Obese											
School	0.055	-0.112*	-0.278*	-0.444*	-0.608*	-0.771*	0.064	-0.103†	-0.270*	-0.436*	-0.603*	-0.770*
Breakfast	(0.035)	(0.035)	(0.035)	(0.034)	(0.033)	(0.032)	(0.041)	(0.041)	(0.040)	(0.040)	(0.039)	(0.038)
School	0.015	0.044	0.075†	0.108*	0.144*	0.182*	0.032	0.061‡	0.092*	0.125*	0.160*	0.199*
Lunch	(0.030)	(0.030)	(0.030)	(0.030)	(0.029)	(0.029)	(0.035)	(0.035)	(0.035)	(0.034)	(0.034)	(0.033)

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Specifications (7) and (8) refer to control sets used in Table 2. See Table 2 and text for details.

Table 7. Sensitivity Analysis: Amount of Selection on Unobservables Relative to Selection on Observables Required to Attribute the Entire SBP Effect to Selection Bias

	Specification (7)			Specification (8)		
	Cov(ε,ν)÷ Var(ν)	τ_1	Implied Ratio	Cov(ε,ν)÷ Var(ν)	τ_1	Implied Ratio
BMI: Levels	14.625	0.290	0.020	0.453	0.209	0.460
		(0.092)			(0.056)	
BMI: Logs	0.654	0.014	0.022	0.024	0.010	0.405
		(0.005)			(0.003)	
BMI: Growth Rates	0.490	0.010	0.021	0.175	0.010	0.057
		(0.003)			(0.003)	
Percentile BMI: Levels	77.583	2.114	0.027	4.465	1.478	0.331
		(0.714)			(0.510)	
Percentile BMI: Changes	57.727	1.009	0.017	7.718	1.475	0.191
		(0.548)			(0.510)	
Probability of Being Overweight	3.313	0.019	0.006	0.327	0.019	0.058
		(0.011)			(0.009)	
Probability of Being Obese	3.450	0.015	0.004	0.456	0.012	0.027
		(0.009)			(0.007)	

NOTES: Standard errors in parentheses. Specifications (7) and (8) refer to control sets used in Table 2, plus NSLP participation. Cov(ε,ν)/Var(ν) refers to the asymptotic bias of the unconstrained estimate under the assumption of equal (normalized) selection on observables and unobservables. τ1 refers to the unconstrained estimate of the effect of SBP participation. The implied ratio is the latter divided by the former. See Table 2 and text for details.

Table 8. Propensity Score Matching Sensitivity Analysis: Rosenbaum Bounds

	Γ = 1	**Γ = 1.2**	**Γ = 1.4**	**Γ = 1.6**	**Γ = 1.8**	**Γ = 2**	**Γ = 2.5**	**Γ = 3**
I. School Breakfast Program								
BMI: Levels	p = 0.000	p = 0.000	p = 0.411	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.000	p = 0.996	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.000	p = 0.873	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.000	p = 0.989	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.000	p = 0.718	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.071	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.828	p = 1.000	p = 1.000	p = 1.000
II. National School Lunch Program								
BMI: Levels	p = 0.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.004	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.134	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.624	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.120	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.096	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.030	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000

NOTES: Rosenbaum critical p-values for test of the null of zero average treatment effect. For controls included in the propensty score, see Table 2.

