

Do Means-Tested School Lunch Subsidies Change Children's Weekly Consumption Patterns?

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Abstract

This article examines whether participation in the means-tested component of the National School Lunch Program changes the dietary patterns of children. Endogeneity bias arising from the incentive effects of lunch subsidies on program take-up is addressed using an identification strategy that relies on variation across school districts in the financing of and demand for school meal programs. Analyzing data on 5th grade public elementary school children observed in spring 2004, we find significant changes in the weekly consumption patterns of subsidized children relative to children that do not receive a means-test subsidy. Our estimates indicate increases in consumption for items known to be a rich source of vitamins and minerals that are essential for children's health and development, particularly fruits and 100% fruit juices; however, the weekly increases appear to substitute for the consumption of all types of milk. The effects are generally stronger for children receiving the full subsidy, as opposed to a partial subsidy or none, which points toward one lever available to policymakers concerned with increasing the program's effectiveness.

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I INTRODUCTION

Beneficiaries of the means-tested component of the National School Lunch Program (NSLP) account for approximately 60% of the lunches it funds and 50% of all participants. Having been in effect since 1946, the NSLP now provides over eight billion dollars of federal funding (a small percentage of which is matched by state governments) for the provision of low-cost lunches. Currently, more than thirty million students take advantage of this program each school day in nearly all public and nonprofit private schools and residential child care institutions in the U.S.¹ The additional school lunch subsidies provided to students from eligible low-income households (beneficiaries) make up a sizeable portion of the total cost of the program; and this component arguably has the most potential to impart health benefits, particularly for young children.

Limited accessibility to nutritious meals poses a severe threat to children's development and growth by impairing the body's ability to resist infection which, in turn, exacerbates negative effects of undernourishment. A central objective of the NSLP is to help prevent undernourishment among children by relaxing household resource constraints and expanding access to domestic agricultural products. Currently, a student is eligible for a partially subsidized (price is less than or equal to 40 cents) or fully subsidized school lunch when their household income is below 185% or 130% of the federal poverty guidelines, respectively (U.S. Congress, 2004).² To the extent that children from low-income households experience undernourishment with greater frequency, subsidization of nutritious foods high in essential vitamins and minerals is required to maintain immunological functions and prevent impaired

¹The NSLP funds school lunches in every public school that children attend in our sample. See <http://www.fns.usda.gov/pd/slsummar.htm> for a summary of the program's participants and lunches served since 1969. The initial National School Lunch Act was passed in 1946 in response to the increased demand for military servicemen during World War II and the extent to which potential soldiers had health limitations related to nutritional status.

²Congress established uniform national guidelines and criteria in the determination of eligibility beginning fiscal year 1971. See Gunderson (1971) for a comprehensive history of school food assistance programs in Europe and the U.S. prior to 1971.

growth and development (Scrimshaw and SanGiovanni, 1997).

The recent policy discussion in the U.S., however, has acquired a different emphasis. There has been an increasing amount of research investigating the role of federal food and nutrition programs in the increasing national trend in obesity.³ While analyzing the inter-relationships between children’s anthropometric measurements and welfare program participation is informative, from a policy standpoint it is important to understand how these programs can change body size through intermediary mechanisms such as consumption patterns. The NSLP is a primary focal point for examining potential links between program participation and individual diet composition because nearly all of a student’s lunchtime meals are consumed at school. The literature has typically focused on the entire population of students consuming NSLP funded meals, and thus classify students as participants if they purchase a NSLP school lunch at the full price or the lower price available for those receiving a means-tested subsidy.⁴ Given the vast reach of the program and its strong potential to improve low-income children’s health and development, we focus on the most vulnerable populations among the aggregate NSLP participant population and investigate how the weekly consumption patterns of beneficiaries are directly impacted by the means-tested subsidies.

³See Currie (2003) for a thorough overview of food and nutrition programs in the U.S. and summary of the empirical evidence. For recent studies of program and participation effects see Schanzenbach (2008) and Millimet et al. (2008) for estimates of the effects of the NSLP on children’s prevalence of obesity; Hinrichs (2008) for estimates of the effects of the NSLP on a number of adult health and education outcomes; Dunifon and Kowaleski-Jones (2003) for effects on children’s probability of having health limitations; Bhattacharya et al. (2006) for estimates of the effects of the availability of the School Breakfast Program on a number of nutritional outcomes and Millimet et al. (2008) for effects of participation on children’s prevalence of obesity; Gibson (2003) for estimates of the effects of the Food Stamp Program on adults’ prevalence of obesity and their body mass indices; Hofferth and Curtin (2005) for evidence that food programs do not contribute to overweight among low-income children.

⁴Gleason and Sutor (2003), for example, analyze the impact that NSLP participation has on children’s diet composition. They study lunchtime and 24 hour dietary intakes and find it increases participants’ consumption of several key vitamins and minerals and dietary fat while decreasing that of added sugars. Similarly, Gordon et al. (2007b) provide more recent estimates of differences in dietary intakes and food consumption between NSLP participants and nonparticipants. They only report the sample means by participation status for consumption of various categories of food and beverages. In their regression-adjusted estimates of mean dietary intakes, no measure of children’s body weights is included in the model and participation is assumed exogenous. No analytical distinction is made for those participants receiving means-tested subsidies in either of these studies.

In general, regressing a behavioral outcome of interest on an indicator variable for the child’s beneficiary status will not give the causal effect of the subsidy. The “take-up” of welfare is likely to be correlated with other important determinants of individual patterns of behavior; some of which are observable and some of which are plausibly unobservable. For example, in this paper variation in appetites alone could result in children who have a high preference for consumption selecting into the NSLP with greater frequency; all else being equal, households with children with smaller appetites could be less likely to enroll in the program even if they do meet the eligibility criteria. Estimates of the effect of NSLP subsidies on consumption rates are likely to be confounded with other factors which differ between beneficiaries and non-beneficiaries. Research investigating causes of obesity has found considerable evidence documenting complex interrelationships between individual activity patterns, appetite, body weight and metabolism; thus, posing a threat to the identification of causal effects.⁵ In order to account for omitted and difficult to measure factors influencing dietary patterns, we include reliable measures of body weight and height in our models of children’s weekly consumption rates to control for general differences in appetites and metabolism that are highly correlated with body size.

A second threat to identification in this context, however, is that the frequency of consumption and the types of foods consumed can change an individual’s basal metabolic rate which, in turn, can influence body weight directly.⁶ Strictly relying on the inclusion of all variables affecting individual consumption rates, body size, and take-up of the NSLP subsidy is a tenuous solution because children’s appetites and metabolism are the product of many environmental and genetic factors.⁷ We estimate the effects of children’s beneficiary status

⁵See Bhargava et al. (2008) for recent findings on the effects of children’s activity patterns on body weights and body mass indices; Prentice et al. (1989) find metabolism alone cannot explain obesity and discuss the importance of accounting for interrelationships between energy intake, energy expenditure and body size.

⁶The basal metabolic rate is the minimum daily amount of energy required to sustain life. See Johnstone et al. (2005) for recent evidence on factors, such as fat-free body mass, which explain variation in these rates across individuals.

⁷Escobar (1999) and Birch and Fisher (1998) provide a nice qualitative overview of the developmental and

on their weekly rates of consumption by taking the following steps. First, we utilize a large, nationally representative sample of fifth grade children attending public elementary schools in the U.S. surveyed in the Early Childhood Longitudinal Study-Kindergarten (ECLS-K) during the spring of 2004 (the consumption survey module was not introduced until the sixth round preventing us from taking advantage of any time variation). The extensive information compiled in the study enables us to incorporate several variables into our models which are likely to influence weekly consumption rates, appetites, and metabolism such as the average amount of time children spend watching television during a typical day, the number of weekly physical exercise periods which exceeded twenty minutes, and a number of other individual, household, and environmental factors. Second, we match information on the finance characteristics of the school districts in which the children are enrolled and construct “instrumental variables” that measure cross-sectional variation in the per student funding of and demand for nutrition and lunch programs. We use these additional variables to identify the effect of beneficiary status and body weight on children’s weekly rates of consumption separately from other variation in take-up and body weight that is left unexplained in our models. Third, to assess the robustness of our identification strategy and main results, we further incorporate measures of food availability within the zip code in which children’s households are located such as the per capita level of supermarkets, full-service restaurants, limited-service restaurants, and the ratio of full- to limited-service restaurants. Using this additional information enables us to ascertain the extent to which our identification strategy is measuring off of differences across individuals in their access to food sources near home or the socioeconomic characteristics of their local communities.

Overall, the results suggest that NSLP means-tested subsidies change children’s weekly rate of consumption for certain types of food and beverages. For models that omit or include food availability characteristics, we find the weekly rate of consumption increases for fruit,

environmental factors affecting food preferences and patterns of food consumption from early ages onward.

green salad, and 100% fruit juice, and decreases for all types of milk.⁸ In contrast, we find no statistically significant effect on children’s weekly rate of consumption for carrots, potatoes, other vegetables, or sweetened beverages. The findings suggest a degree of household reallocation in response to the receipt of means-tested subsidies as the consumption of fruit, green salad, and 100% fruit juice substitutes for the consumption of all types of milk over the period of one week.

