Breakfast of Champions? The School Breakfast Program and the Nutrition of Children and Families

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Abstract

We use the National Health and Nutritional Examination Survey (NHANES) III to examine the effect of the availability of the school breakfast program (SBP). Our work builds on previous research in three ways: First, we develop a transparent difference-in-differences strategy to account for unobserved differences between students with access to SBP and those without. Second, we examine serum measures of nutrient in addition to intakes based on dietary recall data. Third, we ask whether the SBP improves the diet by increasing/or decreasing the intake of nutrients relative to meaningful threshold levels.

We have three main findings. First, the SBP helps students build healthy eating habits: SBP increases scores on the healthy eating index, reduces the percentage of calories from fat, and reduces the probability of low fiber intake. Second, the SBP reduces the probability of serum micronutrient deficiencies in vitamin C, vitamin E, and folate, and it increases the probability that children meet USDA recommendations for potassium and iron intakes. Since we find no effect on total calories these results indicate that the program improves the quality of food consumed.

1. Introduction

"Hunger in America," a landmark report issued by a group of physicians in 1968, documented appalling levels of malnutrition among poor children in America. The authors wrote that "Wherever we went and wherever we looked, whether it was the rural south, Appalachia, or an urban ghetto, we saw children in significant numbers who were hungry and sick, children for whom hunger was a daily fact of life and sickness in many forms, an inevitability" (U.S. Congress, 1968).

School nutrition programs were one public response to the problem of widespread nutritional deficiencies. These programs are now second only to the Food Stamps Program in terms of federal expenditures on nutrition programs. The school lunch program currently serves children in 98 percent of the nation's public schools. In contrast, during the 2002-2003 school year the national School Breakfast Program (SBP) was offered in only 78.3 percent of the 97,674 schools that offered school lunch, even though the program has more than doubled in size since 1990 (U.S. Committee on Ways and Means, 2004). Several studies have linked poor nutrition to poor school performance (Middleman et al. 1996; Pollitt et al. 1998), and advocacy groups argue that school breakfast should be available to all children because skipping breakfast impairs a child's ability to learn (FRAC, 2003).

Today, however, we hear more about the rising epidemic of obesity, even among young children, than about nutritional deficiencies. The poor are at higher risk of obesity than the rich, hence the growth in obesity will exacerbate existing differences in health between rich and poor (Cutler, Glaeser and Shapiro, 2003). Some commentators blame federal nutrition programs for some of the growth in obesity among the poor citing evidence that school meals, for example, exceed federal guidelines for fat (Besharov, 2003). The Surgeon General's 2001 report on obesity calls for schools to ensure that school meals meet dietary guidelines, and for more research into the effects of school nutrition programs on the quality of children's diets (U.S. Department of Health and Human Services, 2001).

The shift away from scarcity to excess, even among the poor, underscores the importance of measuring the effects of school nutrition programs on the quality of food consumed. School meals have been criticized for being high in saturated fat and sodium (Devaney, Burghardt, and Gordon, 1995), which suggests that school breakfast could actually harm child health if it substituted for more nutritious food that would have been consumed elsewhere. On the other hand, nutritionists show that poor children often consume foods that are high in calories and low in nutrients, so that there may be considerable scope for school nutrition programs to improve the quality of children's diets even if these programs fall short of federal nutritional guidelines (Dietz, 1995). Moreover, periodically reauthorized programs like the SBP are always subject to intense scrutiny. In this policy environment, it is more important than ever to ask whether school breakfast programs are having the intended effects.

We investigate this question using the third National Health and Nutritional Examination Survey (NHANES) III, a nationally representative survey on diet, demographics, and health. We rely on a simple idea to identify the effects of the SBP: in schools where SBP is not available, no differences in short term nutritional outcomes between the school year and the summer can be attributed to SBP. Hence, such differences can be used as a control in measuring the short term nutritional effects of the SBP in places where it is offered.[1]

[1] Bhattacharya and Currie (2001) use a similar strategy to examine the impact of the National School Lunch Program. However, since the NSLP is offered in almost all schools, they compare children who are and are not eligible for NSLP, when school is and is not in session. One problem with this identification strategy is that eligibility cannot be perfectly determined given the information available in the NHANES.

We find that SBP availability has no effect on the total number of calories consumed or on the probability that a child eats breakfast, but does improve the nutritional quality of the diet substantially. Children with access to the SBP consume fewer calories from fat and are less likely to have low serum values of vitamin C, vitamin E, or folate. They are also more likely to meet recommendations for intakes of fiber, potassium, and iron. The overall improvement in the quality of the diet is indicated by higher scores on a Healthy Eating Index, developed by the U.S. Department of Agriculture.

2. Background

The School Breakfast Program (SBP) provides nutritionally balanced, low-cost meals to children each school day.[2] It is administered by the United States Department of Agriculture (USDA) through its Food and Nutrition Service (FNS). On an average day in FY 2001, 7.79 million children ate school breakfast, up from 3.4 million children in 1990. The cash payments for this program in FY 2001 were $1.5 billion. School breakfasts must meet minimum dietary requirements.[3] Typically, a breakfast might include orange juice, fresh fruit, cereal and milk. These foods are good sources of vitamin C, folate, calcium, protein, and other important nutrients, and are relatively low in fat.

Children are eligible for free meals if their family incomes are less than 1.3 times the federal poverty line, and they are eligible for reduced-price meals if their incomes are between

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[2] Information on SBP is available from the USDA/FNS website at http://www.fns.usda.gov/cnd/Breakfast/Default.htm. Unless otherwise noted, the information from this section comes from the SBP Fact Sheet (http://www.fns.usda.gov/cnd/breakfast/AboutBFast/bfastfacts.htm), participation totals (http://www.fns.usda.gov/pd/sbsummar.htm), and budgetary totals (http://www.fns.usda.gov/pd/cncosts.htm).

[3] Since 1995, these guidelines have included: (1) the provision of one-fourth of the Recommended Dietary Allowance for protein, calcium, iron, vitamin A, vitamin C and calories, and (2) the applicable recommendations of the Dietary Guidelines for Americans which recommend that less than 30 percent of an individual's calories come from fat and less than 10 percent from saturated fat.

1.3 and 1.85 times the federal poverty line. Children of higher incomes can also buy meals at full price.[4] In FY 2001, an average of 5.80 million children (74 percent of all participants) received a free breakfast daily, and 0.67 million children (9 percent) received a reduced price breakfast daily.