Table A1. Summary Statistics

Variable	Full Sample		Particpation in Neither		SBP Only		NSLP Only		Participation in Both	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
SBP Participation (1 = Yes)	0.234	0.423	0	0	1	0	0	0	1	0
NSLP Participation (1 = Yes)	0.575	0.494	0	0	0	0	1	0	1	0
Third Grade Child Weight										
BMI	18.404	3.861	18.124	3.536	19.155	4.537	18.358	3.873	18.933	4.266
BMI Growth Rate	0.112	0.126	0.104	0.119	0.130	0.132	0.110	0.125	0.128	0.137
BMI percentile	62.326	30.105	60.966	29.867	65.363	30.300	61.686	30.409	65.697	29.739
Change in BMI Percentile	1.295	22.887	0.589	22.473	3.471	23.587	1.048	23.148	2.826	23.054
Overweight (1 = Yes)	0.325	0.468	0.304	0.460	0.397	0.490	0.320	0.466	0.365	0.481
Obese (1 = Yes)	0.171	0.377	0.150	0.357	0.248	0.432	0.172	0.377	0.204	0.403
Fall Kindergarten Child Weight										
BMI	16.265	2.142	16.168	1.977	16.600	2.667	16.259	2.179	16.423	2.295
BMI percentile	61.030	28.452	60.376	28.122	61.892	30.077	60.638	28.840	62.871	28.133
Overweight (1 = Yes)	0.258	0.438	0.244	0.430	0.293	0.456	0.258	0.437	0.282	0.450
Obese (1 = Yes)	0.114	0.318	0.103	0.304	0.185	0.389	0.114	0.318	0.125	0.331
Age (in months)	110.767	4.356	110.725	4.347	110.936	4.087	110.749	4.345	110.861	4.424
Gender (1 = boy)	0.507	0.500	0.511	0.500	0.522	0.500	0.494	0.500	0.523	0.500
White (1 = Yes)	0.579	0.494	0.721	0.449	0.591	0.492	0.587	0.492	0.291	0.454
Black (1 = Yes)	0.138	0.345	0.050	0.218	0.122	0.328	0.123	0.328	0.334	0.472
Hispanic (1 = Yes)	0.174	0.379	0.125	0.330	0.185	0.389	0.186	0.390	0.246	0.431
Asian (1 = Yes)	0.054	0.226	0.058	0.235	0.045	0.207	0.056	0.231	0.041	0.199
Child's Birthweight (ounces)	118.284	20.040	120.015	19.510	117.542	21.788	117.970	19.495	115.600	21.407
Child's Birthweight (1 = Missing)	0.121	0.326	0.098	0.297	0.143	0.351	0.117	0.322	0.167	0.373
Central City (1 = Yes)	0.395	0.489	0.356	0.479	0.310	0.463	0.425	0.494	0.428	0.495
Urban Fringe & Large Town (1 = Yes)	0.377	0.485	0.475	0.499	0.340	0.475	0.346	0.476	0.250	0.433
Northeast (1 = Yes)	0.182	0.386	0.265	0.441	0.334	0.472	0.134	0.340	0.089	0.285
Midwest (1 = Yes)	0.250	0.433	0.293	0.455	0.236	0.425	0.239	0.427	0.189	0.391
South (1 = Yes)	0.346	0.476	0.192	0.394	0.278	0.448	0.413	0.492	0.535	0.499
Mother's Age at First Birth ≤ 19 Years Old (1 = Yes)	0.227	0.419	0.141	0.348	0.290	0.454	0.208	0.406	0.418	0.493
Mother's Age at First Birth is 20-29 Years Old (1 = Yes)	0.522	0.500	0.566	0.496	0.507	0.501	0.544	0.498	0.398	0.490
Mother's Age at First Birth (1 = Missing)	0.104	0.305	0.085	0.279	0.143	0.351	0.102	0.303	0.139	0.346
WIC Benefits During Pregnancy (1 = Yes)	0.339	0.473	0.189	0.391	0.504	0.501	0.323	0.468	0.634	0.482
WIC Benefits During Pregnancy (1 = Missing)	0.112	0.315	0.095	0.293	0.134	0.342	0.113	0.316	0.141	0.348
Mother's Education = High School (1 = Yes)	0.198	0.398	0.172	0.377	0.278	0.448	0.197	0.398	0.239	0.426
Mother's Education = Some College(1 = Yes)	0.281	0.450	0.304	0.460	0.301	0.460	0.292	0.455	0.218	0.413
Mother's Education = Bachelor's Degree (1 = Yes)	0.144	0.351	0.198	0.398	0.057	0.232	0.152	0.359	0.038	0.192
Mother's Education = Advanced College Degree (1 = Yes)	0.084	0.277	0.125	0.330	0.027	0.162	0.078	0.268	0.023	0.151
Mother's Education (1 = Missing)	0.209	0.407	0.168	0.374	0.221	0.415	0.206	0.405	0.293	0.455

Notes: N = 13,534 (full sample); 5,423 (participation in neither); 335 (SBP only); 4,950 (NSLP only); 2,826 (SBP and NSLP). Data are from spring third grade wave of ECLS-K. Change in BMI percentile and BMI growth rate calculated using baseline data from fall kindergarten. Omitted category for race is 'other', city type is small town & rural', mother's age at first birth is greater than 29 years old, mother's employment is 'missing', mother's education is 'less than high school', and sufficient food is 'sometimes or often there is not enough to eat'.

Table A1 (cont.). Summary Statistics

Variable	Full Sample		Particpation in Neither		SBP Only		NSLP Only		Participation in Both	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Household Income (dollars)	52150	32034	61774	33666	38744	23611	52855	31091	34036	21285
Mother Employed During Kindergarten (1 = Yes)	0.608	0.488	0.619	0.486	0.552	0.498	0.637	0.481	0.542	0.498
Mother Employed During Kindergarten (1 = No)	0.285	0.451	0.288	0.453	0.310	0.463	0.258	0.438	0.322	0.467
Mother Employed During 3rd Grade (1 = Yes)	0.572	0.495	0.613	0.487	0.513	0.501	0.594	0.491	0.462	0.499
Mother Employed During 3rd Grade (1 = No)	0.204	0.403	0.206	0.405	0.242	0.429	0.186	0.389	0.229	0.420
Sufficient Food of Type Desired in Household (1 = Yes)	0.847	0.360	0.901	0.299	0.758	0.429	0.859	0.348	0.733	0.442
Sufficient Food, but not of Type Desired in Household (1 = Yes)	0.138	0.345	0.093	0.290	0.209	0.407	0.130	0.337	0.231	0.422
Sufficient Food (1 = Missing)	0.001	0.028	0.000	0.014	0.000	0.000	0.001	0.032	0.002	0.042
Number of Children's Books in Household	74.930	57.030	91.101	58.567	67.774	56.005	74.002	54.846	46.369	45.065
Number of Children's Books in Household (1 = Missing)	0.097	0.296	0.085	0.279	0.134	0.342	0.097	0.296	0.117	0.321

Notes: N = 13,534 (full sample); 5,423 (participation in neither); 335 (SBP only); 4,950 (NSLP only); 2,826 (SBP and NSLP). Data are from spring third grade wave of ECLS-K. Change in BMI percentile and BMI growth rate calculated using baseline data from fall kindergarten. Omitted category for race is 'other', city type is small town & rural', mother's age at first birth is greater than 29 years old, mother's employment is 'missing', mother's education is 'less than high school', and sufficient food is 'sometimes or often there is not enough to eat'.

