3. The Data

3.1. The NHANES III

We rely on the National Health and Nutrition Examination Survey (NHANES) III. The NHANES III is a nationally representative survey that was conducted between October 1988 and October 1994 and included 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 (e.g., age, gender, education), income (e.g., labor income and government program participation), and self-reported health (e.g., diseases and functional status). The survey also collects information on dietary intake and substantial health information not normally found in surveys such as data from a physical exam conducted by doctors (e.g. blood and urine tests). One of the primary contributions of this report is that we use measures of nutrition that are based on these exams, which provide more objective measurements of nutritional adequacy than self-reported data can.

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 present weighted results for all of the analyses in the body of the report, and present unweighted results for some of the key analyses in the appendix.

3.2. Measure of Nutrition

One of the substantial benefits of using the NHANES III is that it allows us to examine multiple nutritional outcomes, including some based on physical exams and clinical laboratory data. We briefly describe these measures here and provide additional details in the appendix.

Previous evaluations of SBP have examined whether offering school breakfast increases the probability of children eating breakfast. This is an important outcome because children who skip breakfast are thought to be less able to learn. We examine the impact of the SBP on the likelihood of eating breakfast by relying on a question that asks the frequency an individual eats breakfast in which the available responses are categorical (never, every day, some days, rarely, and weekends only). Similar questions are not available in the NHANES III for lunch consumption.

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 based on the respondent's account of the types of foods and amounts that were eaten. 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 first measure based on the dietary recall data is a summary measure of overall dietary quality called the Healthy Eating Index (HEI). The index has 10 components including grains, vegetables, fruits, meat, total fat, cholesterol and sodium. The latter categories such as total fat, cholesterol, and sodium are based on a recipe analysis of the reported food intake. 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. See Kennedy et al. (1995) for more details on the index.

We also rely on several nutritional measures that are based on a recipe analysis of the dietary recall data. These measures include total caloric intake, percent calories from fat, and percent calories from saturated fat. In addition, we construct indicator variables for whether an individual had low magnesium intake or low zinc intake.

Finally, we rely on several measures that are drawn from physician examination data, which include blood and urine tests. These measures include serum levels of vitamin A, vitamin C, vitamin E, folate, and cholesterol. For each measure, we create variables that indicate whether a respondent has deficient serum levels (excessive in the case of cholesterol). We use cut-off values for abnormal serum levels that are based upon standard medical textbook definitions. Additionally, we construct an indicator variable for anemia based on standard laboratory tests (based on hematocrit and hemoglobin levels); anemia is a condition that is often caused by insufficient iron intake and by chronic disease.

There are significant benefits to using these blood measures. Blood tests can provide solid, objective evidence of an inadequate diet when properly interpreted. These measures are not susceptible to recall bias as is the dietary recall data. However, the relationship between micro-nutrient intake and blood levels of these nutrients is complicated because the body can store some vitamins and minerals for extended periods of time. The appendix provides additional details on the various measures.

3.3. Sample Descriptive Statistics

For our primary analysis sample, we select individuals from the NHANES who are 5 to 16 years old, who are currently attending school or on vacation from school, whose parents responded to a question regarding whether school lunch and school breakfast were available, who answered the dietary questionnaire, and who participated in the physical exam. Based on these criteria, we obtain a sample of 4,841 children.[15]

Table 2 provides the basic tabulations for the children by school nutrition program eligibility, determined by the income-to-poverty ratio (IPR). A fairly large share of children comes from families who do not provide income information. We place the children without income information in a separate group.

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[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 provide a physical exam, 230 additional children for whom dietary recall information was not available, and 128 additional children for whom the requisite school questions (whether school was in session and whether meal programs were available) were not answered.

We do not have complete data for all 4,841 children in this remaining sample. The question regarding breakfast consumption is not asked about children over 11 years old. Vitamin C levels are not provided for children under 6 years old. Some additional laboratory test data are simply missing. For all of the analysis reported below, we use all available data. So that the potential for missing data problems can be assessed, we provide sample sizes for all regression results.

The descriptive statistics exhibit many well-known patterns. For example, the proportion of the population who are non-Hispanic white increases with income, while the proportion of the population who are non-Hispanic black and Hispanic decreases with income. In addition, a SBP is more likely to be available to children from poorer families: 67.3 percent of children from families with income below 130 percent of the poverty line report having a SBP available, 59.0 percent of children in from the middle income category, and 40.6 percent of children from the higher income category. Thus, the targeting of the SBP appears to be at least somewhat successful.

The dietary recall outcomes generally do not exhibit a simple, monotonic relationship by family income, although the children from higher income families tend to have better outcomes. For example, higher income children have a healthier diet, as measured by the HEI score, the percent of calories from fat and from saturated fat. The exam outcomes also generally suggest that the higher income children are better off. For example, their rates of vitamin A deficiency, anemia and hypercholesterolemia (that is, high cholesterol) are lower than corresponding rates for poorer children.

There are some children in the NHANES III sample who do not have a recorded family income (see the last column of Table 2). The results suggest children from such families are fairly poor. The distribution of race and the proportion of these families who receive Food Stamps are more like the corresponding quantities for poor children, though these children are actually less likely to have a SBP available at their school.