The USDA reimburses school districts for each breakfast that meets program requirements. Currently, schools are reimbursed $1.21 for each free breakfast, $0.90 for each reduced-price breakfast, and $0.22 for each full price breakfast served.[5] To encourage participation by low-income schools, the SBP offers a severe need payment (an additional subsidy of $0.23) if a specified percentage of their breakfasts are served free or at reduced price.

Several studies have examined the impact of SBP (Wellisch et al. 1983; Devaney and Fraker 1989; Burghardt, Devaney, and Gordon 1995; Gleason 1995; Devaney and Stuart 1998; Fox et al. 2001; Gleason and Suitor 2001).[6] These studies have focused on whether the SBP increases the likelihood that children eat breakfast and on whether the SBP has positive impacts on the nutritional outcomes of children. While some find that the SBP increases breakfast eating, others find that the SBP decreases it, and still others find no effect. Similarly, many of the studies find that a SBP improves some dietary outcomes and harms others, but the studies come to different conclusions regarding which outcomes are improved and which are harmed.

Identifying the causal effect of the SBP is difficult because a simple comparison of outcomes between participants and non-participants conflates the impact of the SBP with unobserved differences determining participation. Two studies have used statistical techniques beyond simple regression in an attempt to obtain causal estimates of the effects of SBP

[4] Even at full price there is, of course, an implied subsidy.
[5] Reimbursement rates are higher in Alaska and Hawaii.
[6] See Gleason and Suitor (2001) and Levedahl and Oliveira (1999) for more detailed reviews of the programs and the literature that has analyzed them.

participation.[7] Devaney and Fraker (1989) find that SBP participation in 1980-81 increased breakfast intakes of calcium and magnesium, while it reduced intakes of cholesterol and iron. They model the choice to participate jointly with their outcomes equations, and they estimate their model using a Heckman two-step estimator. However, they have no exclusion restrictions to identify their participation equation, so the validity of their estimates depends upon unverifiable assumptions about functional form. Gordon, Devaney, and Burghardt (1995) evaluate the impact of SBP on nutrient intakes using an instrumental variables approach.[8] However, they report that their first stage equation does not predict participation well.[9]

There are several criticisms that apply to some or all studies of school nutrition programs. First, many of the studies rely on 24 hour dietary recall data to estimate intakes. These calculations require accurate dietary recall and analysis of the likely contents of food. Even if these quantities are accurately obtained, nutrient intakes can vary considerably from day to day even in well-nourished populations. Second, many studies look at whether the SBP increases intakes of nutrients. If most children already exceed the recommended daily intakes for the nutrient, then there may be no benefit to increasing intakes, and increasing intakes could even be harmful.

Third, no study has dealt convincingly with endogenous participation in the SBP. In fact, some studies find that the SBP reduces the likelihood that children eat breakfast. This counter-intuitive finding may reflect the way that children are selected into the program—poorer

[7] Akin, Guilkey, and Popkin (1983) use a switching regression model to allow the behavior of poor and non-poor children to differ in obtaining their results. However, such a model does not allow for program participation to be endogenous within the income groups, and thus we do not consider it here.

[8] The instruments they use include the price of lunch, indicators for the price for which the student qualifies, the available alternatives to school lunch measured by an indicator for vending machines or school store, and the school's food characteristics measured by an indicator for *a la carte* service availability.

[9] See Bound, Jaeger, and Baker (1995) for a discussion regarding the problems with weak instruments.

children who are most likely to skip breakfast in the first place are also most likely to be enrolled.

Fourth, none of the previous studies of the SBP has considered its effects on household members other than the school-age child. To the extent that the program loosens the family budget constraint, resources freed up by the program may be redirected towards other household members.[10] Because the NHANES collects nutritional outcome information about multiple household members, our data present a unique opportunity to examine the impact of school nutrition programs on all family members.[11] Although a small number of studies have examined the impact of U.S. school nutrition programs on household food expenditures (West and Price 1976; Wellisch et al. 1983; Long 1990), these studies have not addressed the endogeneity of program participation.

One limitation our study shares with previous work is that it is based on data collected prior to late 1990s era reforms of the school nutrition programs. These reforms placed great emphasis on reducing the fat and saturated fat content of school meals. To the extent that these reforms have been effective, our estimates will likely understate the current beneficial effects of the SBP program, especially with regard to fat intakes.[12] On the other hand, the SBP now

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[10] The lack of a household perspective in the literature on the SBP contrasts with the substantial literature on child feeding programs in developing countries. The explicit alternative hypothesis in the developing country literature is that the feeding programs induce families to transfer household resources towards other family members, spreading benefits directed at a particular child over a greater number of individuals (Jacoby 2002). Beaton and Ghassemi (1982) review approximately 200 studies of preschool feeding programs in developing countries, and Jacoby (1997) reviews more recent studies. Studies of these issues in developing countries often only have information on children, and therefore, must infer transfers to other family members based on the estimated impacts on the child. See Behrman (1997).

[11] Not everyone within a household is selected is into the sample given the NHANES sampling scheme, and some individuals may refuse to participate in some or part of the survey. However, family identification numbers are provided so that individuals within the same family who are sample members can be connected.

[12] See footnote 3 above. These reforms seem to have had a smaller effect on the SBP than on the National School Lunch Program because the average pre-reform school breakfast was closer to the new standards than the average pre-reform school lunch. A USDA study of the issue compared breakfasts in 1991-92 with those in 1998-99 and finds that breakfasts in 1991-92 were already meeting standards for supplying vitamins and minerals. The

reaches many more schools than it did in 1990 when only roughly half of the schools that offered school lunch also offered school breakfast. Thus, our identification strategy, which relies on differences in the availability of the SBP, is well suited to data from this period.

3. Data and Outcome Measurement

The NHANES III is a nationally representative survey that was conducted between October 1988 and October 1994. It includes nearly 34,000 respondents, aged 2 months and over. The NHANES collects much of the usual information found in household surveys, such as demographics (for example, age, gender, education) and income (for example, labor income and government program participation). The survey also collects information on dietary intakes, data from a physical exam conducted by doctors, and laboratory tests of blood and urine. For our primary analysis sample, we select individuals from the NHANES who were 5 to 16 years old, were attending school or on vacation from school, have a completed dietary questionnaire available, and underwent a physical exam. There are 4,841 children who meet these criteria.[13] In the remainder of this section, we describe the nutritional outcome variables that we analyze.