Table A2. Sensitivity Analysis: School Fixed Effects

	Full Sample		Risk Type: Normal Weight		Risk Type: Overweight		Risk Type: Obese		Risk Type: Overweight or Obese	
	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se
I. BMI: Levels										
School	0.248†	0.209*	0.291*	0.260*	-0.149	-0.105	0.684‡	0.337	0.234	0.068
Breakfast	(0.105)	(0.063)	(0.077)	(0.067)	(0.263)	(0.255)	(0.395)	(0.299)	(0.235)	(0.165)
School	0.032	-0.018	-0.031	-0.060	-0.107	-0.194	0.099	0.321	-0.003	0.021
Lunch	(0.102)	(0.062)	(0.073)	(0.063)	(0.261)	(0.252)	(0.463)	(0.352)	(0.249)	(0.175)
N	13534	13534	10039	10039	1954	1954	1541	1541	3495	3495
II. BMI: Logs										
School	0.012†	0.010*	0.016*	0.014*	-0.010	-0.008	0.026‡	0.014	0.008	0.001
Breakfast	(0.005)	(0.003)	(0.004)	(0.004)	(0.013)	(0.012)	(0.016)	(0.012)	(0.010)	(0.007)
School	0.001	-0.002	-0.002	-0.004	-0.005	-0.009	0.004	0.013	-0.001	0.000
Lunch	(0.005)	(0.003)	(0.004)	(0.004)	(0.012)	(0.012)	(0.018)	(0.014)	(0.011)	(0.008)
N	13534	13534	10039	10039	1954	1954	1541	1541	3495	3495
III. BMI: Growth Rates										
School	0.010*	0.010*	0.013*	0.014*	-0.009	-0.008	0.009	0.014	0.001	0.001
Breakfast	(0.003)	(0.003)	(0.004)	(0.004)	(0.012)	(0.012)	(0.012)	(0.012)	(0.007)	(0.007)
School	-0.001	-0.002	-0.003	-0.004	-0.008	-0.009	0.012	0.013	0.001	0.000
Lunch	(0.003)	(0.003)	(0.004)	(0.004)	(0.012)	(0.012)	(0.014)	(0.014)	(0.008)	(0.008)
N	13534	13534	10039	10039	1954	1954	1541	1541	3495	3495
IV. Percentile BMI: Levels										
School	1.745†	1.459†	2.579*	2.100*	-2.015	-1.594	1.048	0.985	-0.238	-0.482
Breakfast	(0.812)	(0.575)	(0.919)	(0.761)	(1.430)	(1.412)	(0.695)	(0.662)	(0.782)	(0.708)
School	-0.074	-0.633	-0.445	-0.799	-0.833	-1.185	0.168	0.195	-0.441	-0.589
Lunch	(0.791)	(0.560)	(0.868)	(0.719)	(1.420)	(1.399)	(0.815)	(0.776)	(0.830)	(0.750)
N	13534	13534	10039	10039	1954	1954	1541	1541	3495	3495

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Control sets refer to those used in Table 2, with the addition of school fixed effects in all models. Panels VI and VII are now estimated using a linear probability model. N = number of observations. See Table 2 and text for details.

Table A2 (cont.). Sensitivity Analysis: School Fixed Effects

	Full Sample		Risk Type							
			Normal Weight		Overweight		Obese		Overweight or Obese	
	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se
V. Percentile BMI: Changes										
School	1.152‡	1.456†	1.727†	2.096*	-1.871	-1.594	0.912	0.985	-0.359	-0.482
Breakfast	(0.616)	(0.575)	(0.812)	(0.761)	(1.400)	(1.412)	(0.665)	(0.662)	(0.709)	(0.708)
School	-0.625	-0.633	-0.746	-0.800	-1.207	-1.185	0.054	0.195	-0.529	-0.589
Lunch	(0.600)	(0.560)	(0.767)	(0.719)	(1.391)	(1.399)	(0.780)	(0.776)	(0.752)	(0.750)
N	13534	13534	10039	10039	1954	1954	1541	1541	3495	3495
VI. Probability of Being Overweight										
School	0.015	0.017	0.033*	0.033*	-0.083‡	-0.083‡	0.028	0.028	-0.016	-0.016
Breakfast	(0.013)	(0.011)	(0.012)	(0.012)	(0.044)	(0.044)	(0.022)	(0.022)	(0.024)	(0.024)
School	0.000	-0.007	-0.010	-0.010	-0.008	-0.008	0.014	0.014	-0.004	-0.004
Lunch	(0.013)	(0.010)	(0.012)	(0.012)	(0.043)	(0.043)	(0.025)	(0.025)	(0.025)	(0.025)
N	13534	13534	10039	10039	1954	1954	1541	1541	3495	3495
VII. Probability of Being Obese										
School	0.019‡	0.017†	0.022*		0.004		0.017		0.019	0.011
Breakfast	(0.010)	(0.008)	(0.007)		(0.043)		(0.037)		(0.029)	(0.025)
School	0.003	0.001	-0.004		0.027		-0.016		0.003	0.003
Lunch	(0.010)	(0.008)	(0.006)		(0.043)		(0.043)		(0.031)	(0.027)
N	13534	13534	10039		1954		1541		3495	3495

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Control sets refer to those used in Table 2, with the addition of school fixed effects in all models. Panels VI and VII are now estimated using a linear probability model. N = number of observations. See Table 2 and text for details.