In general, coefficient estimates for beneficiary status are biased toward zero if we ignore the endogeneity of the beneficiary take-up choice. The results indicate that the children receiving means-tested subsidies are less likely to have above-average rates of consumption in the absence of the subsidy program. Further disaggregating NSLP beneficiary status into partially subsidized and fully subsidized categories of eligibility highlights disparate effects between the two. Though the precision of the estimated effects is weakened overall, the coefficient for partially subsidized lunch is generally smaller than that for fully subsidized lunch. Although the effects are not statistically different from one another, this finding is consistent with the hypothesis that the nominal price of school meals is a *binding* constraint for certain children on the margin of eligibility for the means-tested subsidies. To our knowledge this is the first study to analyze differences in consumption patterns between these distinct categories of low-income children.

We discuss a conceptual framework for our analysis in Section II, and describe the various data sources we utilize here in Section III. Section IV outlines the empirical framework and estimation strategy. An important component of the estimation is the rigorous treatment of beneficiary take-up as well as the potential correlation of children weights to unobserved factors. Section V presents the results and explores the robustness of the findings to omitted zip code food availability characteristics. Section VI concludes and discusses policy implications.

⁸The measure for milk is somewhat imprecise because it conflates the frequency of all types of milk consumption into one outcome.

II CONCEPTUAL FRAMEWORK

Economic theory suggests that in-kind commodity transfers can change consumption patterns depending on individual preferences. In the context of welfare assistance targeted toward children, the model developed in Becker (1974) suggests the transfer can stimulate a reallocation of resources within households; however, the extent of the response is contingent upon the preferences of the “head” of the family, household resource constraints, and the time horizon. If, on the one hand, the means-tested subsidies received through a child’s participation in the NSLP result in a reallocation of household expenditure away from children’s consumption by the full “value” of the subsidy then we would expect no change in observed consumption patterns due to the food and beverages provided by the program itself. On the other hand, however, there is the possibility that previous levels of household expenditure are only partially displaced or are not displaced at all in response to the subsidy.⁹ In this case, there is scope for the means-tested component of the NSLP program to change the composition of food and beverages consumed by children from low-income households on a weekly basis (or an even longer time horizon).

NSLP And Households’ Consumption Decisions

Households’ consumption decisions have been found to respond directly to welfare assistance. Hoynes and Schanzenbach (2007) recently estimate that the marginal propensity to consume food is slightly larger for in-kind transfers as opposed to cash transfers. It is difficult to disentangle whether this response is due to the constraints imposed by in-kind welfare programs, or as Becker (1974) illustrate, the individual preferences of the household deci-

⁹Long (1991) find households reduce expenditure on food by 61 cents for each additional dollar of NSLP benefits; Jacoby (2002) find no intrahousehold reallocation of calories for children in response to a school feeding program; Hoynes and Schanzenbach (2007) find the Food Stamp Program increases overall food expenditures and reduces out-of-pocket expenditures on food.

sion maker.¹⁰ Overall, the evidence suggests a marginal propensity to spend on food in the range of \$0.17 and \$0.47, and substantially less than one (Currie, 2003). To gain perspective on the economic impact of the NSLP subsidies on household budgets, for our time period, the maximum reimbursement rate paid to schools located in the contiguous U.S. through the NSLP is \$2.36 per meal (U.S. Department of Agriculture, 2003). This would amount to about a \$50 transfer per month to a household for each fully subsidized child. If this transfer was viewed by the head of the family as equivalent to a cash transfer then spending on food would increase by a minimum of about nine dollars per month. It is an empirical question whether households reallocate food resources to other members or whether children experience a net increase in consumption. If the household is currently experiencing food shortages, the findings of Bhattacharya et al. (2003) suggest adult members might benefit more from the additional resources because the hierarchical organization of families is such that children are protected from economic shocks. In this case, we would expect no net change in children's weekly consumption.

III THE DATA

The empirical analysis uses data assembled from a variety of sources. This section gives a brief summary of the data sources, the variables utilized, and how we construct certain measures from data not included in the ECLS-K.

¹⁰The matter is complicated further by the fact that certain households are simultaneously receiving assistance from more than one program. In our full sample, for example, about 11% of households received food stamps in the previous 12 months and 94% of these households had children participating in the NSLP. Similarly, about 4% of households received aid through the Temporary Assistance for Needy Families program in the previous 12 months and 92% of these households had children participating in the NSLP. Simultaneous participation in multiple welfare programs is another reason why treating NSLP beneficiary take-up or body weight as exogenous is problematic in this context.

ECLS-K

The ECLS-K is a longitudinal study that began in the fall of 1998 by observing nearly 20,000 children in kindergarten enrolled in over 1,200 schools throughout the U.S. Attrition due to geographical relocation resulted in approximately 11,000 children remaining in the study from kindergarten through 5th grade, and the locatable students were followed for a random 50% of the schools (Tourangeau et al., 2006). We strictly focus on the fifth grade round because this was the first round which surveyed children directly about their consumption of various types of food and beverages consumed in the previous week. Due to missing observations on individual data and the availability of school district finance characteristics, complete data were analyzed on 6,530 children in the fifth grade who attended schools in nearly 700 different public school districts located across 40 states during the spring of 2004.¹¹

The consumption outcomes we analyze are based on children’s own response to survey questions regarding the food they consumed during the previous seven days. The responses range one through seven corresponding to answers of none, 1-3 times, 4-6 times, 1 time per day, 2 times per day, 3 times per day, or 4 or more times per day, respectively. Using cell midpoints, outcomes are constructed to measure the number of servings consumed in the previous week and range from 0 to 28. There are eight specific categories of consumption: 1. Fruit such as apples, bananas, oranges, berries, or other types of fruit, and does not include

¹¹Demographic characteristics of the sample in the analysis were similar to the full sample covering all children from kindergarten through the 5th grade. Certain kinds of sampling weights (differential probabilities of selection at each sampling stage) based on aggregate non-response and other variables such as children’s age, gender, ethnicity, and geographical location are available in the ECLS-K data; however, they were not utilized in the modeling as they are formulated under the assumption of non-missing data in both the ECLS-K survey and the additional data sources we match and incorporate into our specification. Wang et al. (1997), using several bootstrap methods, provide evidence that ignoring the possibility of unobserved group effects arising from the multi-stage sampling design mainly affects the estimate of the constant term. Additionally, it is not clear which of the available weights provided in the sixth round of the ECLS-K would be appropriate and have a logical interpretation as there are child weights, parent weights, and child-parent-teacher weights to choose from; none of which account for missing values for key characteristics of children and their households in our models, strictly sampling public school children, or the missing values generated by a lack of school district finance characteristics.

fruit juice; 2. Green salad; 3. Carrots; 4. Potatoes which does not include “French fries”, fried potatoes, potato chips, or tater tots; 5. Other vegetables not including green salad, potatoes, or carrots; 6. Milk including all types of milk such as cow’s milk, soy milk, or any other kind of milk, and whether it was in a carton, cup, glass, or with cereal; 7. 100% Fruit juice including only non-sweetened, 100% fruit juices such as orange juice, apple juice, or grape juice; 8. Sweetened beverages including soda pop, sports drinks, or fruit drinks that are not 100% fruit juice.

Additionally, information was collected on the attributes of children and their households. Parents were asked directly whether their child was currently receiving a full or partial means-tested NSLP subsidy. Children’s heights and body weights were measured using a Shorr Board and digital scale, respectively; duplicate measures were taken and we use the mean values.¹² The highest parental education level achieved was assessed as a categorical variable that ranges one through nine corresponding to answers of 8th grade or below, 9th-12th grade, high school diploma/GED, vocational program, some college, bachelor’s degree, graduate/professional school with no degree, master’s degree, doctorate or professional degree, respectively. Using cell midpoints, responses are mapped into one variable measuring the years of schooling for a child’s parent, and ranges from 4 to 20 treating categories 4 and 5 as equivalent to 14 years of schooling. Annual household income was assessed as a categorical variable that ranges one through 13 corresponding to answers of <5, 5-10, 10-15, 15-20, 20-25, 25-30, 30-35, 35-40, 40-50, 50-75, 75-100, 100-200, >200 in US \$1000, respectively.¹³ Using cell midpoints, responses are mapped into one variable measuring the annual household income in dollars, and ranges from \$2,500 to \$200,000. Other relevant variables we include in our models are number of siblings, household size, the number of days per week

¹²A Shorr Board vertical stadiometer (Shorr Production, Olney, MD); measures standing height to the nearest 0.1 cm.

¹³Finer measures of household income were not extensively surveyed after the base round in 1998. For example, only 14% of households in our full sample reported a specific value for their total annual household income; 35% and 2% of NSLP beneficiaries and non-beneficiaries, respectively.

the child exercises for periods longer than twenty minutes, the average number of minutes per day the child watches television, the age in months of the child, and gender. Lastly, we construct an indicator variable measuring whether a child had been diagnosed by a professional to have a disability such as difficulty with eyesight or in hearing and understanding speech, or other impairments resulting in developmental disorder or delay.

School District Finance Characteristics

We utilize the National Center for Education Statistics seven digit local education agency identifiers to match data from the Common Core of Data, School District Finance Survey for fiscal year 2003. We use the previous fiscal year before the children are observed to avoid the possibility of simultaneity bias in our instrumental variables identification strategy. In particular, the school district revenues from federal, state, and local sources allocated for specific expenditures related to meals served in schools within the district are used to construct instrumental variables for children's body weights and take-up of the NSLP means-tested subsidies. Specifically, we construct three per student revenue measures for each school district in the sample. The federal revenues are those allocated for Child Nutrition Act (CNA) programs such as the NSLP, School Breakfast Program, Special Milk Program, and Ala Carte Program. It does not include the monetary value of commodities which have been donated to the school districts. The state revenues are those allocated by the state government for CNA program matching payments.¹⁴ The local revenues are the reported gross receipts from the sale of school breakfasts, lunches, and milk from students, teachers, and adults, and exclude revenues from state or federal funds (Berry and Cohen, 2006).