A primary contribution of this study is that we analyze measures based on laboratory tests and clinical examination. These measures include serum levels of vitamin A, vitamin C, vitamin E, and folate, as well as anemia, and high cholesterol.[14] We use cut-off values for abnormal

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average fraction of calories from fat decreased from 30.7% to 25.8% while the average fraction of calories from saturated fat decreased from 13.8% to 9.8% (USDA, 2001).

[13] We begin with 6,423 children in the appropriate age group and who are enrolled in school. We then lose 1,224 children who did not have a physical exam, 230 additional children for whom dietary recall information was not available, and 128 additional children for whom the requisite school questions (whether school was in session and whether meal programs were available) were not answered. We do not have complete data for all 4,841 children in this remaining sample. The question regarding breakfast consumption is not asked about children over 11 years old. Vitamin C levels are not provided for children under 6 years old. Some additional laboratory test data are simply missing. For all of the analysis reported below, we use all available data. So that the potential for missing data problems can be assessed, we provide sample sizes for all regression results.

[14] We examine macronutrient and micronutrient intake levels relative to USDA recommended intake or adequate intake cutoffs whenever those cutoffs have been set by the USDA. These cutoffs are listed in Appendix

serum levels from standard medical textbooks.[15] We also examine the probability a child is overweight.[16]

Like previous evaluations, we examine whether SBP availability increases the probability that children eat breakfast. This outcome is important because children who skip breakfast are thought to be less able to learn (Pollitt, Cueto, and Jacoby, 1998). NHANES respondents are asked to report categorically how often breakfast is eaten: never, every day, some days, rarely, and weekends only. We focus on whether or not a child eats breakfast every day.

We examine measures of dietary intake. NHANES respondents are asked what they ate in the past twenty-four hours (midnight to midnight) and how many times they ate various foods in the past month. The USDA then calculates nutrient values using a standard recipe analysis. We analyze a summary measure of overall dietary quality called the Healthy Eating Index (HEI). The index has 10 components (each scored between 0 and 10) including grains, vegetables, fruits, milk, meat, total fat, saturated fat, cholesterol, sodium, and variety.[17] We also analyze the intake of fiber, sodium, potassium, magnesium, zinc, iron, calcium, total calories, and the percentage of total calories from fat and saturated fat. We construct measures of nutritional adequacy by comparing intake against standard nutritional recommendations set by the USDA.

Table 1. We examine serum nutrient measures when there is reasonable a physiological basis to think that such measures reflect nutritional deprivation. For example, some nutrients such as potassium are stored in the body, and serum levels will not fluctuate with intakes unless there is a prolonged period of severe deprivation or some medical condition associated with hypokalemia. Hence, we look at potassium intakes but not at serum levels of potassium.

[15] Though serum vitamin deficiencies resulting in frank disease are rare in the U.S., these laboratory measures are nevertheless good measures at the population level of dietary nutritional adequacy. The appendix provides further detail on these outcome measures.

[16] Children are overweight if their body-mass-index is over the 85th percentile in the sex and age appropriate growth chart.

[17] See Kennedy et al. (1995) for more details on the index.

4. School Breakfast Transfers and Family Nutritional Decisions

If the cash value of the school breakfast was $1.12 (the USDA reimbursement rate for free breakfasts), the SBP would represent a monthly transfer of about $25 for each child receiving free breakfasts. This is much less than a typical family's food budget, so conventional economic analysis suggests that the family will treat this in-kind transfer in the same way as they would treat an equivalent cash transfer. Multiplying this additional income by a realistic marginal propensity to spend on food out of income, suggests that the effect on consumption is likely to be very modest. The studies reviewed by Currie (2003) estimate the marginal propensity to spend on food to be between $0.17 and $0.47. Hence, the SBP subsidy should induce an increase in the value of food consumed by between $4.25 and $11.75 per month.

This calculation underestimates the potential impact of school nutrition programs. First, 55 percent of the sample children with family incomes less than 130 percent of poverty lived in households that used Food Stamps. In these households, there may not be much opportunity to offset SBP transfers by spending less on food.[18] Second, this simple calculation ignores the fact that not all calories are equal. For example, some calories are replete with vitamins and minerals, while other calories come with few nutrients and perhaps even negative attributes such as a high fat content. Similarly, calories also vary tremendously in price, particularly when the purchase price and the time cost of preparation are considered. Cutler, Glaeser, and Shapiro (2003) argue that technological change has made high fat, empty calories inexpensive relative to high quality, nutrient-rich calories, and that this may explain why poorer individuals are more

[18] Specifically, families might be at a corner solution regarding food expenditures in which the total in-kind food transfer that the family receives is greater than the level of food expenditures the family would choose if the in-kind transfers were paid in cash. On the other hand, if families can sell food stamp entitlements for cash, then this constraint will not be binding.

likely to be obese. Hence, even if the SBP has little effect on the quantity of calories consumed, it might lead children to substitute for relatively low quality food consumed at home.

Other household members might also benefit from the school nutrition program. First, the implicit transfer of the nutrition program might simply be shared by all household members through the allocation of other household food resources. Second, it might be the case that the when the household experiences food shortages children are always fed first.[19] In this case, adults might benefit more from the additional resources directed to the household than children. Third, school nutrition programs involve an explicit educational component which the recipient children could share with their family members.

5. Estimation Strategy

We are interested in measuring the causal impact of the SBP availability on nutritional outcomes.[20] Unfortunately, the simplest strategy, directly comparing students who have a SBP available against those who do not, confounds the true causal impact of the SBP because students who attend schools where a SBP is available differ in unobserved ways from those for whom it is not. Table 1 provides ample and directly observable evidence. For example, Table 1 shows that a SBP is much more likely to be available to children in poor families, and it shows that these children have systematically worse diets than children from higher income families.

Instead, our identification strategy is based on the simple observation that most school systems are not in session year around, so students are not exposed to the SBP year around. We first compare students' diets while school is in session to diets while school is not in session. Where school breakfast is *not* available, these outcomes differences are a measure of seasonal

[19] For evidence that poor families protect children against economic shocks in the U.S, see Bhattacharya, Deleire, Haider, and Currie (2003)

[20] We focus on availability rather than participation because policy makers have considerably more control over availability than participation, and hence the former is more directly policy relevant.

changes in outcomes that are due to many things (such as changes in activity levels or food prices), but not the SBP. Where a SBP is available, these differences are due to both changes in outcomes induced by the SBP and by seasonal differences. Hence, we use a difference-in-differences strategy with children from schools without an SBP available as a control group.