Table A2 (cont.). Sensitivity Analysis: School Fixed Effects

	Mother's Education								Race					
	Less Than High School		High School		Some College		Bachelor's Degree		White		Black		Hispanic	
	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se
I. BMI: Levels														
School	0.214	0.226	0.103	0.131	0.556†	0.379*	0.088	-0.116	0.379†	0.191‡	0.120	0.346†	-0.092	0.115
Breakfast	(0.260)	(0.163)	(0.199)	(0.119)	(0.219)	(0.126)	(0.362)	(0.230)	(0.157)	(0.097)	(0.281)	(0.164)	(0.252)	(0.145)
School	-0.314	-0.152	-0.046	0.084	-0.105	-0.210‡	0.305‡	0.048	0.118	0.031	0.353	0.023	0.035	0.038
Lunch	(0.386)	(0.243)	(0.229)	(0.137)	(0.200)	(0.115)	(0.180)	(0.114)	(0.124)	(0.077)	(0.456)	(0.267)	(0.291)	(0.168)
N	1982	1982	4030	4030	4311	4311	3211	3211	7832	7832	1865	1865	2356	2356
II. BMI: Logs														
School	0.013	0.012	0.004	0.004	0.029*	0.021*	0.005	-0.006	0.017†	0.008	0.005	0.015‡	-0.002	0.007
Breakfast	(0.013)	(0.008)	(0.010)	(0.006)	(0.011)	(0.007)	(0.019)	(0.012)	(0.008)	(0.005)	(0.013)	(0.008)	(0.012)	(0.007)
School	-0.016	-0.011	-0.003	0.003	-0.006	-0.011‡	0.016‡	0.003	0.005	0.001	0.016	0.000	0.002	0.000
Lunch	(0.019)	(0.013)	(0.011)	(0.007)	(0.010)	(0.006)	(0.009)	(0.006)	(0.006)	(0.004)	(0.022)	(0.014)	(0.014)	(0.009)
N	1982	1982	4030	4030	4311	4311	3211	3211	7832	7832	1865	1865	2356	2356
III. BMI: Growth Rates														
School	0.010	0.012	0.005	0.004	0.021*	0.021*	-0.002	-0.006	0.010‡	0.008	0.012	0.015‡	0.005	0.007
Breakfast	(0.009)	(0.008)	(0.006)	(0.006)	(0.007)	(0.007)	(0.013)	(0.012)	(0.005)	(0.005)	(0.009)	(0.008)	(0.008)	(0.007)
School	-0.009	-0.011	0.002	0.003	-0.010	-0.011‡	0.004	0.003	0.001	0.001	0.003	0.000	0.000	0.000
Lunch	(0.013)	(0.013)	(0.007)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.014)	(0.014)	(0.009)	(0.009)
N	1982	1982	4030	4030	4311	4311	3211	3211	7832	7832	1865	1865	2356	2356
IV. Percentile BMI: Levels														
School	2.382	1.642	0.492	0.762	4.414*	2.904†	1.040	0.409	1.239	0.275	0.742	1.370	0.443	1.561
Breakfast	(1.917)	(1.390)	(1.461)	(1.034)	(1.694)	(1.171)	(3.287)	(2.326)	(1.310)	(0.933)	(1.926)	(1.384)	(1.758)	(1.222)
School	-1.349	-1.791	-0.558	-0.165	-1.342	-1.898‡	1.704	-0.342	0.038	-0.765	1.627	-0.764	0.512	-0.257
Lunch	(2.850)	(2.057)	(1.676)	(1.187)	(1.547)	(1.069)	(1.638)	(1.161)	(1.039)	(0.740)	(3.123)	(2.250)	(2.030)	(1.411)
N	1982	1982	4030	4030	4311	4311	3211	3211	7832	7832	1865	1865	2356	2356

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Control sets refer to those used in Table 2, with the addition of school fixed effects in all models. Panels VI and VII are now estimated using a linear probability model. N = number of observations. See Table 2 and text for details.

Table A2 (cont.). Sensitivity Analysis: School Fixed Effects

	Mother's Education								Race					
	Less Than High School		High School		Some College		Bachelor's Degree		White		Black		Hispanic	
	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se	Spec. (7) b/se	Spec. (8) b/se
V. Percentile BMI: Changes														
School	0.740	1.637	0.582	0.759	2.315‡	2.904†	1.070	0.407	0.117	0.273	1.067	1.370	1.553	1.556
Breakfast	(1.473)	(1.389)	(1.108)	(1.034)	(1.243)	(1.171)	(2.492)	(2.326)	(1.001)	(0.933)	(1.491)	(1.384)	(1.299)	(1.222)
School	-1.902	-1.779	-0.063	-0.169	-1.642	-1.898‡	-0.619	-0.340	-0.643	-0.765	-1.524	-0.761	-0.566	-0.254
Lunch	(2.190)	(2.057)	(1.272)	(1.187)	(1.135)	(1.069)	(1.242)	(1.161)	(0.793)	(0.740)	(2.418)	(2.250)	(1.500)	(1.411)
N	1982	1982	4030	4030	4311	4311	3211	3211	7832	7832	1865	1865	2356	2356
VI. Probability of Being Overweight														
School	0.024	0.040	0.001	0.004	0.018	0.009	-0.024	-0.038	0.008	-0.002	-0.01	-0.012	0.000	0.011
Breakfast	(0.032)	(0.027)	(0.024)	(0.019)	(0.027)	(0.021)	(0.050)	(0.041)	(0.020)	(0.017)	(0.031)	(0.026)	(0.030)	(0.024)
School	-0.006	-0.018	-0.025	-0.014	-0.004	-0.016	0.026	-0.004	0.007	-0.008	0.043	0.026	0.038	0.027
Lunch	(0.047)	(0.040)	(0.027)	(0.022)	(0.024)	(0.020)	(0.025)	(0.020)	(0.016)	(0.013)	(0.051)	(0.042)	(0.035)	(0.028)
N	1982	1982	4030	4030	4311	4311	3211	3211	7832	7832	1865	1865	2356	2356
VII. Probability of Being Obese														
School	0.019	0.032	0.004	0.000	0.034	0.034†	0.022	-0.027	0.045*	0.030†	0.012	0.039‡	-0.010	0.001
Breakfast	(0.027)	(0.022)	(0.020)	(0.015)	(0.022)	(0.017)	(0.036)	(0.030)	(0.016)	(0.013)	(0.026)	(0.021)	(0.026)	(0.020)
School	-0.008	-0.013	-0.007	0.017	-0.016	-0.030‡	0.041†	0.029‡	0.010	0.008	0.053	0.023	0.002	-0.009
Lunch	(0.040)	(0.032)	(0.022)	(0.017)	(0.020)	(0.015)	(0.018)	(0.015)	(0.013)	(0.010)	(0.042)	(0.034)	(0.030)	(0.023)
N	1982	1982	4030	4030	4311	4311	3211	3211	7832	7832	1865	1865	2356	2356

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Control sets refer to those used in Table 2, with the addition of school fixed effects in all models. Panels VI and VII are now estimated using a linear probability model. N = number of observations. See Table 2 and text for details.