¹⁴As of fiscal year 1956 states were required to match three dollars for each federal dollar received through the NSLP; states with per capita incomes below the national average had matching rates reduced by the percentage difference (Gunderson, 1971). With the passage of the CNA, the a minimum state contribution could not be less than 30% of the administrative cost for all programs funded through the act (U.S. Congress, 108th, 2004).

Zip Code Characteristics

We utilize the zip code location of children’s households to match data from the U.S. Census Bureau 2004 Zip Code Business Patterns Survey. Variables which reflect the availability of food and beverages close to a child’s home are used to construct per capita measures for each child who lives in a zip code included in the survey universe. These are included in expanded models of children’s weekly rates of consumption to ascertain the extent to which our identification strategy is measuring off of differences across individuals in their access to food sources near home or the socioeconomic characteristics of their local communities. Establishments are classified according to the North American Industry Classification System and we utilize data on the number of supermarkets (#445110), full-service restaurants (#722110), and limited-service restaurants (#722211). Establishments meet the definition of a full-service restaurant if they provide food services to patrons who order and are served while seated from waiters and then pay after eating. In contrast, limited-service restaurants include establishments that provide food services to patrons who order and pay before eating. Per capita measures are constructed using zip code population data from the Census 2000 Summary File 1.

IV EMPIRICAL FRAMEWORK

The baseline model for children’s weekly rate of consumption is postulated in equation (1):

$$Outcome_{ij} = \alpha_1 + \beta_{11}nslp_{ij} + \beta_{12}ln(weight)_{ij} + \beta_{13}ln(height)_{ij} + \mathbf{X}_{ij}\Gamma_1 + u_{1ij} \quad (1)$$

where i indexes each child in the sample, j indexes the public school district in which the child attends elementary school, $nslp$ is an indicator for partial or full NSLP beneficiary status, $ln(weight)$ is children’s body weights in pounds expressed in natural logarithms,

and $\ln(\text{height})$ is children’s body heights in inches expressed in natural logarithms.¹⁵ We include these measures of body size to control for children’s overall nourishment and, more importantly, for the unobserved serving sizes corresponding to children’s reported weekly rates of consumption. To a certain extent, these measures also control for differences in children’s appetites and metabolism that influence consumption patterns.¹⁶ Body weights are treated endogenously in the estimation due to its short-run, more immediate relationship with consumption and nutrient intake. Body height is a long-run measure of nutritional status and health shocks occurring in early stages of development. These measures are typically compared against national standards based on age and gender to gain perspective on the physiological development of children, and are often combined as the ratio of weight to squared height to construct a body mass index (Cole, 1991). As Bhargava (1994) suggest, we can test the validity of this restrictive transformation; the null hypothesis is, $2 \cdot \beta_2 + \beta_3 = 0$, and can be tested using a Chi-square statistic distributed with one degree of freedom.¹⁷

\mathbf{X} is a vector of potentially confounding variables. We include the natural logarithm of parental years of schooling due to its complex inter-relationship with children’s health status and height (Thomas et al., 1991), and its potential to affect food choice, serving sizes, and preparation methods. The natural logarithm of annual household income, in addition to the number of siblings and household size, are included to control for potential resource constraints affecting children’s consumption.¹⁸ The number of days per week the

¹⁵The extent of the household income effect for fully subsidized beneficiaries depends primarily on school attendance; and for partially subsidized beneficiaries it depends on attendance as well as whether their household is able to finance the remaining cost of school lunch. Sample means of the number of days a child was absent during the school year for beneficiaries and non-beneficiaries are close at 6.9 and 6.0, respectively, but statistically different from one another at conventional levels of significance; data on school absence was only available for 5780 of the children in the full sample. Further, fully subsidized children had an average of 7.2 school day absences while partially subsidized children receiving had an average of 6.4 school day absences; and the difference is statistically significant. Absenteeism does not appear to explain our findings.

¹⁶The heights and weights of children’s parents were not surveyed in the ECLS-K.

¹⁷We generally reject the null hypothesis of the body mass index transformation and therefore specify the height and weight components separately in all models.

¹⁸Utilizing a nonlinear specification of education and/or income in the specification, such as a series of dummy variables for different categories, showed slightly different magnitudes across categories which were

child exercises for periods longer than 20 minutes and the average number of minutes per day the child watches television are included to control for behavioral factors affecting children’s consumption, appetites, and metabolism (Dixon et al., 2007; Johnson, 2000). Lastly, we include variables measuring children’s ages, gender, and disability status in the model.

Identifying the Causal Effect: An Instrumental Variables Technique

As previously discussed, there is concern that NSLP beneficiary status is not randomly assigned, even if we control for household income and size, and that a number of genetic and environmental factors, which are difficult to measure, are likely to be correlated with children’s body weights and weekly rates of consumption of food and beverages. To minimize bias we employ an instrumental variables estimation strategy. The first stage regressions are specified in equation (2) and (3):

$$nslp_{ij} = \delta_{11}federal_{ij} + \delta_{12}state_{ij} + \delta_{13}local_{ij} + \mathbf{Z}_{ij}\Lambda_1 + \varepsilon_{1ij} \quad (2)$$

$$\ln(weight)_{ij} = \delta_{21}federal_{ij} + \delta_{22}state_{ij} + \delta_{23}local_{ij} + \mathbf{Z}_{ij}\Lambda_2 + \varepsilon_{2ij} \quad (3)$$

where Z is a vector of all exogenous variables in the model including a constant term, *federal* is school district revenues per student for all CNA programs, *state* is school district revenues per student for state government school lunch matching payments, and *local* is reported gross receipts from the sale of school breakfasts, lunches, and milk from students, teachers, and adults, and these receipts exclude revenues from state or federal funds.¹⁹ We obtain consistent parameter estimates in this case by utilizing the heteroscedasticity-robust generalized method of moments (GMM) estimator available through Stata. We subsequently refer to this baseline model, defined by equation (1), and the moment conditions implied in (2) and (3), as model

not statistically different from one another. We find the same pattern of subsidy effects in either of the specifications.

¹⁹Reduced-form effects are generally significant across all the models.

1.

We are able to formally test our moment conditions, and the results support our approach (see Table-A1 in the appendix); however, we also believe there is a straightforward intuition behind our identification strategy. To consistently estimate the effect of NSLP beneficiary status we require at least one exogenous variable which is likely to affect an individual's take-up choice, conditional on household income and size, but not their weekly rates of consumption of food and beverages directly. Similarly, identification of the effect of children's body weights requires at least one explanatory variable which strictly affects consumption via weight loss or gain.

We propose the use of three distinct variables measuring the financing of and demand for lunch and nutrition programs within the child's public school district. The federal and state per student revenues included in equation (2) and (3) above represent federal funds allocated to school districts based on the CNA and the state matching requirement necessary to receive the federal funds. In contrast, the local per student revenues represent gross school meal sales revenue. Thus, holding constant a school district's meal sales, higher federal and state per student revenues imply a higher number of CNA program participants and subsidy beneficiaries per total students in the district.²⁰ The more classmates a child has who are beneficiaries can increase individual take-up by reducing the "welfare stigma" associated with welfare program participation.²¹ Further, a larger share of funds received through CNA programs can induce school districts to conform more closely to the nutrition guidelines required by federal law which, in turn, can influence children's body weights depending on how frequently the children consume meals and snacks provided through their schools.

Similarly, holding CNA program expenditures constant, higher local per student revenues

²⁰States are reimbursed with federal funds on a per meal basis for CNA programs; schools serving 40% or more of their school lunches as free or reduced-price are eligible for additional assistance. See U.S. Department of Agriculture (2003) for the specific reimbursement rates valid for our sample period.

²¹See Moffitt (1983) for theoretical and empirical evidence that the stigma from participation can stem primarily from the "act of welfare reciprocity."

imply a higher overall demand for school meals in that district. For example, 37% of children in our full sample attend a school which offers “ala carte” meal items, and these are designed to increase individual demand. Moreover, school districts are granted considerable leeway in designing school meal menus, and these menus exhibit considerable variation in terms of nutrition and variety (see Gordon et al. (2007a) for the most recent and comprehensive evidence). The higher overall demand is for school meals, the greater the likelihood that children’s body weights reflect the nutritional component of school meals and snacks. Because we do not observe in our data what the children are actually consuming at school during a typical week, we must rely on the effect of any consumption of food and beverages from specific school district related sources as operating through children’s body weights.