We implement this strategy with a direct comparison of means and in a regression that allows us to control for observable differences across people such as in age, gender, race, and income. The models, which we estimate using ordinary least squares,[21] take the form:[22]

(1) $$Outcome_i = \alpha + sbav_i \beta_1 + inschool_i \beta_2 + sbav_i * inschool_i \beta_3 + X_i \gamma + \varepsilon_i ,$$

Here, $sbav_i$ is an indicator for school breakfast being available, $inschool_i$ is an indicator for school being in session, and X_i is a vector of control variables.[23] The coefficient on the interaction between $sbav_i$ and $inschool_i$ measures the causal impact of program.

Our strategy can only identify the causal impact of SBP on nutritional outcomes that can change within a few months after a change in diet; it cannot identify the causal impact on longer-term outcomes. Hence, though we measure the effect of the SBP on the prevalence of overweight, we do not expect to see large impacts since body weight may take some time to adjust to changes in food intakes.

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[21] Our regression results account for the complex sampling design of the NHANES. We report standard error calculations that are robust to the fact multiple children from the same household are often in our sample.

[22] We have estimated logit models for all of our outcomes and the results are substantively similar.

[23] The vector of control variables X_i includes age (indicators for each year of age), male, race (indicators for Hispanic, non-Hispanic black, and "other race"), income (indicators for \$5,000 increments, for income greater than \$50,000 and for missing income), household size, and geography (a complete set of interactions between indicators for urban and the four census regions).

6. Results

Table 1 provides some basic descriptive statistics. Unsurprisingly, children with the SBP available have lower incomes, are more likely to participate in the Food Stamp Program, and are less likely to be non-Hispanic white than other children. Nutritional outcomes are also worse for children who have SBP available, compared to those who do not. For example, the children with SBP available are less likely to eat breakfast every day, have lower scores on the HEI, especially when school is not in session. They consume a higher fraction of calories from fat, as well as from saturated fat, and are more likely to have high cholesterol. They are more likely to have low serum values of vitamins A, C, and E as well as low serum folate and are more likely to be anemic. While there are a few anomalous outcomes (for example, serum calcium) the overall pattern shows worse nutritional outcomes for SBP-available children. Clearly a simple comparison of children with and without a SBP available will not measure the causal effect of the SBP.

Table 1 also shows uncontrolled difference-in-difference estimates. Children with access to the SBP have a healthier diet when school is in session than when school is not in session. For example, the HEI is 63.0 in session compared to 60.9 out of session. But can seasonal differences in diet explain this result? Children in schools without a SBP available have an HEI of 63.6 when school is in session, and an HEI of 64.7 when school is out. Thus, in the absence of the SBP, diets are better in the summer. The difference-in-difference estimate implies that the SBP is responsible for 3.2 [= (63.0 - 60.9) - (63.6 - 64.7)] point increase in the HEI, which is about the size of the largest average between-group difference in HEI scores shown in Table 1.

The difference-in-difference estimates suggest that SBP has no effect on total calories or on the probability of eating breakfast, but improves the quality of the diet. Aside from the effect on the HEI, the SBP lowers the probability of low vitamin C intake by 5.5 percentage points, reduces the probability of low fiber intake by 7.5 percentage points, and reduces the probability of low potassium intake by 4.1 percentage points. The effects of SBP availability on the percentage of calories from fat, low vitamin E, and low folate suggest that the program is beneficial, with the estimates statistically significant at a 90 percent confidence level. Overall, our results are remarkably consistent: all of the statistically significant coefficients imply that the SBP improves nutritional outcomes.

Table 2 presents the regression controlled estimates of the causal effect of the SBP.[24] The estimated coefficients on the interaction terms are generally very similar to the raw difference-in-differences shown in Table 1 but are more precisely estimated. They confirm that the SBP has many positive impacts on nutrition: increased HEI; reduced calories from fat; increased probability of adequate iron, fiber, or potassium intakes; and reduced probability of low vitamin C, E, and folate in the serum.

7. Specification Checks and Falsification Tests

In this section, we describe several specification checks for our results and falsification tests aimed at examining the validity of our identification strategy. In general, these tests confirm the validity of our main findings—that the SBP improves nutritional outcomes—and provide evidence that these results are robust to a wide variety of decisions about sample selection and regression specification. However, these tests raise the possibility that the subsidies induced by the SBP do not accrue only to poor children, but also to children from other socioeconomic strata.

[24] The regression controlled estimates are shown in Table 2 for all of our primary outcomes. Space constraints prevent us from showing regression controlled estimates for all the outcomes. Regression estimates for the other outcomes listed in Table 1 are available upon request.

Although we control for income fairly flexibly, it is possible that these controls are not sufficient to make the underlying individuals comparable. Such comparability is critical to the plausibility of our identification scheme, which depends upon children in schools without a SBP as a way to control for seasonal differences in nutrition. Panel B of Table 3 shows the results of one attempt to increase the comparability across individuals: exclude from the sample all children from families with incomes above $40,000.[25] This exclusion trades off sample size and statistical power in exchange for comparability. Nevertheless, we find causal effect estimates that are very similar to our main results.

Another threat to the validity of our estimates is due to the design of the NHANES, which confounds seasonality and geography. The NHANES survey relies on fully equipped medical clinics (Mobile Examination Centers or MECs) that are housed in the back of tractor trailers, and are transported to each of the data collection sites.[26] Data collection is limited by the number and transportation costs of the MECs. Appendix Table 2 shows that, due perhaps to these constraints, few interviews took place in the South and West during the summer.

One way to gauge the impact of this sampling scheme is to examine whether there is seasonality in the demographic characteristics of the sample. To the extent that the same types of places were visited over the calendar year, then demographic characteristics should not vary by whether or not school is in session. However, Table 1 shows that Hispanics are more likely to be interviewed when school is in session, regardless of whether or not the SBP was available. Hence, the sampling scheme of the NHANES introduces at least one source of non-comparability between the in-school and out-of-school groups.

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[25] For convenience, the first panel in Table 3 reproduces the SBP causal effect estimates from Table 2.

[26] For more information about the MEC, see the special section on the NHANES website: http://www.cdc.gov/nchs/about/major/nhanes/mectour.htm.

Table 3 shows three responses to this problem. First, panel C shows causal effect estimates excluding Hispanic children. These estimates are similar to the main results in Table 2, and are in fact slightly larger although a large number of observations are excluded by this restriction. Panels D and E of Table 3 exclude households from the South and West, respectively. Again, the results are similar to our baseline estimates.