Table A3. Sensitivity Analysis: Bivariate Probit Results with Different Assumptions Concerning Correlation Among the Disturbances for Various Population Sub-Groups

	Correlation of the Disturbances											
	Specification (7)						Specification (8)					
	ρ = 0	ρ = 0.1	ρ = 0.2	ρ = 0.3	ρ = 0.4	ρ = 0.5	ρ = 0	ρ = 0.1	ρ = 0.2	ρ = 0.3	ρ = 0.4	ρ = 0.5
I. Risk Type												
IA. Normal Weight Entering Kindergarten												
A. Probability of Being Overweight												
School	0.124*	-0.043	-0.210*	-0.377*	-0.543*	-0.709*						
Breakfast	(0.042)	(0.042)	(0.042)	(0.041)	(0.040)	(0.038)						
School	-0.011	0.016	0.046	0.078†	0.112*	0.149*						
Lunch	(0.035)	(0.035)	(0.035)	(0.035)	(0.034)	(0.034)						
B. Probability of Being Obese												
School	0.155†	-0.013	-0.180*	-0.348*	-0.516*	-0.686*						
Breakfast	(0.061)	(0.060)	(0.059)	(0.058)	(0.057)	(0.055)						
School	0.008	0.037	0.070	0.107†	0.147*	0.192*						
Lunch	(0.053)	(0.053)	(0.052)	(0.052)	(0.051)	(0.050)						
IB. Obese or Overweight Entering Kindergarten												
A. Probability of Being Overweight												
School	-0.046	-0.213*	-0.381*	-0.548*	-0.717*	-0.887*						
Breakfast	(0.065)	(0.065)	(0.065)	(0.064)	(0.063)	(0.061)						
School	-0.016	0.013	0.040	0.066	0.090	0.113†						
Lunch	(0.057)	(0.057)	(0.057)	(0.056)	(0.056)	(0.056)						
B. Probability of Being Obese												
School	0.032	-0.135†	-0.301*	-0.468*	-0.633*	-0.798*						
Breakfast	(0.058)	(0.058)	(0.057)	(0.057)	(0.055)	(0.053)						
School	0.027	0.056	0.086‡	0.115†	0.145*	0.174*						
Lunch	(0.050)	(0.050)	(0.050)	(0.050)	(0.050)	(0.049)						

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Specifications (7) and (8) refer to control sets used in Table 2. See Table 2 and text for details.

Table A3 (cont.). Sensitivity Analysis: Bivariate Probit Results with Different Assumptions Concerning Correlation Among the Disturbances for Various Population Sub-Groups

