RESEARCH
Original Research: Brief

Eating School Meals Daily Is Associated with Healthier Dietary Intakes: The Healthy Communities Study

Lauren E. Au, PhD, RD; Klara Gurzo, MA; Wendi Gosliner, DrPH, RD; Karen L. Webb, PhD; Patricia B. Crawford, DrPH, RD; Lorrene D. Ritchie, PhD, RD

ARTICLE INFORMATION

Article history:
Submitted 4 August 2017
Accepted 11 January 2018

Keywords:
School breakfast
School lunch
Dietary intake
Fruits and vegetables
Dairy

Supplementary materials:
Tables 1 and 2 are available at www.jandonline.org

https://doi.org/10.1016/j.jand.2018.01.010

ABSTRACT

Background Research on the association between school meal consumption and overall dietary intake post-Healthy Hunger-Free Kids Act implementation is limited.

Objective This study examines the association between frequency of participating in the National School Lunch and School Breakfast Programs and children's dietary intakes.

Design The Healthy Communities Study was a cross-sectional observational study conducted between 2013 and 2015.

Participants and setting US children aged 4 to 15 years (n=5,106) were included.

Main outcome measures Dietary measures were assessed using the National Health and Nutrition Examination Survey Dietary Screener Questionnaire. Dietary intake included fruit and vegetables, fiber, whole grains, dairy, calcium, total added sugar, sugar-sweetened beverages, and energy-dense foods of minimal nutritional value.

Statistical analysis Multivariate statistical models assessed associations between frequency of eating school breakfast or lunch (every day vs not every day) and dietary intake, adjusting for child- and community-level covariates.

Results Children who ate school breakfast every day compared with children who ate 0 to 4 days/wk, reported consuming more fruits and vegetables (0.1 cup/day, 95% CI: 0.01, 0.1), dietary fiber (0.4 g/day, 95% CI: 0.2, 0.7), whole grains (0.1 oz/day, 95% CI: 0.05, 0.1), dairy (0.1 cup/day, 95% CI: 0.05, 0.1), and calcium (34.5 mg/day, 95% CI: 19.1, 49.9). Children who ate school lunch every day, compared with those who ate less frequently, consumed more dairy (0.1 cup/day, 95% CI: 0.1, 0.2) and calcium (32.4 mg/day, 95% CI: 18.1, 46.6). No significant associations were observed between school meal consumption and energy-dense nutrient-poor foods or added sugars.

Conclusions Eating school breakfast and school lunch every day by US schoolchildren was associated with modestly healthier dietary intakes. These findings suggest potential nutritional benefits of regularly consuming school meals.

J Acad Nutr Diet. 2018;■:■-■.

THE US NATIONAL SCHOOL LUNCH PROGRAM (NSLP) and the School Breakfast Program (SBP) provide the opportunity for students to receive nutritious meals every school day. In 2016, the NSLP served more than 30 million children per day and the SBP served over 14 million children.[1-3] Although meals are available to all students, most (85% of school breakfasts[4] and 73% of school lunches in 2016) are served to low-income students for free or a reduced price.[3] Because of this broad reach, the new standards have the potential to greatly and consistently affect the nutritional health of many children, especially those from low-income households.[5] School meals can contribute over half of a child's daily caloric intake with 22% of calories coming from school breakfast and close to 31% of calories coming from school lunch.[6] In 2010, the Healthy Hunger-Free Kids Act (HHFKA)[7] made strong nutritional improvements to school meals by aligning them with the 2010 Dietary Guidelines for Americans.[8] Although the revised standards were implemented gradually beginning during the 2012-2013 school year, most changes were instituted by 2013 when data collection for this study began. These updated school meal guidelines included minimum and maximum calorie allowances, increased fruit and vegetable and whole grain servings, and the elimination of full-fat milk.[7]

Despite improvements to school meals over the past decade, research on the consumption of school meals and dietary intake has been limited since the HHKFA was instituted. In studies conducted before the HHFKA improvements, eating school meals has been found to have mixed results. Some studies found school meal consumption to be associated with higher diet quality,[9] higher nutrient density,[10,11] and higher consumption of whole grains[12] and fruits and vegetables.[13] Other studies found that NSLP participants vs nonparticipants were less likely to consume energy-dense

foods of low nutritional value, such as soda,[14] and consumed less added sugars.[15] However, other studies found no clear direction between school meal participation and dietary intake, with NSLP participants having similar diet quality to nonparticipants.[16,17] The few studies that have been conducted after HHFKA have shown promising results. For example, in a study comparing pre- and post-HHFKA standards, vegetable and fruit consumption increased.[18] In another study comparing food consumption and waste in schools from 2012 to 2014, students consumed more fruit, threw away less vegetables, and consumed the same amount of milk.[19]

