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 four 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. Fourth, we examine the effect of the SBP on other members of the family besides the school-aged child.

We have three main findings. First, the SBP helps students build good 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. Finally, in households with school-aged children, both preschool children and adults have healthier diets and consume less fat when the SBP is available. These results suggest that school nutrition programs may be an effective way to combat both nutritional deficiencies and excess consumption among children and their families.

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1. Introduction

In the 1940s, large numbers of World War II draftees were found to be unfit for service because of nutrition-related health problems (Congressional Record, 1946). "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 a world in which scarcity was common to one in which even the poor consume too many calories, makes it increasingly important to examine the impact of school nutrition programs on the quality of food consumed, rather than simply assuming that programs that supply additional calories benefit children. 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 households that suffer from hunger and food insecurity 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 (for example, Dietz, 1995).

Moreover, given current budgetary pressures, periodically reauthorized programs like the SBP will be subjected to intense scrutiny. Gale and Kotlikoff (2004) estimate that paying for current tax cuts to become permanent and for new prescription drug benefits for the elderly will require a cut of 58 percent in all federal spending other than interest, defense, homeland security, social security, Medicare and Medicaid. In this environment, it is more important than ever to ask whether federal programs for children actually improve the nutritional status of children, taking both problems of scarcity and problems of excess consumption into account.

We investigate this question using data from the third National Health and Nutritional Examination Survey (NHANES) III. These data are nationally representative and contain detailed information on food consumption, a complete clinical exam, and a laboratory report for respondents, as well as information about income, family structure, and participation in school nutrition programs. We identify the effects of the School Breakfast Program by taking advantage of the fact that it is not offered in some schools at all, and that in schools that do offer it, it is not available during summer vacation. Specifically, we use a difference-in-differences design in which we measure differences between children surveyed during the regular school year and during summer vacation, and then compare these differences across schools with and without the SBP. [1]

We find that the availability of the SBP 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.

Our work differs from existing investigations of the SBP in several respects. First, previous investigations have largely ignored the problem of endogenous participation in SBP which makes it difficult to draw inferences about the causal effects of the program. We confront the problem by adopting a transparent identification strategy. Second, we ask whether the SBP raised consumption of vitamins and minerals above target levels. Most previous studies ask only whether the SBP raises intakes. If children already consume recommended levels of nutrients,

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[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.

then increasing consumption is unlikely to be beneficial. Third, our data includes serum measures of some nutrients, which are less subject to error than data based on dietary recall.

Finally, we examine the effect of the availability of the SBP on preschool children and adults in households with school aged children. If families are able to reallocate food expenditures away from school-aged children towards other household members as a result of the SBP, then the SBP may lead to improvements in the nutrition of household members other than the school-aged child. We show that the SBP is associated with higher scores on the healthy eating index and a lower fraction of calories from fat among preschool children and adults in households with a school-aged child. Hence, the whole family benefits from the SBP; investigations that focus only on the enrolled child underestimate the size of the program's benefits.

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). The SBP was established in 1966 as a pilot program to provide categorical grants to schools to serve breakfast to nutritionally needy children. Over the next several years, the program was expanded and in 1975, it became permanent. 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.

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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).

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 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

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[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.

[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.

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 of standard endogeneity concerns—a simple comparison of outcomes between participants and non-participants reflects both the impact of the SBP and the underlying choice to participate. Two studies have used statistical techniques beyond simple regression in an attempt to obtain causal estimates of the effects of SBP participation.[7] Using data from the 1980-81 school year, Devaney and Fraker (1989) find that SBP participation increases breakfast intakes of calcium and magnesium, while it reduces 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, nothing beyond an arbitrary non-linear functional form assumption identifies their model; in particular, they have no exclusion restrictions to identify their participation equation. Consequently, the validity of their estimates depends upon unverifiable assumptions about functional form (Wooldridge 2002).

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 participation equation does not predict participation well.[9] Not surprisingly, the estimates from their models adjusting for endogenous participation are similar to estimates from their unadjusted models.

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[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.

There are several criticisms that apply to some or all of these studies. 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 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. The lack of a household perspective in the literature on the SBP contrasts with the substantial literature on child feeding programs in developing countries.[10] 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.