	Correlation of the Disturbances											
	Specification (7)						Specification (8)					
	ρ = 0	ρ = 0.1	ρ = 0.2	ρ = 0.3	ρ = 0.4	ρ = 0.5	ρ = 0	ρ = 0.1	ρ = 0.2	ρ = 0.3	ρ = 0.4	ρ = 0.5
II. Mother's Education												
IIA. No College or Missing Education												
	A. Probability of Being Overweight											
School	0.069‡	-0.097†	-0.263*	-0.429*	-0.595*	-0.759*	0.100†	-0.066	-0.233*	-0.400*	-0.567*	-0.735*
Breakfast	(0.041)	(0.041)	(0.040)	(0.039)	(0.038)	(0.037)	(0.046)	(0.046)	(0.045)	(0.044)	(0.043)	(0.042)
School	0.023	0.061	0.101†	0.141*	0.182*	0.225*	0.026	0.064	0.104†	0.144*	0.186*	0.229*
Lunch	(0.041)	(0.041)	(0.041)	(0.041)	(0.041)	(0.040)	(0.047)	(0.047)	(0.047)	(0.046)	(0.046)	(0.045)
	B. Probability of Being Obese											
School	0.058	-0.109†	-0.275*	-0.441*	-0.606*	-0.771*	0.074	-0.092‡	-0.259*	-0.426*	-0.594*	-0.764*
Breakfast	(0.045)	(0.045)	(0.045)	(0.044)	(0.043)	(0.041)	(0.053)	(0.053)	(0.052)	(0.051)	(0.050)	(0.048)
School	0.035	0.074	0.115†	0.158*	0.203*	0.250*	0.070	0.109†	0.150*	0.192*	0.237*	0.284*
Lunch	(0.047)	(0.046)	(0.046)	(0.046)	(0.045)	(0.045)	(0.054)	(0.054)	(0.054)	(0.053)	(0.053)	(0.052)
IIB. Some College or More												
	A. Probability of Being Overweight											
School	0.035	-0.137*	-0.308*	-0.478*	-0.646*	-0.813*	0.028	-0.144†	-0.315*	-0.485*	-0.655*	-0.824*
Breakfast	(0.051)	(0.051)	(0.050)	(0.049)	(0.048)	(0.047)	(0.058)	(0.058)	(0.057)	(0.056)	(0.055)	(0.053)
School	-0.027	-0.007	0.014	0.036	0.059‡	0.084†	-0.044	-0.024	-0.002	0.020	0.044	0.070‡
Lunch	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.039)	(0.039)	(0.039)	(0.038)	(0.038)	(0.038)
	B. Probability of Being Obese											
School	0.082	-0.090	-0.260*	-0.429*	-0.596*	-0.760*	0.061	-0.110‡	-0.280*	-0.448*	-0.616*	-0.783*
Breakfast	(0.057)	(0.057)	(0.056)	(0.055)	(0.054)	(0.052)	(0.067)	(0.067)	(0.066)	(0.065)	(0.063)	(0.061)
School	-0.006	0.015	0.039	0.064	0.092†	0.123*	0.002	0.023	0.047	0.072	0.100†	0.131*
Lunch	(0.040)	(0.040)	(0.040)	(0.040)	(0.039)	(0.039)	(0.046)	(0.046)	(0.046)	(0.046)	(0.045)	(0.045)
III. Child's Race												
IIIA. Black or Hispanic												
	A. Probability of Being Overweight											
School	-0.025	-0.189*	-0.353*	-0.516*	-0.677*	-0.837*	0.012	-0.153*	-0.317*	-0.482*	-0.647*	-0.812*
Breakfast	(0.047)	(0.047)	(0.047)	(0.046)	(0.045)	(0.043)	(0.054)	(0.054)	(0.053)	(0.052)	(0.051)	(0.049)
School	0.032	0.078	0.125†	0.172*	0.221*	0.271*	0.037	0.083	0.131†	0.179*	0.228*	0.279*
Lunch	(0.052)	(0.052)	(0.051)	(0.051)	(0.051)	(0.050)	(0.060)	(0.060)	(0.059)	(0.059)	(0.058)	(0.057)
	B. Probability of Being Obese											
School	-0.029	-0.194*	-0.358*	-0.522*	-0.685*	-0.847*	0.036	-0.128†	-0.294*	-0.459*	-0.626*	-0.795*
Breakfast	(0.052)	(0.052)	(0.051)	(0.050)	(0.049)	(0.048)	(0.061)	(0.061)	(0.060)	(0.059)	(0.058)	(0.056)
School	-0.006	0.041	0.091	0.142†	0.196*	0.252*	-0.039	0.009	0.058	0.111‡	0.166†	0.224*
Lunch	(0.057)	(0.057)	(0.056)	(0.056)	(0.056)	(0.055)	(0.066)	(0.066)	(0.066)	(0.065)	(0.064)	(0.063)

NOTES: ‡ p<0.10, † p<0.05, * p<0.01. Standard errors in parentheses. Specifications (7) and (8) refer to control sets used in Table 2. See Table 2 and text for details.

Table A4. Sensitivity Analysis: Amount of Selection on Unobservables Relative to Selection on Observables Required to Attribute the Entire SBP Effect to Selection Bias for Various Population Sub-Groups

	Specification (7)			Specification (8)		
	Cov(ε,ν)÷ Var(ν)	τ_1	Implied Ratio	Cov(ε,ν)÷ Var(ν)	τ_1	Implied Ratio
I. Risk Type						
IA. Normal Weight Entering Kindergarten						
BMI: Levels	8.825	0.305 (0.067)	0.035	1.002	0.243 (0.059)	0.242
BMI: Logs	0.437	0.017 (0.004)	0.038	0.051	0.013 (0.003)	0.261
BMI: Growth Rates	0.363	0.013 (0.003)	0.035	0.204	0.013 (0.003)	0.065
Percentile BMI: Levels	76.532	3.077 (0.798)	0.040	7.903	2.198 (0.668)	0.278
Percentile BMI: Changes	68.900	1.608 (0.716)	0.023	11.741	2.195 (0.668)	0.187
Probability of Being Overweight	4.561	0.033 (0.011)	0.007			
Probability of Being Obese	2.633	0.016 (0.006)	0.006			
IB. Obese or Overweight Entering Kindergarten						
BMI: Levels	14.461	0.272 (0.189)	0.019	0.837	0.177 (0.131)	0.211
BMI: Logs	0.561	0.010 (0.008)	0.017	0.037	0.006 (0.006)	0.170
BMI: Growth Rates	0.396	0.006 (0.006)	0.015	0.225	0.006 (0.006)	0.028
Percentile BMI: Levels	20.935	-0.081 (0.620)	-0.004	3.058	-0.179 (0.557)	-0.058
Percentile BMI: Changes	10.621	-0.147 (0.559)	-0.014	7.906	-0.179 (0.557)	-0.023
Probability of Being Overweight	0.640	-0.013 (0.019)	-0.021	0.640	-0.013 (0.019)	-0.021
Probability of Being Obese	2.531	0.012 (0.023)	0.005	0.395	0.007 (0.020)	0.017
II. Mother's Education						
IIA. No College or Missing Education						
BMI: Levels	4.943	0.238 (0.125)	0.048	0.152	0.181 (0.077)	1.197
BMI: Logs	0.202	0.012 (0.006)	0.057	0.008	0.008 (0.004)	0.991
BMI: Growth Rates	0.267	0.008 (0.004)	0.031	0.080	0.008 (0.004)	0.101
Percentile BMI: Levels	18.669	1.507 (0.927)	0.081	1.519	0.963 (0.666)	0.634
Percentile BMI: Changes	30.568	0.456 (0.718)	0.015	2.153	0.959 (0.666)	0.446
Probability of Being Overweight	0.681	0.025 (0.015)	0.037	0.060	0.027 (0.012)	0.450
Probability of Being Obese	0.637	0.016 (0.012)	0.025	0.095	0.014 (0.010)	0.150

NOTES: Standard errors in parentheses. Specifications (7) and (8) refer to control sets used in Table 2. See Tables 2 and 7 for details.