Alternative Specifications

We further investigate whether the effect of NSLP beneficiary status varies according to whether a child is fully subsidized or partially subsidized. While the price is nominal at less than or equal to 40 cents, these children come from households with limited resources and households might not be able to afford the small cost. In the context of analyzing how the means-tested component of the NSLP changes children’s consumption it is important to distinguish between situations which are not knowable a priori. Our identification strategy permits one degree of freedom and we utilize it to estimate an expanded model, subsequently referred to as model 2:

$$\begin{aligned}
 Outcome_{ij} &= \alpha_2 + \beta_{21}full_{ij} + \beta_{22}partial_{ij} + \beta_{23}ln(weight)_{ij} + \beta_{24}ln(height)_{ij} + \mathbf{X}_{ij}\Gamma_2 + u_{2ij} \\
 full_{ij} &= \delta_{31}federal_{ij} + \delta_{32}state_{ij} + \delta_{33}local_{ij} + \mathbf{Z}_{ij}\Lambda_3 + \varepsilon_{3ij} \\
 partial_{ij} &= \delta_{41}federal_{ij} + \delta_{42}state_{ij} + \delta_{43}local_{ij} + \mathbf{Z}_{ij}\Lambda_4 + \varepsilon_{4ij} \\
 ln(weight)_{ij} &= \delta_{51}federal_{ij} + \delta_{52}state_{ij} + \delta_{53}local_{ij} + \mathbf{Z}_{ij}\Lambda_5 + \varepsilon_{5ij}
 \end{aligned} \tag{4}$$

where we allow for NSLP beneficiary status to be defined by two dichotomous variables indicating whether a child is fully or partially subsidized, respectively.

Lastly, there is concern that children’s weekly rates of consumption might depend on the density of food markets and restaurants in the area in which the child’s household is geographically located, and that our school district finance characteristics might be correlated with these potentially relevant local factors. Large supermarkets, for example, typically charge lower prices and have a wider variety of selection relative to restaurants. Moreover, the evidence suggests low-income households tend not to concentrate in suburban areas where prices are generally lower (Kaufman et al., 1997). To ascertain the extent to which our identification strategy is measuring off of differences across individuals in their access to food sources near home or the socioeconomic characteristics of their local communities, we modify model 1 and 2 to include a vector of zip code food availability characteristics and refer to the corresponding expanded models as model 3 and 4, respectively. The additional explanatory variables are per capita levels of supermarkets, full-service restaurants, limited-service restaurants, and the ratio of full- to limited-service restaurants.

V RESULTS

Descriptive Statistics

The sample means of the consumption outcomes we analyze, the explanatory variables we utilize, and the instrumental variables are reported in Table 1. About 36% of the full sample are beneficiaries and about 73% of the beneficiaries are fully subsidized. Mean servings consumed per week and body weights are slightly higher for beneficiaries relative to non-beneficiaries, while mean parent years of schooling and annual household incomes were one standard deviation or more higher for non-beneficiaries. The average parent years of schooling for beneficiaries was between 12-13, and annual household income was approximately

\$26,000-\$27,000. For non-beneficiaries, the average parent years of schooling was between 15-16, and annual household income was approximately \$81,000-\$82,000. Furthermore, beneficiaries had slightly more siblings and household sizes, higher disability prevalence, lower physical exercise rates, and spent more time watching television than non-beneficiaries, on average. Lastly, as we expect and previously discussed, mean levels of federal and state school district revenues per student are higher for beneficiaries relative to non-beneficiaries, and vice versa for local school district revenues per student.

Results for Children’s Weekly Consumption Patterns

We present the results from our specifications for children’s weekly rates of consumption in Table 2-9. Model 1 and 3 estimate specifications defined by equation (1), (2), and (3), where the difference between the two is the inclusion of zip code food availability characteristics. Similarly, model 2 and 4, defined in equation (4), disaggregate NSLP beneficiary status into full and partial subsidization categories, and differ only in the inclusion of the additional zip code characteristics.²²

The main findings are, first, NSLP subsidies increase children’s weekly consumption of fruit, green salad, and 100% fruit juice, and decrease their consumption of all types of milk. The coefficient on beneficiary status can be interpreted as the change in the number of servings consumed in the previous week due to a person moving from non-beneficiary to beneficiary status; thus reflecting the effect of the subsidy on weekly rates of consumption. We find that, on average, beneficiaries consume 8.87, 3.74, 8.80 more servings of fruit, green salad, and 100% fruit juice per week, respectively. In contrast, beneficiaries consume 14.14 fewer servings of all types of milk per week, while beneficiary status has no statistically significant effect on the consumption of carrots, potatoes, other vegetables, or sweetened

²²Results not reported here show a similar pattern of effects, in terms of coefficient sign and statistical significance, if we leave the outcomes in their original qualitative metric, or if we standardized them relative to the entire sample to have mean zero and variance one.

beverages. Household reallocation in response to the subsidy is a likely explanation for these changes in children's dietary patterns. The substitution pattern we find here illustrates the importance of analyzing children's consumption over long time horizons. It also suggests the consumption of low-income households is responsive to means-tested subsidies, and perhaps the particular components of NSLP funded school lunches.²³

Second, model 2 shows how the effect of beneficiary status varies according to the degree of subsidization. Fully subsidized children have significantly higher rates of consumption of fruit, green salad, other vegetables, and 100% fruit juice, and lower rates of consumption of all types of milk. In contrast, partially subsidized children are only found to have significantly lower rates of milk consumption, and other rates of consumption are not statistically different from zero. While the precision of the estimated effects is considerably weakened under this specification, the smaller coefficients and larger standard errors for partially subsidized children relative to fully subsidized children suggests that the nominal price is a binding constraint for at least a fraction of these children.

Third, if we push further and specify zip code characteristics measuring food availability, the same qualitative pattern of NSLP beneficiary status effects remains for model 3. Moving to model 4 where we allow the effect of beneficiary status to vary according to subsidization level, we see that the children who are fully subsidized are affected the most. The estimate precision does change slightly, however, implies that differences across individuals in their access to food and beverages near home explains part of the variation in children's weekly rates of consumption, particularly green salad, carrots, and other vegetables among fully subsidized children..

Fourth, we do find a significant effect of body weights on children's weekly consumption of fruit, green salad, 100% fruit juice, and sweetened beverages. In particular, heavier children

²³School have discretion in deciding how to meet the federal minimum nutrition standards to receive funding; for details see section 210.10 at http://www.fns.usda.gov/cnd/Governance/regulations/7cfr210_9.pdf

consume more sweetened beverages per week, and less fruit, green salad, and 100% fruit juice. While the complete omission of body weight in a model of consumption will likely lead to omitted variables bias, the bidirectional relationship must be acknowledged in the estimation. We further find children from higher income households have significantly higher rates of consumption for fruit, green salad, carrots, and 100% fruit juice, and lower consumption of all types of milk. We also find that the effect of parent years of schooling is a significant determinant of children’s consumption of other vegetables, but the effect of this factor is overstated for children’s milk and sweetened beverage consumption if the endogeneity of our key variables is ignored.

Results for specification tests

We test the joint significance of our instrumental variables in the first stage regressions and calculate tests of overidentifying restrictions where applicable; these results are shown in Table A-1 of the appendix. Despite the small possibility that our instrumental variables are highly correlated with non-beneficiary weekly rates consumption, the tests of overidentifying restrictions provide reassurance that the correlations are very small and well within conventional size, especially after controlling for the household zip code food availability characteristics. The data do not suggest the children are sorting, to any significant degree, across public school districts according to their weekly consumption patterns.

VI DISCUSSION

In this study we estimate models of children’s weekly rates of consumption for certain types of food and beverages, and evaluate the effect of participation in the means-tested component of the NSLP in this context. Methodologically, we are careful to account for non-random beneficiary take-up and the bidirectional relationship between body weight and

consumption choice. We use an instrumental variables estimation strategy to account for endogeneity by taking advantage of variation across public school districts in the financing of and demand for lunch and nutrition programs. The results from instrumental variables diagnostic tests support the validity of our estimating framework, especially after controlling for household zip code food availability characteristics. Overall, our findings suggest that the means-tested policy component of the NSLP has a significant effect on beneficiaries' weekly consumption patterns.

We find NSLP subsidies increase children's weekly rate of consumption for fruit, green salad, and 100% fruit juice, and decrease their weekly rate of consumption for all types of milk. This paper provides the first analysis of changes in dietary patterns over long time horizons in the context of NSLP evaluation. While we find certain changes attributable to the means-tested subsidies persist at the weekly level, changes in the consumption of carrots, potatoes, other vegetables, and sweetened beverages are not evident. The findings underscore the importance of collecting consumption survey data over long time horizons, particularly for children. More extensive dietary pattern data would afford deeper insight into the extent that low-income households reallocate food resources to other members or whether children experience net increases in consumption in response to food and nutrition programs that target disadvantaged populations.

The findings we present here are of significant policy interest because changes in dietary patterns have developmental and health benefits that are also well-documented in the literature. We find the changes in children's dietary patterns attributable to the means-tested component of the NSLP to be in accordance with the objective of ensuring adequate nourishment of children. In a recent large and expensive study, Gordon et al. (2007a) provide comparisons of the average rates of consumption for various categories of food and beverages consumed by NSLP participants and nonparticipants during lunchtime at school. We show that certain differences in children's dietary patterns persist at the weekly level for those

children whose meal purchase is subsidized above and beyond the standard full price for NSLP school lunch participants; and that these differences are not completely offset by a reallocation of resources within households in response to the in-kind commodity transfer. In contrast, we find that increased milk consumption at lunchtime during school is more than equally offset by intrahousehold substitution in as short a time period as one week.