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[10] More generally, the allocation of resources within families is the focus of much research in development economics. See Behrman (1997).

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. 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.

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 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.

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[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 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).

3. The Data

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 III 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. One of the primary contributions of this study is that we use measures of nutrition based on these exams, as well as information about dietary intakes.

Previous evaluations of the SBP have asked whether offering school breakfast increases the probability that children eating breakfast. This is an important outcome because children who skip breakfast are thought to be less able to learn (Pollitt, Cueto, and Jacoby, 1998). The NHANES asks how often an individual eats breakfast. The available responses are categorical: Never, every day, some days, rarely, and weekends only. We focus on whether or not a child eats breakfast every day.

A common method of collecting nutritional information in surveys is to ask respondents to recall what they ate. In the NHANES III, 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. Nutrient values are then calculated by the USDA based on respondent accounts of the types and amounts of food eaten, using a standard recipe analysis. We use several measures of dietary intake based on the 24-hour recall, all of which were computed by the NHANES and are on the publicly-available data files.

Our main summary measure of overall dietary quality is called the Healthy Eating Index (HEI). The index has 10 components including grains, vegetables, fruits, milk, meat, total fat, saturated fat, cholesterol, sodium, and variety. Each component is scored between 0 and 10 (a perfect score is 100), and intakes that fall between the criteria for scores of 0 and 10 are scored proportionally. The principal drawback of the HEI is that it does not penalize a diet that is high in empty carbohydrates from sweets.[13] We also examine the intake of fiber, sodium, potassium, magnesium, zinc, iron, calcium, total calories, and the percentage of total calories from fat and saturated fat.

Finally, we use several measures based on blood tests. 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 serum levels from standard medical textbooks and construct measures of inadequate (or excessive) intakes using standard nutritional recommendations. The appendix provides further details about all of these outcome measures.

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.[15]

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

[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. 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] 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

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. For example, the studies reviewed in Currie (2003) suggest that the marginal propensity to spend on food is between $0.17 and $0.47 so that the value of food consumed in SBP households might be expected to rise between $4.25 and $11.75 per month as a result of this subsidy.

This calculation underestimates the potential impact of school nutrition programs for several reasons. First, to the extent that families participate in many other in-kind nutrition programs (Food Stamps, WIC, etc), the poorest families might be spending very little of their own money on food. Fifty-five 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 at home, so that the entire school nutrition subsidy may be used to purchase additional calories for the child.[16]

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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.

[16] 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.

Second, due to cooking habits or packaging constraints, households may not change their food preparation behavior with the introduction of school nutrition programs, also implying that the entire school nutrition subsidy could purchase additional calories for the child.

Third, 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. Many studies have found that the poor are more likely to be obese than the non-poor in the United States. Cutler, Glaeser, and Shapiro (2003) speculate that this may be because technological change has made high fat, empty calories inexpensive relative to high quality, nutrient-rich calories. Hence, even if the SBP has little effect on the quantity of calories that are consumed, the program could substitute for relatively nutrient-poor calories that would have been consumed at home. In this case the program could improve the overall quality of the diet, with resulting longer-term effects on health and on the probability of overweight.

The discussion thus far ignores the fact that children generally live with a family in which a parent (or guardian) is purchasing food to be shared among all members. There are several reasons why other household members might 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. Alternatively, it might be the case that the when the household experiences food shortages children are always fed first.[17] In this case, adults might benefit more from the additional resources directed to the household than children.

[17] The USDA's measures of food insecurity assume that parents will protect children from hunger. Households are said to be "food insecure with moderate hunger" if food intakes for adults have been reduced but children have not been affected. Households are "food insecure with severe hunger" if children's food intakes have been affected. See Bickel et al (2000) for details.

A third reason why school nutrition programs could benefit other household members is that they involve an explicit educational component which the recipient children could share.

5. Estimation Strategy

We are interested in measuring the causal impact of the SBP on nutritional outcomes, but comparing students who participate in the SBP with those who do not confounds the true causal impact of the SBP with the choice to participate. Instead, we focus on the causal impact of SBP availability and exploit the fact that some schools have a SBP while others do not. While availability does not guarantee participation, it is the policy lever that the government controls and that advocates monitor—it is possible to increase availability of the SBP, but it is not possible to force students to participate. Hence, the effects of SBP availability is of direct interest.