In addition to the specification checks we report in Table 3, we also conducted two others that we do not report in detail here due to space constraints. First, our main results are estimated on the sample of NHANES children who had no missing data for all of the outcomes. We thus excluded some children who reported some outcomes, but were missing others. Our results do not substantively change when we rerun our regressions using all children with non-missing data for each outcome. Second, we checked the sensitivity of our results to the inclusion of state or county fixed effects. With one notable exception, these results with geographic fixed effects are also substantively similar to our main result that the SBP improves dietary quality and nutritional outcomes. The exception is that in some specifications, we find that the SBP leads to a statistically significant increase in caloric intake (by about 300 calories per day).[27]

Table 4 shows the results of two falsification tests.[28] Since the SBP provides larger subsidies to children from poor families than children from richer families, and also because richer children tend to have better diets than poorer children, one might expect that children from higher socioeconomic strata would benefit less from the SPB than other children. Panels B and C of Table 4, estimated using the same difference-in-difference strategy that we use for our main

[27] We do not highlight this finding as a main result for two reasons. First, because of confidentiality concerns the NHANES only reports information about state and county of residence for non-rural households. Second, in the version of the survey where such geographic indicators are available, detailed survey sampling information is not reported. Hence, our standard errors estimates in the regressions with geographic fixed effects do not account for the survey design effect. Regression results using geographic fixed effects are available upon request from the authors.

[28] As in Table 3, the first panel of Table 4 reproduces the SBP causal effect estimates from Table 2.

results, suggest that this is true. Surprisingly, Panel B indicates that children from families with more than $50,000 annual income have better diets as a result of SBP exposure. The statistically significant results include the following: the SBP raises the HEI by 3.69 points; it reduces the frequency of low serum vitamin E levels by seven percentage points; and lowers the probability of low fiber and low iron intake by 19 percentage points. With the exception of the vitamin E, fiber, and iron results, however, the results for richer children suggest smaller gains from the SBP than the results for the sample as a whole. Panel C shows the effect of SBP exposure when the sample is limited to non-Hispanic white children. In this case, the evidence suggests that such children gain more nutritionally from the SBP than the sample as a whole, including statistically significant improvements in the probability of breakfast eating, HEI score, calories from fat, probabilities of inadequate serum vitamin C, E, and folate, and fiber, iron, and potassium intake. Taken together, these panels suggest that the benefits of the SBP are not confined to children from lower socioeconomic strata, though they tend to be larger for poorer than for richer children. However, in results that we do not report here (but which are available upon request) we find that, unlike our main results, the results in Panels B and C are not robust to the inclusion of geographic fixed effects. That is, SBP has no statistically significant effects on the diets of richer children once these controls are added.

Panel D of Table 4 shows the results of a second falsification exercise. In this exercise, we limited the sample to only children who report having school in session. We counterfactually counted students who were surveyed between November and March as not in school, and compared them with students who were surveyed between April and October (who were counted correctly as in school). Of course, since students in this sample were actually in school in all of these months, if our estimation strategy is valid, we should find no measured effect of the SBP.

The nutritionally small and statistically insignificant results for nearly all the outcomes in Panel D suggest that our identification scheme strongly passes this falsification test.

8. The Effects of the SBP on Pre-school Children and Adult Family Members

Tables 5 and 6 extend the empirical analysis to other family members in households with school-aged children. Table 5 shows some descriptive statistics from the NHANES about demographics and nutritional outcomes for children 0 to 5 and for adults 25 to 64 in families with school-aged children.[29] Table 5 shows that sample adults tend to have worse diets than those of their preschool children. For example, the preschool children have a score of 68.1 on the HEI compared to 61.8 for adults. The children are also much less likely to have low serum values of vitamins or folate, or to have low fiber or mineral intakes.

Table 6 indicates that the estimated effects of SBP availability on the HEI score and on the fraction of calories from fat are remarkably similar for all members of the household; apparently, the SBP improves diet quality even for family members who are not directly exposed to it. However, we find no other statistically significant effects of the SBP on nutritional outcomes for pre-school and adult household members. Thus, unlike the specific nutritional benefits that the SBP has for school children (such as increasing fiber intake or lowering the probability of inadequate serum folate), it leads to improved diets for other family members in a general sense.

One story that explains these results is that households use the transfer implicit in the SBP to improve the quality of the diets of other household members. Another alternative is that the SBP is working through some other mechanism, like nutrition education, to improve

[29] We choose this age range for adults because it is not clear whether adults aged 18 to 24 should be thought of primarily as dependents or as household decision makers and dietary outcomes for the elderly are significantly different than dietary outcomes for prime-aged adults.

household outcomes. Though these results are intriguing, a different research design would be needed to make progress on identifying the underlying mechanisms at work here.

9. Discussion and Conclusion

We use the National Health and Nutritional Examination Survey (NHANES) III, a nationally representative data set with detailed information on food consumption, a complete clinical exam, and a laboratory report for each respondent to examine the effect of the availability of the SBP on children's diets. Our work builds on previous research in three ways. First, we develop a simple difference-in-differences strategy to account for unobserved differences between schools with and without the program. Second, we examine serum measures of nutritional adequacy, which are less subject to error than food intake data based on dietary recall. Third, we ask whether the SBP improves diets by increasing or decreasing the intake of nutrients above meaningful threshold levels (rather than focusing only on whether the SBP changes intakes).

Our findings address two important questions about the program. First: does the SBP lead to bad dietary habits?   We find on the contrary that the SBP increases scores on the healthy eating index, reduces the percentage of calories from fat, and reduces the probability of low fiber intake. Because we find no effect on total calories or on whether or not breakfast is consumed, these results indicate that the program improves the quality of the calories consumed. Second: does the SBP reduce the prevalence of vitamin and mineral deficiencies? Again the answer is yes. The availability of the SBP reduces the probability that children have low serum vitamin C, vitamin E, and folate serum levels, as well as reducing the probability of low fiber, iron, and potassium intakes.

There are at least two reasons to suspect that our results are lower bounds on the nutritional benefits of the SBP. First, identification strategy does not account for the Summer Food Service Program (SFSP), which provides free nutritious meals and snacks to children in low-income areas during the summer months when school is not in session.[30] In 1990, the program served 1.7 million children per day compared to 3.4 million served by the SBP. To the extent that the SFSP improves nutritional outcomes during the summer, the SFSP confounds our identification strategy, leading to an estimate of the SBP effect that is biased downward. Second, as discussed above, the SBP underwent substantive reform in the mid 1990s, so that meals that are currently served may be healthier (especially lower in fat) than those that were served over our sample period. Although we leave it to future research to deal with these and other issues, our findings suggest that the SBP is an important mechanism by which the government improves nutritional outcomes for American children.