Our findings of increased weekly rates of consumption for fruit and 100% fruit juice corroborate those of Gordon et al. (2007a) and, taken together, suggest the NSLP program is increasing the overall net rate of consumption of vitamins A and C as well as calcium and iron for low-income children receiving means-tested subsidies. To the extent that these are essential ingredients for maintaining immunological functions and preventing impaired growth and that children from low-income households experience undernourishment with greater frequency, we conclude the means-tested component of the NSLP is imparting positive long-run effects on beneficiaries' health and development in certain respects. However, we caution against drawing stronger conclusions on the overall effect of the program on children's nourishment because the dietary survey data analyzed here are somewhat limited in scope, and do not allow us to link children's caloric intake with the reported outcomes. More research investigating the tradeoff between nutrient and caloric intake in the design of NSLP funded meals is imperative.

In conclusion, the effects we find are generally larger for fully subsidized children relative to partially subsidized children. We interpret this evidence as consistent with the hypothesis that the nominal price of school meals is a binding constraint for certain children on the margin of eligibility for the subsidy program. Additional research into the extent to which the nominal cost of school meals is a barrier to access for low-income children would likely prove informative for policymakers considering the future direction and overall effectiveness of the NSLP and other entitlement programs concerned with preventing undernourishment among children.

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Table 1 Descriptive statistics for children enrolled in 5th grade in public elementary schools from the ECLS-K by beneficiary status for the full and limited sample

	Full sample				Limited sample			
	NSLP beneficiaries		Non-beneficiaries		NSLP beneficiaries		Non-beneficiaries	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Servings per week								
Fruit	8.64	8.99	7.15	7.52	8.67	8.97	7.12	7.44
Green salad	2.30	4.46	2.18	3.72	2.36	4.57	2.18	3.66
Carrots	3.03	5.87	2.78	5.01	3.06	5.86	2.77	4.98
Potatoes	2.11	4.03	1.67	2.82	2.04	3.96	1.65	2.79
Other vegetables	5.34	6.98	5.01	6.01	5.28	6.97	5.06	6.05
Milk (all types)	9.63	9.14	11.34	9.45	9.49	8.99	11.21	9.37
100% fruit juice	5.91	7.81	4.94	6.59	5.95	7.82	4.96	6.54
Sweetened beverages	6.70	8.15	5.89	7.16	6.60	8.02	5.82	7.07
Explanatory variables								
Fully subsidized (%)	0.73		0		0.73		0	
Weight (lb)	103.00	31.63	96.60	27.56	102.80	31.80	96.04	27.18
Height (in)	57.69	3.04	57.74	2.94	57.64	3.06	57.69	2.94
Physical exercise >20 minutes (d/week)	3.63	2.04	3.81	1.78	3.60	2.04	3.77	1.79
Television watching (min/d)	160.70	82.47	139.20	66.09	159.40	82.14	138.50	66.33
Age (months)	134.80	4.64	134.80	4.35	134.60	4.62	134.70	4.34
Male (%)	0.48		0.50		0.48		0.50	
Disability (%)	0.17		0.15		0.17		0.14	
Number of siblings (n)	1.86	1.29	1.35	0.93	1.86	1.31	1.35	0.93
Household size (n)	4.86	1.61	4.37	1.12	4.87	1.64	4.38	1.14
Parent schooling (yrs)	12.59	2.86	15.19	2.36	12.58	2.91	15.28	2.37
Annual household income (\$)	26654	17744	81824	47331	26999	18115	83098	47821
Supermarkets per capita in home zip code (n)					0.0004	0.0075	0.0002	0.0001
Full-service restaurants per capita in home zip code (n)					0.0018	0.0526	0.0008	0.0005
Limited-service restaurants per capita in home zip code (n)					0.0029	0.1020	0.0007	0.0004
Ratio of full- to limited-service restaurants (n)					1.06	1.03	1.22	1.02
Instrumental variables								
Federal revenue to school district for CNA programs (\$/student)	216.40	101.10	125.00	80.21	208.30	89.79	125.30	81.02
State revenue to school district for CNA programs (\$/student)	11.69	23.76	8.90	18.51	12.37	25.23	9.27	19.51
Local revenue to school district from school meal sales (\$/student)	101.80	62.03	148.20	66.58	101.60	59.90	146.20	65.13
Observations	2350		4180		1970		3570	

Notes: Sample means and standard deviations reported. Fruit does not include fruit juice. Potatoes do not include "French fries", fried potatoes, potato chips, or tater tots. Other vegetables do not include green salad, potatoes, or carrots. Fruit juice includes only non-sweetened, 100% fruit juices. Sweetened beverages include soda pop, sports drinks, or fruit drinks that are not 100% fruit juice.

Sources: Early Childhood Longitudinal Study-Kindergarten (ECLS-K) observed in spring 2004. Revenue and student data are from the National Center for Education Statistics Common Core of Data, School District Finance Survey for fiscal year 2003. Zip code characteristics are constructed from U.S. Census Bureau data from the 2004 Zip Code Business Patterns Survey and the Census 2000 Summary File 1.

Table 2 OLS and GMM estimates for models of children's weekly consumption of fruit treating NSLP beneficiary status and body weights as endogenous ^a

Variable	Servings of fruit consumed in previous week							
	Model 1		Model 2		Model 3		Model 4	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
NSLP beneficiary	1.55** (0.30)	8.87** (2.72)			1.64** (0.33)	11.06** (3.13)		
Fully subsidized			1.77** (0.34)	10.13** (3.89)			1.81** (0.38)	12.19** (4.12)
Partially subsidized			1.21** (0.40)	6.10 (6.43)			1.40** (0.43)	9.05 (5.57)
Ln(weight)	-0.30 (0.52)	-27.44* (15.54)	-0.31 (0.52)	-33.58 (20.85)	-0.25 (0.56)	-22.43* (12.95)	-0.26 (0.56)	-25.67* (15.20)
Ln(height)	8.03** (2.74)	103.93* (55.05)	8.07** (2.74)	125.84* (74.05)	7.91** (2.92)	85.50* (45.55)	7.96** (2.92)	97.10* (53.68)
Physical exercise	0.09* (0.06)	-0.11 (0.14)	0.10* (0.06)	-0.15 (0.17)	0.12** (0.06)	-0.07 (0.13)	0.12** (0.06)	-0.09 (0.15)
Television watching	-0.01** (0.00)	0.00 (0.00)	-0.01** (0.00)	0.00 (0.01)	-0.00** (0.00)	0.00 (0.00)	-0.00** (0.00)	0.00 (0.00)
Age	-0.04 (0.02)	-0.08* (0.04)	-0.04 (0.02)	-0.09* (0.05)	-0.03 (0.03)	-0.08* (0.04)	-0.03 (0.03)	-0.08* (0.05)
Male	-0.24 (0.20)	0.43 (0.47)	-0.23 (0.20)	0.62 (0.65)	-0.39* (0.22)	0.15 (0.44)	-0.38* (0.22)	0.27 (0.52)
Disability	-0.22 (0.29)	-0.17 (0.37)	-0.23 (0.29)	-0.21 (0.40)	-0.32 (0.31)	-0.33 (0.38)	-0.33 (0.31)	-0.37 (0.40)
Number of siblings	0.03 (0.18)	-0.77* (0.45)	0.02 (0.18)	-0.91 (0.56)	0.11 (0.19)	-0.67 (0.42)	0.10 (0.19)	-0.75 (0.47)
Household size	0.21 (0.15)	0.32 (0.24)	0.21 (0.15)	0.41 (0.31)	0.18 (0.15)	0.20 (0.22)	0.18 (0.15)	0.25 (0.26)
Ln(parent years of schooling)	0.01 (0.48)	-0.21 (0.80)	0.05 (0.48)	-0.35 (0.90)	-0.02 (0.51)	0.32 (0.76)	0.00 (0.51)	0.31 (0.78)
Ln(annual household income)	0.01 (0.17)	1.87** (0.69)	0.06 (0.18)	1.98** (0.77)	0.12 (0.19)	2.75** (0.86)	0.16 (0.19)	2.90** (0.96)
Supermarkets per capita					158.47 (784.91)	-1,855.40* (1,121.15)	106.18 (785.09)	-2,095.13* (1,265.58)
Full-service restaurants per capita					-103.83 (339.43)	425.80 (448.11)	-91.80 (339.64)	454.17 (463.96)
Limited-service restaurants per capita					46.33 (176.78)	-79.53 (217.91)	43.95 (176.72)	-76.65 (222.97)
Ratio of full- to limited-service restaurants					-0.03 (0.13)	-0.09 (0.15)	-0.03 (0.13)	-0.07 (0.17)
Observations	6530	6530	6530	6530	5540	5540	5540	5540

Notes: Slope coefficients and robust standard errors are reported. Data on children enrolled in 5th grade in public schools from the ECLS-K (spring 2004) were used in the estimation.

^a Includes fruit such as apples, bananas, oranges, berries, or other types of fruit, and does not include fruit juice.