However, as Table 1 shows, along many dimensions students who attend schools where a SBP is available differ from those for whom it is not. 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.

Our identification strategy is based on the simple observation that most school systems are not in session year around, so students do not receive the nutrition program year around. We first compare students' diets while school is in session to diets while school is not in session. If the only thing that changed between these periods was the availability of school nutrition programs, then this difference would be an estimate of the causal impact of the program on children's diets.

An obvious problem with this argument is that schools tend not to be in session during the summer, and it is unlikely that all seasonal differences in outcomes are due to the SBP. For example, if food costs are lower in the summer than in the winter then dietary outcomes may be better in the summer regardless of the availability of the SBP, and we will under-estimate the effect of SBP. Similarly, activity levels could vary by season.

The children who attend schools where a SBP is not available provide important information about these seasonal variations. Hence, we use a difference-in-differences design with children from schools without an SBP available as a control group. For this control group, differences in outcomes between the regular school year and summer vacation cannot be attributed to the SBP, and are presumably a good measure of seasonal variation in outcomes.

We implement this difference-in-differences strategy directly and in a regression framework. The regression framework allows us to control for observable differences in variables such as age, gender, race, and income. To the extent that we can control for other important determinants of the outcomes, the regression framework will reduce the bias in our estimates relative to the direct difference-in-difference procedure.

The regression models take the form:

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

where $sbav_i$ is an indicator variable for school breakfast being available, $inschool_i$ is an indicator variable for school being in session, and X_i is a vector of important control variables.

The coefficient on the interaction between $sbav_i$ and $inschool_i$ (β_3) measures the causal impact of program. 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). For simplicity, we use ordinary least squares for all models, regardless of whether the dependent variable is continuous or dichotomous.[18]

The regressions account for the complex sample design of the NHANES. Specifically, we use information on the strata, primary sampling units, and weights provided by the NHANES for the regressions.[19] These methods implicitly account for the fact that our sample contains multiple children from some households.

This strategy can only identify the causal impact of SBP on outcomes that can reasonably be expected to change within a few months. For example, we can identify the causal impact of the programs on dietary quality and on serum levels of vitamins that change rapidly in response to consumption, but we cannot identify the causal impact of the SBP on somewhat longer-term outcomes. Hence, although we can measure the prevalence of overweight (body-mass-index over the 85th percentile for gender and age) in the NHANES, we do not expect to see large impacts of seasonal variation in the availability of SBP on this measure, since body size may take some time to adjust to changes in food intakes. Similarly, our methods cannot be used to evaluate the impact of SBP on school achievement because we usually measure school achievement by annual test scores or grade advancement.

6. Results

Table 1 provides some basic descriptive statistics by whether or not the SBP is available at the child's school, and by whether or not the school is in session. These means suggest that children with the SBP available have systematically lower incomes than children who do not

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

[19] The survey over-samples blacks, Mexican-Americans, younger children, and older persons to assure adequate representation and includes weights to make the sample nationally representative. We estimate weighted regression models using the "survey commands" in STATA, identifying the underlying selection probabilities, strata, and primary sampling units. Unweighted regression models produced qualitatively similar estimates.

have access to SBP, that they are more likely to participate in the Food Stamp Program and that they are also less likely to be non-Hispanic white.

The nutrition data in Table 1 is divided into two categories: "primary outcome variables" and "other outcome variables." Given the wealth of information in the NHANES, it is not practical to present regression results for all of our outcomes. Hence, while we present simple difference-in-difference estimates for all of these outcomes, we report regression results only for the "primary" variables. These variables were selected either because we found significant effects, or because it was particularly interesting to show that there was no effect of SBP availability on the outcome in question. Regression estimates for the other outcomes listed in Table 1 are available on request.

Table 1 indicates that there are systematic differences in the nutritional outcomes of children who have SBP available, compared to those who do not. The SBP-available children are less likely to eat breakfast every day, have lower scores on the HEI, especially when school is not in session. The SBP-available children 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 outcomes that show the opposite pattern (for example, the SBP-available children are less likely to have low calcium at least while school is in session than other children), the overall pattern is one in which the SBP-available children have worse nutritional outcomes than other children. This suggests that a simple comparison of the two groups of children may understate the nutritional benefits of the program. The generally low HEI scores (the overall mean is only 63.2 out of a possible 100) suggests that the diets of most children in our sample could be greatly improved.

