Younger Elementary School Students Waste More School Lunch Foods than Older Elementary School Students

Shahrbanou F. Niaki, MS; Carolyn E. Moore, PhD, RDN, LD; Tzu-An Chen, PhD; Karen Weber Cullen, DrPH, RD

ARTICLE INFORMATION

Article history:
Submitted 4 January 2016
Accepted 3 August 2016
Available online 16 September 2016

Keywords:
National School Lunch Program
Plate waste
Elementary schools
Grade levels

http://dx.doi.org/10.1016/j.jand.2016.08.005

ABSTRACT

Background Children may not receive nutritional benefits from school lunch meals if they do not eat the foods served.

Objective This study investigated whether there were differences in school lunch foods consumed and wasted by grade level of elementary school students.

Design In this cross-sectional study, anonymous meal observations were conducted after students selected their reimbursable school lunch meals in the cafeteria lunch line. The amounts of foods selected and consumed were recorded using the quarter waste method and food waste was calculated using the information recorded.

Participants/setting During the spring of 2013, eight elementary schools (50% low income) enrolling children in kindergarten through grade 5 in one school district in the Houston, TX, area were selected by the Child Nutrition Director.

Main outcome measures The amount of calories and foods consumed and the percentage wasted were assessed.

Statistical analyses performed Analysis of covariance and post hoc analysis were used to examine food consumption and plate waste by grade level (kindergarten and grade 1 [K-Gr1], grades 2 and 3 [Gr2-3], and grades 4 and 5 [Gr4-5]), controlling for student sex and school-level free/reduced priced meal eligibility.

Results There were 568 nonrandom lunch meal observations of students included in the analyses. Approximately 48% of the observations were from boys; 50% were from low-income schools, and were evenly divided by grade. In general, students in K-Gr1 consumed fewer calories than both Gr2-3 and Gr4-5, and Gr2-3 students consumed significantly fewer calories than Gr4-5. K-Gr1 students also consumed less and wasted more total and red-orange vegetables, total/whole/refined grains, and total protein foods than the older students. Gr2-3 students wasted more calories and total grains than Gr4-5 students. K-Gr1 students wasted more fruit than Gr2-3 students.

Conclusions Overall, younger students in elementary schools (K-Gr-1) consumed less of the foods they selected for their lunch meals, and wasted more than older elementary school students. Future studies should investigate why younger children wasted more food and potential strategies to reduce food waste by younger students.
J Acad Nutr Diet. 2017;117:95-101.

ESTABLISHED IN 1946, THE NATIONAL SCHOOL LUNCH Program (NSLP) is one of the largest federal nutrition assistance programs in the United States. About 7.1 million children participated in the NSLP by the end of its first year, compared to about 31 million students who participated each day in 2012.[1] Over time, the NSLP has revised its nutrition standards to ensure students receive meals that are aligned with the Dietary Guidelines for Americans.[2] The US Department of Agriculture made changes to the NSLP and School Breakfast program after the Healthy, Hunger-Free Kids Act of 2010 was passed. The new nutrition standards and meal patterns were implemented during the 2012-2013 school year.[3] The changes included weekly minimum and maximum calorie levels for each school grade-level group (elementary, middle, high school), zero *trans* fat, a weekly 10% average for saturated fat, and reduced sodium levels to be implemented over 10 years.[3] Fruit and vegetables were separated into two groups, with two servings (up to $^1/_2$ cup each) of vegetables and one serving ($^1/_2$ cup) fruit per meal, plus weekly specifications for the vegetable subgroups.[3] Fifty percent of the grains were to be whole-grain-rich foods, with increases to 100% by 2014.[3] To reduce waste, the "offer vs serve" option was maintained, giving students the option to choose at least three of the five food items (fruits, vegetables, meat/meat alternative, dairy and grain) offered in the lunch meal. However, the students had to select one fruit or a vegetable serving for the meal to count as reimbursable.[4]