Table A4 (cont.). Sensitivity Analysis: Amount of Selection on Unobservables Relative to Selection on Observables Required to Attribute the Entire SBP Effect to Selection Bias for Various Population Sub-Groups

	Specification (7)			**Specification (8)**		
	Cov(ε,ν)÷ Var(ν)	**τ_1**	**Implied Ratio**	**Cov(ε,ν)÷ Var(ν)**	**τ_1**	**Implied Ratio**
IIB. Some College or More						
BMI: Levels	15.201	0.447	0.029	0.590	0.262	0.444
		(0.141)			(0.086)	
BMI: Logs	0.707	0.022	0.032	0.032	0.013	0.411
		(0.007)			(0.005)	
BMI: Growth Rates	0.382	0.014	0.037	0.156	0.013	0.084
		(0.005)			(0.005)	
Percentile BMI: Levels	91.679	3.240	0.035	5.477	2.189	0.400
		(1.151)			(0.818)	
Percentile BMI: Changes	26.591	1.837	0.069	3.806	2.186	0.574
		(0.876)			(0.818)	
Probability of Being Overweight	3.681	0.013	0.004	0.404	0.007	0.017
		(0.018)			(0.014)	
Probability of Being Obese	3.719	0.022	0.006	0.615	0.013	0.021
		(0.014)			(0.011)	
III. Child's Race						
IIIA. White						
BMI: Levels	9.910	0.473	0.048	0.465	0.207	0.446
		(0.132)			(0.083)	
BMI: Logs	0.447	0.023	0.051	0.025	0.009	0.370
		(0.007)			(0.004)	
BMI: Growth Rates	0.284	0.012	0.042	0.138	0.009	0.067
		(0.004)			(0.004)	
Percentile BMI: Levels	50.298	2.487	0.049	3.925	0.951	0.242
		(1.100)			(0.791)	
Percentile BMI: Changes	35.821	0.554	0.015	6.106	0.948	0.155
		(0.852)			(0.791)	
Probability of Being Overweight	2.116	0.024	0.012	0.282	0.011	0.039
		(0.017)			(0.014)	
Probability of Being Obese	2.577	0.038	0.015	0.452	0.021	0.046
		(0.013)			(0.011)	
IIIB. Black or Hispanic						
BMI: Levels	2.872	-0.005	-0.002	-0.040	0.189	-4.750
		(0.154)			(0.090)	
BMI: Logs	0.109	0.001	0.008	-0.003	0.010	-3.889
		(0.007)			(0.005)	
BMI: Growth Rates	0.210	0.007	0.036	0.037	0.010	0.271
		(0.005)			(0.005)	
Percentile BMI: Levels	1.354	0.670	0.495	-0.793	1.603	-2.020
		(1.068)			(0.754)	
Percentile BMI: Changes	23.426	1.544	0.066	3.495	1.600	0.458
		(0.807)			(0.754)	
Probability of Being Overweight	0.518	-0.009	-0.017	0.008	0.004	0.489
		(0.018)			(0.014)	
Probability of Being Obese	0.015	-0.008	-0.499	-0.038	0.007	-0.177
		(0.015)			(0.012)	

NOTES: Standard errors in parentheses. Specifications (7) and (8) refer to control sets used in Table 2. See Tables 2 and 7 for details.

Table A5. Propensity Score Matching Sensitivity Analysis: Rosenbaum Bounds (SBP)

	Γ = 1	Γ = 1.2	Γ = 1.4	Γ = 1.6	Γ = 1.8	Γ = 2	Γ = 2.5	Γ = 3
I. Risk Type								
IA. Normal Weight Entering Kindergarten								
BMI: Levels	p = 0.000	p = 0.000	p = 0.069	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.000	p = 0.840	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.000	p = 0.000	p = 0.985	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.000	p = 0.487	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.000	p = 0.610	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.064	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000
IB. Overweight Entering Kindergarten								
BMI: Levels	p = 0.001	p = 0.556	p = 0.997	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.032	p = 0.904	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.041	p = 0.923	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.000	p = 0.086	p = 0.904	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.025	p = 0.759	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.461	p = 0.996	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.215	p = 0.975	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
IC. Obese Entering Kindergarten								
BMI: Levels	p = 0.000	p = 0.053	p = 0.805	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.116	p = 0.901	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.063	p = 0.829	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.978	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.986	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.794	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
ID. Obese or Overweight Entering Kindergarten								
BMI: Levels	p = 0.000	p = 0.000	p = 0.491	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.002	p = 0.826	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.335	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.966	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.527	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.191	p = 1.000	p = 1.000
II. Mother's Education								
IIA. Less Than High School or Missing Education								
BMI: Levels	p = 0.038	p = 0.948	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.118	p = 0.987	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.265	p = 0.997	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.060	p = 0.968	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.273	p = 0.997	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.301	p = 0.991	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.007	p = 0.654	p = 0.998	p = 1.000	p = 1.000	p = 1.000	p = 1.000

NOTES: Rosenbaum critical p-values for test of the null of zero average treatment effect. For controls included in the propensty score, see Table 2.