Table 1 also shows the direct 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. Given that we might expect children to have healthier diets in the summer when school is out of session, this first difference suggests that SBP does improve children's diets.

The experience of children who do not have access to the SBP provides information about underlying seasonal variation in diet. Children in this group have an HEI of 63.6 when school is in session, and an HEI of 64.7 in the summer when school is out of session. This finding confirms our intuition that in the absence of the SBP, diets are likely to be better in the summer. The difference-in-difference estimate shown in the final column of Table 1 implies that the SBP increases the HEI score by 3.2 points [= (63.0 - 60.9) - (63.6 - 64.7)]. That is, the causal effect of the SBP is to improve dietary quality by 3.2 HEI points, 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.

Regression estimates of model (1) are shown in Table 2 for the "primary outcome variables." 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. Table 2 indicates that the SBP has many positive impacts on nutrition, increasing the HEI, and reducing the percentage of calories from fat. The SBP also reduces the probability of low serum levels of vitamin C, E, and folate, as well as the probability of low iron, fiber, or potassium intakes.

The results thus far are striking. We exploit a transparent identification strategy, and we find evidence that the availability of SBP has a significant positive impact on the quality of children's diets. Table 3 presents several specification checks to test the sensitivity of our results. The first panel reproduces the Table 2 estimates of the key interaction term. The second panel shows estimates from a sample that excludes families with incomes above $40,000. Although we control for income fairly flexibly (by including indicator variables for $5,000 bands up to $50,000, as well as an indicator for income over $50,000 and one for income unknown), it is possible that these controls are not sufficient to make the underlying individuals comparable. However, panel B shows that the estimates are very similar when higher income individuals are excluded from the sample.

Recall that our strategy to deal with normal seasonal variation in nutrient intakes is to use children from schools without a SBP available as a control group. Unfortunately, the design of the NHANES 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.[20] A MEC is transported to each of the data collection sites. Data collection is limited by the number and transportation costs of the MECs. We show in Appendix Table 1 that,

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

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-session and out-of-session groups.

Table 3 shows three responses to this problem. First, panel C repeats the estimates excluding Hispanic children. These estimates are very similar to the baseline regressions estimates shown in the first panel, 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 households from the West, respectively. Again, the results are very similar to our baseline estimates, suggesting that geographic differences in the timing of interviews cannot explain away our results.

A final caveat about our results is that our identification strategy does not account for at least one seasonal confounding factor, the Summer Food Service Program (SFSP).[21] The Summer Food Service Program provides free nutritious meals and snacks to children in low-income areas during the summer months when school is not in session. In 1990, the program served 1.7 million children per day compared to 3.4 million served by the SBP. To the extent

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

that this program confounds our estimates, it will bias our results toward not finding any impact because some children still receive meals from the SFSP program in the summer.

Tables 4 and 5 extend the analysis to other family members in households with school-aged children. Table 4 shows basic summary statistics for children 0 to 5, and for adults 25 to 64. 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. Table 4 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. These comparisons may indicate that adults in households with preschool and school-aged children do sacrifice their own consumption to protect the quality of their children's diets.

Table 5 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. This suggests either that households use the transfer implicit in the SBP to improve the quality of the diets of other household members, or that the SBP is working through some other mechanism, like nutrition education. However, we find no other significant effects for other household members, which indicates that the overall impact of the SBP is less for these other members than for the school-aged children.

7. 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 four 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 nutrient outcomes as well as intake outcomes based on dietary recall data. 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). Fourth, we examine the effect of the SBP on the entire household because changes in resource allocation within the household can cause program benefits to spillover to other household members.

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.

Finally, our results indicate that the SBP benefits other family members. In households with school-aged children, both adults and preschool children have healthier diets and lower percentages of calories from fat when the SBP is available. These results show that the SBP is an important tool for improving the quality of the diets consumed by families; improved diets, in turn, are likely to have important consequences for future health and well-being.

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 1: 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: 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 5: 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				
Mean				
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				
Mean				
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				
Mean				
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.