[30] Information on SFSP is available from the USDA/FNS website at http://www.fns.usda.gov/cnd/Summer/Default.htm.

Appendix Table 1: Cutoffs for Nutrient Intakes by Age and Gender

Age and Gender:	F/M	0-6 mo	7-12 mo	1-3y	4-8y	9-13y	14-18y	19-30y	31-50y	51-70y
RDA levels										
Calcium (mg/day)	F/M	210 [a]	270 [a]	500 [a]	800 [a]	1300 [a]	1300 [a]	1000 [a]	1000 [a]	1200 [a]
Fiber (g/day)	F	ND	ND	19 [a]	25 [a]	26 [a]	26 [a]	25 [a]	25 [a]	21 [a]
	M	ND	ND	19 [a]	25 [a]	31 [a]	38 [a]	38 [a]	38 [a]	30 [a]
Iron (mg/day)	F	0.27 [a]	11	7	10	8	15	18	18	8
	M	0.27 [a]	11	7	10	8	11	8	8	8
Magnesium (mg/day)	F	30 [a]	75 [a]	80	130	240	360	310	320	320
	M	30 [a]	75 [a]	80	130	240	410	400	420	420
Potassium (g/day)	F/M	0.4 [a]	0.7 [a]	3.0 [a]	3.8 [a]	4.5 [a]	4.7 [a]	4.7 [a]	4.7 [a]	4.7 [a]
Protein (g/day)	F	9.1 [a]	13.5	13	19	34	52	56	56	56
	M	9.1 [a]	13.5	13	19	34	46	46	46	46
High sodium (g/day)	F/M	ND	ND	>1.5	>1.9	>2.2	>2.3	>2.3	>2.3	>2.3
Zinc (mg/day)	F	2	3	3	4	8	9	8	8	8
	M	2	3	3	4	8	11	11	11	11
Laboratory measures										
Vitamin A (μmol/L)	F/M	1.05	1.05	1.05	1.05	1.05 [b]	0.7	0.7	0.7	0.7
Vitamin C (μmol/L)	F/M	NC	NC	NC	11.4 [b]	11.4	11.4	11.4	11.4	11.4
Vitamin E (μmol/L)	F/M	NC	NC	NC	11.6	11.6	11.6 [b]	NC	NC	NC
Folate (nmol/L)	F/M	NC	NC	NC	7	7	7	7	7	7
Anemia (hemoglobin g/dL;	F	11.5;35	11.5;35	11.5;35	11.5;35	11.5;35 [b]	12;37 [b]	12;36	12;36	12;36
hematocrit %)	M	11.5;35	11.5;35	11.5;35	11.5;35	11.5;35	12;37	13;39	13;39	13;39
High cholesterol (mg/dL)	F/M	>200	>200	>200	>200	>200	>200	>200	>200	>200

Notes: Recommended Daily Allowance (RDA) values were taken from the Dietary Reference Intake reports produced by the National Academy of Sciences, summarized in tables on the USDA website (http://www.nal.usda.gov/fnic/etext/000105.html). Laboratory values were taken from Wilson et al. (1991). ND indicates values not defined and NC indicates values not considered. [a] This cut-off represents an Adequate Intake (AI) value rather than a RDA value because no RDA value was available. [b] The age cut-offs for the laboratory measures are not coincident with the age-cut offs for the dietary intake measures. The actual cut-offs are as follows: for Vitamin A, 12y and 13y are grouped with 14-18y; for vitamin C, 4y and 5y are grouped with 1-3y; for vitamin E, 17y and 18y are grouped with 19-30y; for Anemia, 13y are grouped with 14-18y and 18y are grouped with 19-30y.

Appendix Table 2: Sample Size of Children by Census Region and Season

Census region	Winter	Spring	Summer	Fall	Row totals
Northeast	0	20	276	198	494
Midwest	0	312	508	34	854
South + Texas	799	263	44	1,030	2,136
West	521	747	66	23	1,357
Column totals	1,320	1,342	894	1,285	4,841

Notes: Author's tabulations form the NHANES. The sample includes all children used in the primary analysis.

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Table 1: Difference-in-Difference Estimates of SBP Availability for School Children

	Full sample	SBP available: School in	SBP available: School out	SBP available: Diff.	SBP not available: School in	SBP not available: School out	SBP not available: Diff	Diff-in-diff
Observations	4,841	2,754	471		1,263	353		
Male	0.514	0.509	0.500		0.541	0.478		
Non-Hisp. White	0.663	0.534	0.565		0.751	0.881		
Non-Hisp. Black	0.152	0.231	0.216		0.078	0.058		
Hispanic	0.138	0.191	0.110		0.127	0.040		
Age	10.78	10.67	10.83		10.93	10.69		
Income-pov. ratio	2.22	1.85	1.76		2.69	2.47		
Share income N/A	0.048	0.036	0.066		0.047	0.072		
Food Stamp receipt	0.191	0.262	0.309		0.103	0.114		
Primary outcome variables								
Eat brk. everyday[a]	0.855	0.844	0.809	0.035	0.876	0.873	0.003	0.032
HEI score	63.2	63.03	60.93	2.10	63.57	64.71	-1.14	3.24*
Calories	2139	2108	2247	-139	2124	2178	-54	-86
% calories from fat	33.6	34.05	34.72	-0.67	33.15	32.54	0.61	-1.28+
Low serum vit. A	0.072	0.093	0.054	0.039	0.062	0.052	0.010	0.029
Low serum vit. C	0.036	0.034	0.070	-0.036	0.035	0.017	0.018	-0.055**
Low serum vit. E	0.014	0.015	0.033	-0.018	0.012	0.004	0.008	-0.026+
Low serum folate	0.059	0.064	0.081	-0.017	0.058	0.031	0.027	-0.044+
Low calcium intake	0.673	0.665	0.665	0.000	0.690	0.664	0.026	-0.027
Low fiber intake	0.942	0.924	0.967	-0.043	0.961	0.928	0.033	-0.075**
Low iron intake	0.287	0.314	0.275	0.039	0.292	0.211	0.081	-0.041
Low potass. intake	0.942	0.927	0.959	-0.032	0.954	0.945	0.009	-0.041*
Other outcome variables								
% cals from sat. fat	12.1	12.42	12.29	0.13	11.91	11.69	0.22	-0.10
High cholesterol	0.101	0.105	0.139	-0.034	0.081	0.109	-0.028	-0.006
Anemic	0.029	0.036	0.026	0.010	0.022	0.025	-0.003	0.013
Low magn. intake	0.478	0.491	0.464	0.027	0.481	0.450	0.031	-0.005
Low protein intake	0.088	0.086	0.065	0.021	0.099	0.087	0.012	0.009
High sodium intake	0.777	0.774	0.831	-0.057	0.742	0.821	-0.079	0.022
Low zinc intake	0.329	0.317	0.319	-0.002	0.360	0.301	0.059	-0.061
BMI	19.4	19.6	19.8	-0.2	19.1	19.3	-0.2	0.1

Notes: Author's tabulations from the NHANES. All means are weighted; statistical tests take into account the complex survey design. Significance: + at 0.10 level. * at 0.05 level. ** at 0.01 level.