Table A5 (cont.). Propensity Score Matching Sensitivity Analysis: Rosenbaum Bounds (SBP)

	Γ = 1	Γ = 1.2	Γ = 1.4	Γ = 1.6	Γ = 1.8	Γ = 2	Γ = 2.5	Γ = 3
IIB. High School								
BMI: Levels	p = 0.000	p = 0.008	p = 0.959	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.093	p = 0.998	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.001	p = 0.821	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.000	p = 0.529	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.000	p = 0.145	p = 0.994	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.596	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.021	p = 0.937	p = 1.000	p = 1.000	p = 1.000	p = 1.000
IIC. Some College								
BMI: Levels	p = 0.000	p = 0.000	p = 0.684	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.239	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.010	p = 0.967	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.543	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.325	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.696	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.038	p = 0.833	p = 1.000	p = 1.000
IID. Bachelor's Degree or Above								
BMI: Levels	p = 0.000	p = 0.000	p = 0.231	p = 0.991	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.016	p = 0.927	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.063	p = 0.981	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.000	p = 0.522	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.000	p = 0.382	p = 0.997	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.464	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.376	p = 1.000
III. Child's Race								
IIIA. White								
BMI: Levels	p = 0.000	p = 0.000	p = 0.001	p = 0.971	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.000	p = 0.710	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.000	p = 0.044	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.000	p = 0.995	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.000	p = 0.727	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.074	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 1.000	p = 1.000
IIIB. Black								
BMI: Levels	p = 0.004	p = 0.729	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.013	p = 0.851	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.375	p = 0.993	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.013	p = 0.845	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.001	p = 0.558	p = 0.998	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.085	p = 0.969	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.029	p = 0.794	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000
IIIC. Hispanic								
BMI: Levels	p = 0.000	p = 0.357	p = 0.997	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.574	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.020	p = 0.954	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.080	p = 0.990	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.577	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.877	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.004	p = 0.665	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000

NOTES: Rosenbaum critical p-values for test of the null of zero average treatment effect. For controls included in the propensty score, see Table 2.

Table A6. Propensity Score Matching Sensitivity Analysis: Rosenbaum Bounds (NSLP)

	Γ = 1	Γ = 1.2	Γ = 1.4	Γ = 1.6	Γ = 1.8	Γ = 2	Γ = 2.5	Γ = 3
I. Risk Type								
IA. Normal Weight Entering Kindergarten								
BMI: Levels	p = 0.635	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.338	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.647	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.057	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.356	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.000	p = 0.000	p = 0.898	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
IB. Overweight Entering Kindergarten								
BMI: Levels	p = 0.004	p = 0.777	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.004	p = 0.784	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.004	p = 0.779	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.001	p = 0.568	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.001	p = 0.597	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.025	p = 0.933	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.755	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
IC. Obese Entering Kindergarten								
BMI: Levels	p = 0.042	p = 0.907	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.009	p = 0.758	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.302	p = 0.980	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.000	p = 0.000	p = 0.042	p = 0.678	p = 0.992	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.000	p = 0.049	p = 0.702	p = 0.993	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.000	p = 0.398	p = 0.994
Prob. of Being Obese	p = 0.016	p = 0.821	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
ID. Obese or Overweight Entering Kindergarten								
BMI: Levels	p = 0.005	p = 0.980	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.025	p = 0.996	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.279	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.069	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.392	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.690	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.255	p = 0.996	p = 1.000	p = 1.000	p = 1.000	p = 1.000
II. Mother's Education								
IIA. Less Than High School or Missing Education								
BMI: Levels	p = 0.000	p = 0.055	p = 0.907	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.487	p = 0.998	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.180	p = 0.978	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.308	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.009	p = 0.866	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.998	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.000	p = 0.012	p = 0.456	p = 0.966	p = 1.000	p = 1.000

NOTES: Rosenbaum critical p-values for test of the null of zero average treatment effect. For controls included in the propensty score, see Table 2.

Table A6 (cont.). Propensity Score Matching Sensitivity Analysis: Rosenbaum Bounds (NSLP)

	Γ = 1	Γ = 1.2	Γ = 1.4	Γ = 1.6	Γ = 1.8	Γ = 2	Γ = 2.5	Γ = 3
IIB. High School								
BMI: Levels	p = 0.763	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.323	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.015	p = 0.997	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.012	p = 0.997	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.053	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.434	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.426	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
IIC. Some College								
BMI: Levels	p = 0.000	p = 0.741	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.876	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.717	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.001	p = 0.970	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.779	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.000	p = 0.566	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.001	p = 0.668	p = 1.000	p = 1.000	p = 1.000	p = 1.000
IID. Bachelor's Degree or Above								
BMI: Levels	p = 0.039	p = 0.996	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.066	p = 0.998	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.010	p = 0.983	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.331	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.209	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.001	p = 0.910	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.001	p = 0.708	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
III. Child's Race								
IIIA. White								
BMI: Levels	p = 0.393	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.327	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.212	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.469	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.217	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.000	p = 0.976	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.005	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
IIIB. Black								
BMI: Levels	p = 0.000	p = 0.000	p = 0.000	p = 0.106	p = 0.781	p = 0.995	p = 1.000	p = 1.000
BMI: Logs	p = 0.000	p = 0.000	p = 0.009	p = 0.472	p = 0.975	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.000	p = 0.001	p = 0.355	p = 0.975	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.003	p = 0.696	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.000	p = 0.266	p = 0.984	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.000	p = 0.000	p = 0.094	p = 0.777	p = 0.996	p = 1.000	p = 1.000
IIIC. Hispanic								
BMI: Levels	p = 0.000	p = 0.318	p = 0.997	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Logs	p = 0.002	p = 0.804	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
BMI: Growth Rates	p = 0.001	p = 0.773	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Levels	p = 0.165	p = 0.998	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Percentile BMI: Changes	p = 0.002	p = 0.838	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Overweight	p = 0.793	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000	p = 1.000
Prob. of Being Obese	p = 0.000	p = 0.002	p = 0.625	p = 0.999	p = 1.000	p = 1.000	p = 1.000	p = 1.000

NOTES: Rosenbaum critical p-values for test of the null of zero average treatment effect. For controls included in the propensty score, see Table 2.