** Significant at 5-percent level; * Significant at 10-percent level.

Table 3 OLS and GMM estimates for models of children's weekly consumption of green salad treating NSLP beneficiary status and body weights as endogenous ^a

Variable	Servings of green salad consumed in previous week							
	Model 1		Model 2		Model 3		Model 4	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
NSLP beneficiary	0.22 (0.15)	3.74** (1.55)			0.15 (0.16)	3.46** (1.70)		
Fully subsidized			0.27 (0.16)	4.79** (2.29)			0.20 (0.18)	4.33* (2.26)
Partially subsidized			0.14 (0.20)	1.30 (3.91)			0.07 (0.21)	1.91 (3.07)
Ln(weight)	0.61** (0.28)	-20.05** (8.81)	0.61** (0.28)	-25.10** (12.32)	0.58* (0.31)	-15.40** (6.93)	0.58* (0.31)	-17.92** (8.36)
Ln(height)	-0.22 (1.50)	72.92** (31.23)	-0.21 (1.50)	90.86** (43.68)	0.12 (1.64)	56.30** (24.37)	0.13 (1.64)	65.21** (29.48)
Physical exercise	0.02 (0.03)	-0.15* (0.08)	0.02 (0.03)	-0.17* (0.10)	0.04 (0.03)	-0.10 (0.07)	0.04 (0.03)	-0.12 (0.08)
Television watching	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.01 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)
Age	-0.00 (0.01)	-0.04 (0.03)	-0.00 (0.01)	-0.05 (0.03)	0.00 (0.01)	-0.03 (0.02)	0.00 (0.01)	-0.03 (0.03)
Male	-0.58** (0.10)	-0.06 (0.27)	-0.58** (0.10)	0.10 (0.38)	-0.63** (0.11)	-0.21 (0.24)	-0.63** (0.11)	-0.12 (0.29)
Disability	-0.09 (0.14)	-0.04 (0.21)	-0.10 (0.14)	-0.08 (0.24)	-0.03 (0.16)	0.02 (0.21)	-0.03 (0.16)	-0.01 (0.23)
Number of siblings	0.08 (0.08)	-0.45* (0.26)	0.08 (0.08)	-0.57* (0.33)	0.09 (0.09)	-0.35 (0.23)	0.09 (0.09)	-0.41 (0.26)
Household size	-0.05 (0.07)	0.11 (0.13)	-0.05 (0.07)	0.18 (0.18)	-0.03 (0.07)	0.09 (0.11)	-0.03 (0.07)	0.13 (0.14)
Ln(parent years of schooling)	0.15 (0.24)	-0.38 (0.46)	0.16 (0.24)	-0.49 (0.54)	0.26 (0.26)	-0.08 (0.40)	0.26 (0.26)	-0.08 (0.43)
Ln(annual household income)	0.08 (0.09)	0.81** (0.39)	0.09 (0.09)	0.89* (0.46)	0.00 (0.10)	0.76 (0.47)	0.01 (0.10)	0.88* (0.53)
Supermarkets per capita					762.54* (420.69)	370.85 (648.98)	745.58* (419.55)	235.48 (713.67)
Full-service restaurants per capita					-100.72 (173.47)	-17.67 (246.98)	-96.82 (173.55)	-12.43 (259.76)
Limited-service restaurants per capita					-4.35 (91.55)	-18.60 (120.76)	-5.12 (91.52)	-11.42 (126.65)
Ratio of full- to limited-service restaurants					0.03 (0.07)	0.00 (0.09)	0.03 (0.07)	0.02 (0.10)
Observations	6530	6530	6530	6530	5540	5540	5540	5540

Notes: Slope coefficients and robust standard errors are reported. Data on children enrolled in 5th grade in public schools from the ECLS-K (spring 2004) were used in the estimation.

^a Includes only green salad.

** Significant at 5-percent level; * Significant at 10-percent level.

Table 4 OLS and GMM estimates for models of children's weekly consumption of carrots treating NSLP beneficiary status and body weights as endogenous ^a

Variable	Servings of carrots consumed in previous week							
	Model 1		Model 2		Model 3		Model 4	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
NSLP beneficiary	0.66** (0.20)	2.14 (1.48)			0.57** (0.22)	2.27 (1.63)		
Fully subsidized			0.82** (0.23)	3.80 (2.43)			0.75** (0.26)	4.73* (2.50)
Partially subsidized			0.42 (0.26)	-0.81 (3.62)			0.30 (0.27)	-0.56 (2.76)
Ln(weight)	-0.29 (0.35)	-12.09 (7.91)	-0.29 (0.35)	-20.52 (12.77)	0.00 (0.38)	-5.41 (5.83)	-0.00 (0.38)	-13.52 (8.80)
Ln(height)	0.24 (1.81)	41.88 (28.06)	0.27 (1.81)	72.00 (45.42)	-0.32 (1.99)	18.55 (20.59)	-0.27 (1.99)	47.43 (31.18)
Physical exercise	0.05 (0.04)	-0.05 (0.07)	0.05 (0.04)	-0.10 (0.10)	0.06 (0.04)	0.02 (0.07)	0.07 (0.04)	-0.04 (0.08)
Television watching	-0.00** (0.00)	0.00 (0.00)	-0.00** (0.00)	0.00 (0.00)	-0.00** (0.00)	-0.00 (0.00)	-0.00** (0.00)	0.00 (0.00)
Age	-0.05** (0.02)	-0.07** (0.02)	-0.05** (0.02)	-0.09** (0.03)	-0.06** (0.02)	-0.07** (0.02)	-0.06** (0.02)	-0.09** (0.03)
Male	-0.03 (0.13)	0.26 (0.24)	-0.03 (0.13)	0.53 (0.40)	-0.01 (0.15)	0.13 (0.21)	-0.00 (0.15)	0.40 (0.31)
Disability	0.27 (0.21)	0.31 (0.23)	0.27 (0.21)	0.27 (0.26)	0.26 (0.23)	0.26 (0.23)	0.26 (0.23)	0.22 (0.26)
Number of siblings	-0.02 (0.11)	-0.31 (0.25)	-0.03 (0.11)	-0.51 (0.35)	-0.01 (0.12)	-0.19 (0.21)	-0.02 (0.12)	-0.40 (0.28)
Household size	0.06 (0.10)	0.17 (0.13)	0.06 (0.10)	0.28 (0.19)	0.10 (0.10)	0.13 (0.12)	0.10 (0.10)	0.22 (0.16)
Ln(parent years of schooling)	-0.06 (0.32)	-0.45 (0.45)	-0.03 (0.32)	-0.65 (0.55)	0.04 (0.35)	0.04 (0.42)	0.06 (0.35)	-0.05 (0.46)
Ln(annual household income)	0.31** (0.11)	0.55 (0.39)	0.35** (0.11)	0.72 (0.48)	0.21* (0.12)	0.66 (0.47)	0.25* (0.13)	1.05* (0.59)
Supermarkets per capita					148.80 (533.81)	-252.73 (628.19)	91.45 (534.01)	-590.83 (742.63)
Full-service restaurants per capita					146.42 (207.16)	217.24 (228.46)	159.61 (206.79)	287.39 (266.79)
Limited-service restaurants per capita					-87.25 (109.25)	-94.32 (114.44)	-89.86 (109.17)	-105.96 (129.89)
Ratio of full- to limited-service restaurants					-0.03 (0.07)	-0.04 (0.08)	-0.03 (0.07)	-0.01 (0.09)
Observations	6530	6530	6530	6530	5540	5540	5540	5540

Notes: Slope coefficients and robust standard errors are reported. Data on children enrolled in 5th grade in public schools from the ECLS-K (spring 2004) were used in the estimation.

^a Includes only carrots.

** Significant at 5-percent level; * Significant at 10-percent level.

Table 5 OLS and GMM estimates for models of children's weekly consumption of potatoes treating NSLP beneficiary status and body weights as endogenous ^a

Variable	Servings of potatoes consumed in previous week							
	Model 1		Model 2		Model 3		Model 4	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
NSLP beneficiary	0.19 (0.14)	0.25 (1.06)			0.14 (0.15)	0.05 (1.09)		
Fully subsidized			0.26 (0.16)	-1.15 (1.79)			0.22 (0.18)	-0.79 (1.51)
Partially subsidized			0.08 (0.17)	3.03 (2.91)			0.02 (0.17)	1.26 (1.86)
Ln(weight)	-0.17 (0.24)	11.73** (5.79)	-0.18 (0.24)	19.11** (9.70)	-0.03 (0.26)	6.32 (4.24)	-0.03 (0.26)	9.17 (5.59)
Ln(height)	0.85 (1.19)	-41.29** (20.50)	0.86 (1.19)	-67.58** (34.39)	0.22 (1.30)	-22.15 (14.91)	0.24 (1.31)	-32.27 (19.71)
Physical exercise	-0.02 (0.03)	0.08 (0.05)	-0.02 (0.03)	0.12 (0.08)	-0.02 (0.03)	0.04 (0.05)	-0.01 (0.03)	0.06 (0.06)
Television watching	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)
Age	-0.00 (0.01)	0.02 (0.02)	-0.00 (0.01)	0.03 (0.02)	-0.01 (0.01)	0.01 (0.01)	-0.00 (0.01)	0.01 (0.02)
Male	-0.00 (0.08)	-0.32* (0.18)	-0.00 (0.08)	-0.55* (0.30)	0.06 (0.09)	-0.12 (0.15)	0.06 (0.09)	-0.22 (0.19)
Disability	0.10 (0.13)	0.04 (0.15)	0.10 (0.13)	0.09 (0.19)	0.23 (0.14)	0.18 (0.15)	0.23 (0.14)	0.21 (0.16)
Number of siblings	-0.18** (0.09)	0.06 (0.18)	-0.18** (0.09)	0.23 (0.27)	-0.19** (0.09)	-0.06 (0.16)	-0.19** (0.09)	0.01 (0.19)
Household size	0.12* (0.07)	-0.03 (0.11)	0.12* (0.07)	-0.14 (0.16)	0.16** (0.08)	0.07 (0.10)	0.16** (0.08)	0.03 (0.11)
Ln(parent years of schooling)	-0.26 (0.23)	0.41 (0.36)	-0.25 (0.23)	0.59 (0.46)	-0.22 (0.25)	0.11 (0.32)	-0.21 (0.25)	0.14 (0.34)
Ln(annual household income)	-0.18** (0.08)	0.10 (0.28)	-0.16** (0.08)	-0.02 (0.37)	-0.18** (0.08)	-0.08 (0.31)	-0.17** (0.08)	-0.20 (0.36)
Supermarkets per capita					-106.90 (318.21)	-318.61 (397.99)	-133.16 (320.86)	-210.61 (452.45)
Full-service restaurants per capita					-85.41 (142.22)	-5.07 (158.92)	-79.38 (142.17)	-19.30 (173.56)
Limited-service restaurants per capita					52.20 (76.04)	26.27 (82.09)	51.01 (75.96)	25.77 (88.64)
Ratio of full- to limited-service restaurants					0.06 (0.06)	0.07 (0.07)	0.06 (0.06)	0.05 (0.07)
Observations	6530	6530	6530	6530	5540	5540	5540	5540

Notes: Slope coefficients and robust standard errors are reported. Data on children enrolled in 5th grade in public schools from the ECLS-K (spring 2004) were used in the estimation.