Table 2: Main Regression Estimates of SBP Availability for School Children

	Eat brkfast	Total calories	HEI score	% calories from fat	Low serum vit. A	Low serum vit. C	Low serum vit. E	Low serum folate	Low calcium intake	Low fiber intake	Low iron intake	Low potas. intake
Sbavl*	0.04	-0.4	3.89	-2.04	0.01	-0.07	-0.03	-0.06	-0.02	-0.08	-0.08	-0.05
inschool	(0.05)	(99.8)	(1.18)**	(0.73)**	(0.02)	(0.02)**	(0.01)+	(0.03)*	(0.05)	(0.03)**	(0.04)*	(0.02)**
Sbav	-0.01	63.7	-3.30	2.11	-0.00	0.06	0.03	0.04	-0.01	0.05	0.07	0.02
	(0.04)	(89.3)	(1.06)**	(0.54)**	(0.02)	(0.01)**	(0.02)+	(0.02)	(0.04)	(0.02)*	(0.03)*	(0.02)
Inschool	0.01	-64.0	-0.86	0.49	0.01	0.02	0.01	0.02	0.01	0.03	0.06	-0.01
	(0.03)	(81.2)	(0.95)	(0.68)	(0.02)	(0.01)*	(0.01)	(0.01)	(0.04)	(0.02)+	(0.03)*	(0.02)
Hispanic	-0.03	-46.0	0.15	-0.15	0.02	-0.03	-0.00	-0.00	0.00	-0.04	0.05	-0.02
	(0.03)	(65.2)	(0.97)	(0.63)	(0.01)	(0.01)*	(0.01)	(0.01)	(0.03)	(0.02)*	(0.03)	(0.02)
NH-black	-0.06	47.3	-1.58	1.52	0.03	-0.04	-0.00	0.03	0.07	0.00	0.01	-0.00
	(0.03)*	(42.2)	(0.72)*	(0.47)**	(0.01)*	(0.01)**	(0.01)	(0.01)*	(0.02)**	(0.02)	(0.02)	(0.01)
Other race	-0.00	174.3	3.69	-1.59	-0.01	-0.06	-0.01	-0.03	-0.01	-0.03	-0.03	-0.03
	(0.05)	(132.2)	(1.67)*	(0.88)+	(0.03)	(0.02)**	(0.00)	(0.02)	(0.07)	(0.04)	(0.05)	(0.03)
Male	0.03	561.3	0.01	-0.23	0.01	0.01	0.00	-0.02	-0.13	0.01	-0.21	-0.06
	(0.02)	(45.8)**	(0.48)	(0.39)	(0.01)	(0.01)	(0.00)	(0.01)*	(0.02)**	(0.01)	(0.02)**	(0.01)**
HH size	-0.00	-14.4	0.04	-0.20	0.01	-0.00	0.00	0.00	-0.00	-0.01	-0.01	0.00
	(0.01)	(12.5)	(0.17)	(0.10)+	(0.00)**	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
Obs.	3087	4841	4841	4841	4841	4150	4841	4836	4841	4841	4841	4841
R-square	0.05	0.16	0.11	0.05	0.11	0.06	0.02	0.11	0.17	0.03	0.17	0.04

Notes: Author's calculations from the NHANES. The regressions take into account the complex survey design. The other control variables include indicator variables for single years of age, 10 income groups ($0 to $4,999, $5000 to $9,999, $10,000 to $10,499,…, $35,500 to $39,999, $40,000 and above, and not provided), and urban*census region. Significance: + at 0.10 level. * at 0.05 level. ** at 0.01 level.

Table 3: Alternative Regression Estimates of SBP Availability for School Children

	Eat brkfast	Total calories	HEI score	% calories from fat	Low serum vit. A	Low serum vit. C	Low serum vit. E	Low serum folate	Low calcium intake	Low fiber intake	Low iron intake	Low potas. intake
Panel A: Main regression estimates (from Table 2)												
Sbav*inschool	0.04	-0.4	3.89	-2.04	0.01	-0.07	-0.03	-0.06	-0.02	-0.08	-0.08	-0.05
	(0.05)	(99.8)	(1.18)**	(0.73)**	(0.02)	(0.02)**	(0.01)+	(0.03)*	(0.05)	(0.03)**	(0.04)*	(0.02)**
Obs	3087	4841	4841	4841	4841	4150	4841	4836	4841	4841	4841	4841
R-square	0.05	0.16	0.11	0.05	0.11	0.06	0.02	0.11	0.17	0.03	0.17	0.04
Panel B: Excluding high income households												
Sbav*inschool	-0.01	-120.2	3.68	-2.50	0.01	-0.07	-0.03	-0.05	0.04	-0.06	-0.04	-0.06
	(0.04)	(126.3)	(1.20)**	(0.69)**	(0.03)	(0.02)**	(0.01)+	(0.03)	(0.07)	(0.03)+	(0.04)	(0.03)*
Obs	2493	3852	3852	3852	3852	3275	3852	3848	3852	3852	3852	3852
R-square	0.05	0.15	0.11	0.04	0.11	0.06	0.02	0.11	0.16	0.04	0.17	0.04
Panel C: Excluding Hispanic children												
Sbav*inschool	0.06	0.1	3.97	-2.06	0.00	-0.07	-0.03	-0.07	-0.02	-0.08	-0.11	-0.05
	(0.05)	(102.5)	(1.33)**	(0.83)*	(0.03)	(0.02)**	(0.02)+	(0.03)*	(0.05)	(0.03)**	(0.04)*	(0.02)*
Obs	1864	2979	2979	2979	2979	2598	2979	2975	2979	2979	2979	2979
R-square	0.05	0.16	0.13	0.05	0.11	0.07	0.03	0.12	0.17	0.03	0.18	0.05
Panel D: Excluding households from the South region												
Sbav*inschool	0.04	67.9	4.11	-2.20	-0.00	-0.05	-0.03	-0.04	-0.06	-0.09	-0.10	-0.08
	(0.05)	(116.1)	(1.42)**	(0.93)*	(0.03)	(0.02)**	(0.02)*	(0.03)	(0.06)	(0.03)**	(0.05)*	(0.03)**
Obs	1756	2705	2705	2705	2705	2384	2705	2700	2705	2705	2705	2705
R-square	0.05	0.18	0.10	0.06	0.10	0.09	0.05	0.10	0.17	0.04	0.18	0.05
Panel E: Excluding households from the West region												
Sbav*inschool	-0.00	15.5	3.37	-1.97	0.03	-0.06	-0.02	-0.08	0.02	-0.09	-0.05	-0.05
	(0.05)	(92.8)	(1.31)*	(0.86)*	(0.03)	(0.02)**	(0.01)+	(0.03)*	(0.05)	(0.03)**	(0.04)	(0.02)*
Obs	2176	3484	3484	3484	3484	2966	3484	3480	3484	3484	3484	3484
R-square	0.06	0.15	0.11	0.06	0.11	0.07	0.03	0.13	0.17	0.03	0.18	0.04