To our knowledge, no studies have assessed the nutritional benefits associated with daily school meal consumption in a diverse national sample of US schoolchildren after the implementation of the HHFKA. A diverse national sample is critical to examine this question because children from low-income or minority families are more likely to be overweight and receive free or reduced-price school meals than children from higher-income non-Hispanic white families who are less likely to eat school meals.[20,21] The hypothesis of this study is that students who consume school meals (lunch or breakfast) every day will have a much more nutritious diet, regardless of their eligibility status for free or reduced-price school meals. The objective of this study is to examine the dietary intakes of students who consumed school breakfast or school lunch every day compared with those who ate the school meals less frequently or not at all.

RESEARCH SNAPSHOT

Research Question: Is the frequency of participating in the National School Lunch Program and School Breakfast Program associated with children's dietary intake?

Key Findings: In this cross-sectional observational study that included 5,106 US schoolchildren aged 4 to 15 years old from the Healthy Communities Study, children who ate school breakfast every day consumed more fruits and vegetables, dietary fiber, whole grains, dairy, and calcium compared with children who did not eat school breakfast every day, and children who ate school lunch every day consumed more dairy and calcium compared with children who did not each school lunch every day.

METHODS

Data on student-level participation in NSLP and SBP and dietary intakes were collected between 2013 and 2015 from a national cross-sectional sample of participants in the Healthy Communities Study (HCS). A full description of the research protocol for the HCS is described in John and colleagues.[22] The Battelle Memorial Institute Institutional Review Board approved the study protocol. Written informed consent for participating students was obtained from parents and guardians.

Sample and Setting

The HCS included a total of 5,138 students aged 4 to 15 years old from 423 elementary and middle schools in 130 communities (defined as high school catchment areas) across the United States. A hybrid sampling approach was used to select communities. Most communities were selected from a national probability-based sample that was stratified by region of the United States and community urbanicity, race or ethnicity, and income (n=102 communities).[23] These communities were sampled using weights proportional to the number of children aged 4 to 15 years in each census tract and randomly selected with weights proportional to size. Other communities were chosen because they were known to be actively engaged in implementing programs and policies to address childhood obesity (n=28 communities).[23] Two elementary and two middle schools were randomly selected for recruiting households within each community. Between 1 and 44 students were sampled from each school, with an average of 12 students per school. Children who met the study's recruitment goals related to sex, age, and race or ethnicity were selected from participating households.[22] During an in-home visit, trained research staff administered survey questions. The respondent (either parent or child) was determined by the child's age.[24] A more detailed description of the sampling approach for communities, schools, and households can be found in Strauss and colleagues.[23]

Measures

Independent Variables: School Meal Participation. SBP and NSLP participation was assessed during an in-home interview. The following school meal participation questions were from the third Student Nutrition Dietary Assessment Study[25]: "How many days a week (does your child/do you) usually eat the school breakfast?" and "How many days a week (does your child/do you) usually eat the school lunch?" From these questions, two binary variables were created for eating school breakfast or lunch 0 to 4 days vs every day (5 days). In addition to examining a binary school meal participation variable, categorical differences also were examined (0 days, 1 to 4 days, and 5 days for school breakfast and school lunch). Results were similar when predictor variables were expressed as binary or using the three categories (Table 1 and Table 2, available at www.jandonline.org). For ease of interpretation, results are focused on the binary comparisons.

Dependent Variables: Dietary Intakes. The National Health and Nutrition Examination Survey (NHANES) Dietary Screener Questionnaire created by the National Cancer Institute was used to estimate dietary intakes for the past 30 days.[26] This 26-item food frequency questionnaire was included in the NHANES 2009-2010.[24] All of the 26 items in the screener were selected because of their relationship to one or more dietary factors of interest in dietary guidance.[26] Of the nine dietary factors available from this screener, the following seven were selected to be consistent with the main study's focus on obesity: fruits or vegetables or legumes without fried potatoes (cups per day), dairy (cups per day), total added sugar (teaspoons per day), sugar from sugar-sweetened beverages (teaspoons per day), whole grains (ounces per day), dietary fiber (grams per day), and calcium (milligrams per day).[24] National Cancer Institute-generated scoring algorithms, based on age- and sex-specific 24-hour dietary recall intake data from NHANES, were used to calculate intakes. In addition, the frequency of intake