^a Does not include "French fries", fried potatoes, potato chips, or tater tots.

** Significant at 5-percent level; * Significant at 10-percent level.

Table 6 OLS and GMM estimates for models of children's weekly consumption of other vegetables treating NSLP beneficiary status and body weights as endogenous ^a

Variable	Servings of other vegetables consumed in previous week							
	Model 1		Model 2		Model 3		Model 4	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
NSLP beneficiary	0.55** (0.23)	1.73 (1.63)			0.41 (0.25)	2.37 (2.00)		
Fully subsidized			0.79** (0.26)	4.02* (2.42)			0.62** (0.29)	3.81 (2.71)
Partially subsidized			0.18 (0.30)	-2.40 (3.76)			0.10 (0.33)	0.43 (3.20)
Ln(weight)	-0.26 (0.40)	3.04 (8.73)	-0.26 (0.40)	-9.08 (12.93)	-0.11 (0.45)	0.58 (7.56)	-0.11 (0.45)	-4.25 (9.73)
Ln(height)	1.89 (2.19)	-9.96 (30.93)	1.94 (2.19)	33.31 (45.97)	2.08 (2.40)	-0.54 (26.61)	2.13 (2.40)	16.74 (34.47)
Physical exercise	0.06 (0.04)	0.09 (0.08)	0.06 (0.04)	0.02 (0.10)	0.06 (0.05)	0.07 (0.08)	0.07 (0.05)	0.04 (0.10)
Television watching	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
Age	-0.03* (0.02)	-0.02 (0.03)	-0.03* (0.02)	-0.04 (0.03)	-0.03 (0.02)	-0.02 (0.03)	-0.03 (0.02)	-0.03 (0.03)
Male	-0.41** (0.16)	-0.50* (0.27)	-0.40** (0.16)	-0.12 (0.40)	-0.45** (0.18)	-0.49* (0.26)	-0.45** (0.18)	-0.32 (0.33)
Disability	-0.17 (0.23)	-0.19 (0.23)	-0.18 (0.23)	-0.25 (0.24)	-0.06 (0.25)	-0.10 (0.25)	-0.07 (0.25)	-0.13 (0.26)
Number of siblings	-0.19 (0.14)	-0.15 (0.26)	-0.19 (0.14)	-0.44 (0.35)	-0.25 (0.15)	-0.30 (0.26)	-0.25 (0.15)	-0.43 (0.31)
Household size	0.25** (0.12)	0.15 (0.15)	0.25** (0.12)	0.32 (0.20)	0.32** (0.13)	0.25* (0.14)	0.32** (0.13)	0.32* (0.17)
Ln(parent years of schooling)	0.66* (0.37)	1.05** (0.50)	0.70* (0.37)	0.75 (0.56)	0.88** (0.37)	1.25** (0.48)	0.91** (0.36)	1.19** (0.49)
Ln(annual household income)	0.04 (0.14)	0.52 (0.43)	0.09 (0.14)	0.73 (0.48)	-0.04 (0.15)	0.62 (0.56)	0.01 (0.15)	0.83 (0.63)
Supermarkets per capita					-113.57 (640.94)	-792.78 (773.95)	-180.73 (639.69)	-1,017.98 (828.47)
Full-service restaurants per capita					51.41 (285.69)	248.38 (315.26)	66.85 (285.72)	275.30 (322.37)
Limited-service restaurants per capita					-18.40 (149.08)	-70.27 (155.22)	-21.45 (149.17)	-67.74 (157.10)
Ratio of full- to limited-service restaurants					0.07 (0.11)	0.06 (0.11)	0.07 (0.11)	0.08 (0.12)
Observations	6530	6530	6530	6530	5540	5540	5540	5540

Notes: Slope coefficients and robust standard errors are reported. Data on children enrolled in 5th grade in public schools from the ECLS-K (spring 2004) were used in the estimation.

^a Does not include green salad, potatoes, or carrots.

** Significant at 5-percent level; * Significant at 10-percent level.

Table 7 OLS and GMM estimates for models of children's weekly consumption of milk treating NSLP beneficiary status and body weights as endogenous ^a

Variable	Servings of milk consumed in previous week							
	Model 1		Model 2		Model 3		Model 4	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
NSLP beneficiary	-0.62*	-14.14**			-0.63*	-13.05**		
	(0.33)	(3.00)			(0.35)	(3.24)		
Fully subsidized			-0.54	-15.79**			-0.49	-12.66**
			(0.37)	(4.71)			(0.40)	(4.41)
Partially subsidized			-0.75*	-11.22*			-0.82*	-13.58**
			(0.42)	(6.66)			(0.45)	(5.22)
Ln(weight)	-1.98**	29.34*	-1.98**	37.78	-2.10**	14.99	-2.11**	13.74
	(0.57)	(16.81)	(0.57)	(25.27)	(0.61)	(13.10)	(0.61)	(16.18)
Ln(height)	13.95**	-96.67	13.96**	-126.71	14.22**	-45.29	14.25**	-40.84
	(3.04)	(59.48)	(3.04)	(89.64)	(3.26)	(46.03)	(3.26)	(57.05)
Physical exercise	0.02	0.24	0.02	0.29	0.01	0.15	0.01	0.14
	(0.06)	(0.16)	(0.06)	(0.20)	(0.07)	(0.14)	(0.07)	(0.15)
Television watching	-0.00**	-0.01**	-0.00**	-0.01*	-0.00**	-0.01*	-0.00**	-0.01
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Age	0.02	0.06	0.02	0.07	0.02	0.05	0.02	0.05
	(0.03)	(0.05)	(0.03)	(0.05)	(0.03)	(0.04)	(0.03)	(0.05)
Male	0.72**	-0.01	0.72**	-0.27	0.68**	0.30	0.68**	0.35
	(0.24)	(0.52)	(0.24)	(0.78)	(0.25)	(0.45)	(0.25)	(0.56)
Disability	0.29	0.29	0.29	0.33	0.17	0.26	0.16	0.25
	(0.34)	(0.43)	(0.34)	(0.48)	(0.36)	(0.42)	(0.36)	(0.43)
Number of siblings	0.37**	1.44**	0.37**	1.64**	0.36*	1.15**	0.36*	1.12**
	(0.18)	(0.49)	(0.18)	(0.67)	(0.19)	(0.43)	(0.19)	(0.50)
Household size	-0.39**	-0.34	-0.39**	-0.46	-0.36**	-0.23	-0.36**	-0.21
	(0.15)	(0.26)	(0.15)	(0.37)	(0.16)	(0.23)	(0.16)	(0.27)
Ln(parent years of schooling)	1.23**	0.60	1.24**	0.81	1.07**	-0.05	1.09**	-0.06
	(0.49)	(0.89)	(0.49)	(1.05)	(0.52)	(0.76)	(0.52)	(0.76)
Ln(annual household income)	0.50**	-3.36**	0.52**	-3.53**	0.44**	-3.28**	0.47**	-3.22**
	(0.19)	(0.78)	(0.19)	(0.90)	(0.20)	(0.90)	(0.21)	(1.01)
Supermarkets per capita					-1,366.10	1,847.69	-1,408.14	1,778.94
					(887.07)	(1,300.43)	(887.90)	(1,396.95)
Full-service restaurants per capita					-218.69	-1,091.36**	-209.03	-1,081.94**
					(395.70)	(477.49)	(396.12)	(480.22)
Limited-service restaurants per capita					218.89	433.79*	216.97	433.95*
					(206.57)	(233.66)	(206.68)	(232.33)
Ratio of full- to limited-service restaurants					0.52**	0.58**	0.52**	0.59**
					(0.16)	(0.18)	(0.16)	(0.19)
Observations	6530	6530	6530	6530	5540	5540	5540	5540

Notes: Slope coefficients and robust standard errors are reported. Data on children enrolled in 5th grade in public schools from the ECLS-K (spring 2004) were used in the estimation.

^a Includes all types of milk such as cow's milk, soy milk, or any other kind of milk, and whether it was in a carton, cup, glass, or with cereal. ** Significant at 5-percent level; * Significant at 10-percent level.