Notes: See notes for Table 2.

Table 4: Two Falsification Tests

	Eat brkfast	Total calories	HEI score	% calories from fat	Low serum vit. A	Low serum vit. C	Low serum vit. E	Low serum folate	Low calcium intake	Low fiber intake	Low iron intake	Low potas. intake
Panel A: Main regression estimates												
Sbav*inschool	0.04	-0.4	3.89	-2.04	0.01	-0.07	-0.03	-0.06	-0.02	-0.08	-0.08	-0.07
	(0.05)	(99.8)	(1.18)**	(0.73)**	(0.02)	(0.02)**	(0.01)+	(0.03)*	(0.05)	(0.04)*	(0.04)*	(0.04)
Obs	3087	4841	4841	4841	4841	4150	4841	4836	4841	4841	4841	4841
R-square	0.05	0.16	0.11	0.05	0.11	0.06	0.02	0.11	0.17	0.17	0.17	0.13
Panel B: Only households with income > $50,000												
Sbav*inschool	0.18	318.76	3.69	-0.74	-0.02	-0.05	-0.07	-0.03	-0.10	-0.19	-0.19	-0.05
	(0.14)	(254.05)	(1.98)+	(1.89)	(0.04)	(0.06)	(0.04)+	(0.05)	(0.08)	(0.07)**	(0.10)*	(0.06)
Obs	533	846	846	846	846	738	846	845	846	846	846	846
R-square	0.13	0.23	0.14	0.08	0.12	0.20	0.11	0.18	0.24	0.10	0.17	0.09
Panel C: Only non-Hispanic white families												
Sbav*inschool	0.11	11.56	3.43	-2.25	0.01	-0.10	-0.03	-0.09	-0.04	-0.12	-0.12	-0.08
	(0.06)+	(121.80)	(1.74)+	(0.95)*	(0.03)	(0.03)**	(0.02)+	(0.04)*	(0.08)	(0.03)**	(0.06)+	(0.03)**
Obs	801	1238	1238	1238	1238	1092	1238	1237	1238	1238	1238	1238
R-square	0.06	0.19	0.12	0.06	0.11	0.10	0.06	0.13	0.18	0.06	0.21	0.07
Panel D: Middle of winter vs. almost winter (everyone in school)												
Sbav*inschool	15.97	15.97	1.89	0.45	0.04	-0.02	0.01	-0.05	0.02	0.04	-0.04	0.03
	(113.76)	(113.76)	(1.28)	(0.91)	(0.02)+	(0.02)	(0.01)	(0.03)	(0.06)	(0.03)	(0.05)	(0.02)
Obs	4017	4017	4017	4017	4017	3403	4017	4014	4017	4017	4017	4017
R-square	0.17	0.17	0.11	0.04	0.12	0.07	0.03	0.11	0.19	0.03	0.17	0.05

Table 5: Descriptive Statistics for Younger and Adult HH members

	0-5 HH members	25-64 HH members
Sample Size	1,332	3,260
Male (1=yes)	0.532	0.467
Non-Hisp. white (1=yes)	0.486	0.703
Non-Hisp. black (1=yes)	0.229	0.127
Hispanic (1=yes)	0.207	0.126
Age	2.82	38.39
Food stamp receipt (1=yes)	0.377	0.131
Schooling variables [a]		
School in session (1=yes)	0.734	0.752
SBP available (1=yes)	0.567	0.515
NSLP available (1=yes)	0.906	0.925
Outcome variables		
HEI score	68.1	61.8
% calories from fat	34.1	34.1
Low serum vit. A, vit. C, vit. E, or folate	0.089	0.334
Low calcium, fiber, iron, or potassium intake	0.925	0.967

Notes: Author's tabulations from the NHANES. All means are weighted. [a] The schooling variables are defined with respect to a household child; if there is more than one school-aged child in the household, a child is chosen at random.

Table 6: Regression Estimates of SBP Availability for School Children and Other Household Members

	HEI score	% calories from fat	Low serum vit. A, vit. C, vit. E, or folate	Low intake calcium, fiber, iron, or zinc
School children				
Sbav*inschool	3.89	-2.04	-0.11	-0.02
	(1.18)**	(0.73)**	(0.04)**	(0.01)
Obs	4841	4841	4841	4841
R-square	0.11	0.05	0.07	0.03
Younger HH members				
Sbav*inschool	5.45	-4.31	-0.10	-0.08
	(2.93)+	(2.09)*	(0.08)	(0.05)
Obs	850	1224	1332	1332
R-square	0.14	0.09	0.23	0.05
Adult HH members				
Sbav*inschool	3.52	-2.58	-0.04	-0.02
	(1.47)*	(1.53)+	(0.08)	(0.02)
Obs	3260	3260	3260	3260
R-square	0.09	0.08	0.09	0.06

Notes: Author's calculations from the NHANES. The regressions take into account the complex survey design. The children samples include indicator variables for single years of age and the adult sample includes indicator variables for 5-year age groups. The other control variables include 10 income groups ($0 to $4,999, $5000 to $9,999, $10,000 to $10,499,…, $35,500 to $39,999, $40,000 and above, and not provided) and urban*census region interactions. Significance: + at 0.10 level. * at 0.05 level. ** at 0.01 level.