Table 8 OLS and GMM estimates for models of children's weekly consumption of 100% fruit juice treating NSLP beneficiary status and body weights as endogenous ^a

Variable	Servings of 100% fruit juice consumed in previous week							
	Model 1		Model 2		Model 3		Model 4	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
NSLP beneficiary	0.85** (0.27)	8.80** (2.26)			0.71** (0.29)	7.89** (2.53)		
Fully subsidized			1.10** (0.30)	12.25** (3.86)			0.92** (0.34)	10.45** (3.65)
Partially subsidized			0.47 (0.34)	1.34 (6.57)			0.41 (0.36)	3.82 (4.82)
Ln(weight)	-0.52 (0.45)	-22.93* (12.75)	-0.53 (0.45)	-40.50* (20.94)	-0.58 (0.48)	-16.77 (10.34)	-0.59 (0.48)	-24.69* (13.55)
Ln(height)	2.24 (2.32)	81.49* (45.16)	2.29 (2.32)	144.04* (74.31)	2.81 (2.45)	59.43 (36.42)	2.86 (2.45)	87.62* (47.85)
Physical exercise	-0.01 (0.05)	-0.17 (0.12)	-0.00 (0.05)	-0.27 (0.17)	0.01 (0.05)	-0.12 (0.11)	0.01 (0.05)	-0.18 (0.13)
Television watching	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.01 (0.01)	-0.00* (0.00)	0.00 (0.00)	-0.00* (0.00)	0.00 (0.00)
Age	-0.03 (0.02)	-0.06* (0.04)	-0.03 (0.02)	-0.08* (0.05)	-0.02 (0.02)	-0.05 (0.03)	-0.02 (0.02)	-0.06 (0.04)
Male	-0.05 (0.18)	0.48 (0.39)	-0.04 (0.18)	1.05 (0.66)	-0.03 (0.19)	0.36 (0.35)	-0.03 (0.19)	0.64 (0.47)
Disability	-0.18 (0.25)	-0.15 (0.32)	-0.19 (0.25)	-0.26 (0.42)	-0.22 (0.27)	-0.23 (0.32)	-0.23 (0.27)	-0.31 (0.36)
Number of siblings	-0.01 (0.16)	-0.72* (0.38)	-0.02 (0.17)	-1.13** (0.57)	-0.04 (0.18)	-0.62* (0.34)	-0.05 (0.18)	-0.83* (0.42)
Household size	0.09 (0.14)	0.12 (0.20)	0.09 (0.14)	0.37 (0.32)	0.16 (0.14)	0.17 (0.19)	0.16 (0.14)	0.29 (0.24)
Ln(parent years of schooling)	-0.17 (0.45)	-0.02 (0.71)	-0.13 (0.45)	-0.45 (0.95)	-0.10 (0.47)	0.21 (0.66)	-0.07 (0.47)	0.14 (0.73)
Ln(annual household income)	-0.10 (0.16)	2.09** (0.59)	-0.04 (0.16)	2.37** (0.77)	-0.15 (0.17)	1.87** (0.70)	-0.11 (0.17)	2.23** (0.84)
Supermarkets per capita					1,856.77** (709.49)	290.10 (933.30)	1,791.74** (710.69)	-197.95 (1,114.79)
Full-service restaurants per capita					-136.28 (281.00)	262.94 (350.28)	-121.33 (280.50)	344.06 (395.09)
Limited-service restaurants per capita					-67.12 (145.53)	-158.38 (170.13)	-70.08 (145.25)	-164.66 (186.55)
Ratio of full- to limited-service restaurants					-0.02 (0.12)	-0.07 (0.14)	-0.02 (0.12)	-0.02 (0.15)
Observations	6530	6530	6530	6530	5540	5540	5540	5540

Notes: Slope coefficients and robust standard errors are reported. Data on children enrolled in 5th grade in public schools from the ECLS-K (spring 2004) were used in the estimation.

^a Includes only non-sweetened, 100% fruit juices such as orange juice, apple juice, or grape juice.

** Significant at 5-percent level; * Significant at 10-percent level.

Table 9 OLS and GMM estimates for models of children's weekly consumption of sweetened beverages treating NSLP beneficiary status and body weights as endogenous ^a

Variable	Servings of sweetened beverages consumed in previous week							
	Model 1		Model 2		Model 3		Model 4	
	OLS	GMM	OLS	GMM	OLS	GMM	OLS	GMM
NSLP beneficiary	0.39 (0.28)	0.54 (2.56)			0.37 (0.30)	0.56 (2.84)		
Fully subsidized			0.35 (0.32)	-2.23 (4.50)			0.19 (0.34)	-1.81 (4.36)
Partially subsidized			0.44 (0.36)	5.38 (6.86)			0.64 (0.40)	3.48 (5.09)
Ln(weight)	-0.49 (0.49)	35.45** (14.04)	-0.49 (0.49)	49.98** (24.24)	-0.30 (0.53)	29.21** (11.18)	-0.29 (0.53)	37.28** (16.18)
Ln(height)	1.67 (2.64)	-125.65** (49.74)	1.67 (2.65)	-177.25** (85.96)	0.62 (2.85)	-103.39** (39.37)	0.57 (2.85)	-131.96** (57.07)
Physical exercise	0.18** (0.05)	0.49** (0.13)	0.18** (0.05)	0.57** (0.19)	0.18** (0.06)	0.45** (0.12)	0.18** (0.06)	0.51** (0.15)
Television watching	0.01** (0.00)	-0.00 (0.00)	0.01** (0.00)	-0.01 (0.01)	0.01** (0.00)	-0.00 (0.00)	0.01** (0.00)	-0.00 (0.01)
Age	0.08** (0.02)	0.16** (0.04)	0.08** (0.02)	0.18** (0.05)	0.08** (0.02)	0.15** (0.04)	0.08** (0.02)	0.16** (0.05)
Male	0.67** (0.19)	-0.28 (0.44)	0.67** (0.19)	-0.73 (0.75)	0.61** (0.20)	-0.22 (0.39)	0.60** (0.20)	-0.49 (0.55)
Disability	0.69** (0.29)	0.55 (0.38)	0.69** (0.29)	0.61 (0.46)	0.67** (0.31)	0.49 (0.38)	0.68** (0.31)	0.54 (0.43)
Number of siblings	-0.09 (0.16)	0.63 (0.42)	-0.09 (0.16)	0.96 (0.65)	-0.00 (0.16)	0.57 (0.37)	0.00 (0.16)	0.78 (0.50)
Household size	-0.21 (0.13)	-0.69** (0.22)	-0.21 (0.13)	-0.88** (0.36)	-0.28** (0.13)	-0.67** (0.20)	-0.28** (0.13)	-0.78** (0.27)
Ln(parent years of schooling)	-1.51** (0.42)	0.51 (0.78)	-1.51** (0.42)	0.87 (1.05)	-1.26** (0.45)	0.39 (0.71)	-1.29** (0.45)	0.47 (0.80)
Ln(annual household income)	-0.14 (0.16)	0.71 (0.68)	-0.15 (0.16)	0.44 (0.89)	-0.10 (0.17)	0.58 (0.80)	-0.13 (0.17)	0.22 (1.00)
Supermarkets per capita					-70.78 (733.10)	-1,362.74 (1,122.35)	-13.47 (734.58)	-1,016.79 (1,332.68)
Full-service restaurants per capita					-327.89 (284.18)	122.92 (408.19)	-341.07 (283.84)	69.46 (462.64)
Limited-service restaurants per capita					175.27 (144.20)	37.42 (195.92)	177.88 (144.13)	39.82 (220.08)
Ratio of full- to limited-service restaurants					-0.03 (0.12)	-0.01 (0.14)	-0.04 (0.12)	-0.04 (0.16)
Observations	6530	6530	6530	6530	5540	5540	5540	5540

Notes: Slope coefficients and robust standard errors are reported. Data on children enrolled in 5th grade in public schools from the ECLS-K (spring 2004) were used in the estimation.

^a Includes soda pop, sports drinks, or fruit drinks that are not 100% fruit juice.

** Significant at 5-percent level; * Significant at 10-percent level.

Appendix Table A-1 Instrumental variables diagnostic tests for each model

F statistics	Model 1	Model 2	Model 3	Model 4
NSLP beneficiary	109.79** [<0.0001]		61.91** [<0.0001]	
Fully subsidized		92.33** [<0.0001]		48.08** [<0.0001]
Partially subsidized		7.93** [<0.0001]		9.15** [<0.0001]
Ln(weight)	10.31** [<0.0001]	10.31** [<0.0001]	11.30** [<0.0001]	11.30** [<0.0001]
χ^2 statistics				
Fruit	0.27 [0.60]		0.21 [0.65]	
Green salad	0.69 [0.41]		0.47 [0.49]	
Carrots	1.23 [0.27]		2.58 [0.11]	
Potatoes	2.29 [0.13]		0.93 [0.33]	
Other vegetables	1.93 [0.16]		0.67 [0.41]	
Milk (all types)	0.27 [0.60]		0.02 [0.90]	
100% fruit juice	2.85* [0.09]		1.39 [0.24]	
Sweetened beverages	1.05 [0.30]		0.76 [0.38]	
Observations	6530	6530	5540	5540

Notes: P-values are reported in brackets. F statistics test the null hypothesis that the instrumental variables are jointly insignificant in each first stage regression. Chi-square statistics are Hansen J test of overidentifying restrictions for each weekly consumption outcome.

** Significant at 5-percent level; * Significant at 10-percent level.