When healthy foods are not consumed, children may not receive the optimal nutritional benefits available from school

lunches.[5] Because about 70% of the meals were provided to students at a free or reduced price (FRP) in 2012,[6] food waste can especially impact students from low-income families who depend on school meals for up to half of their daily energy intake.[5] Food waste also represents a loss of the energy and other resources used to produce the food.[7,8] The disposal of wasted food also costs money, uses limited resources (eg, landfill), and can impact the environment (emissions).[7,8]

Food waste in the NSLP is a concern of the US Department of Agriculture. An early study assessed NSLP plate waste in two Alabama elementary schools in 1986, 62% of the students were African American.[9] Data collectors observed 371 lunch trays and estimated consumption and waste. Overall plate waste was 12.9%. However, students in kindergarten and grade 1 consumed only 75% to 80% of foods selected, while grade 4, 5, and 6 students consumed 90% to 95%.[9] Overall waste of 12% of energy was also reported from 24-hour dietary recalls from 1,744 students in grades 1 to 12 participating in the 1992 School Nutrition Dietary Assessment Study 1.[10] Waste was higher for younger (6 to 10 years old) children (14%), as well as 11- to 14-year-old (17%) and 15- to 18-year-old (11%) females compared with 11- to 14-year-old (8%) and 15- to 18-year-old (5%) males.[10]

Food waste from 5,420 trays of students (58% to 82% Hispanic) in grades 2 to 6 was weighed in a study published in 2010.[11] Compared with grade 5 students, grade 2 students consumed less grain (1.78 vs 1.51 servings), fruit (0.45 vs 0.32 servings), dairy (0.54 vs 0.40 servings), and meat (1.58 vs 1.49 servings).[11]

Two studies directly assessed grade-level differences in waste. Mixed results were reported from a Louisiana study in one school with African-American students in grades 3 to 6 conducted in 1993.[12] In general, grade 5 students wasted significantly more fruit, bread, and pasta/rice than students in the other grades, and more entrées than grade 6 students. However, grade 6 students wasted significantly more potatoes and starch than the other grades, and more vegetables than grade 3 students.

A Colorado study, conducted in the fall of 2010, documented plate waste by grade level for students in three elementary schools using digital photography and visual estimation.[13] For grade 5 children, food waste ranged from 12.6% for entrées to 38.7% for grains. In contrast, food waste for grade 1 children was significantly higher, ranging from 35% for entrées to 54.7% for grains.[13]

Only a few studies have investigated waste after the new meal patterns were implemented in 2012, and differences by grade level were not provided. A 2013 study measured food waste from 304 lunch trays of prekindergarten (n=73) and kindergarten (n=231) students in one school in the southwest region of the United States for 1 week.[14] Researchers photographed meals as selected on the students' trays, and then aggregated waste into bins (entrée, fruit, vegetables, milk) at the end of the lunch period. Over the week, 51.4% of the vegetables, 51% of the entrées, 45.5% of milk and 33% of the fruit were wasted.[14] A study conducted in the fall of 2012 measured plate waste of 864 Massachusetts students in grades 3 to 8 in four schools who provided active consent. Approximately 12.1% of the entrées, 46.1% of milk, 58.9% of vegetables, and 44.8% of fruit were wasted.[15] During a 2-year period, the food waste of Connecticut middle school students in 12 schools was assessed using digital photography of the lunch trays selected, followed by weighing of the foods remaining at the end of the lunch period.[16] Between 2013 (n=465) and 2014 (n=373), waste declined from 39.3% to 25.7% for fruit, from 72.1% to 36.4% for vegetables, from 32.1% to 16.4% for entrées, and from 46.4 to 43.3% for milk.[16] A Wisconsin study used photographs to assess plate waste of 7,117 lunch trays from students in grades 3 to 5 between 2010 and 2013. Combined fruit and vegetable waste for children in the third, fourth, and fifth grades was 27%, 28%, and 26%, respectively.[17]

School cafeteria managers have also been queried on student plate waste. A national random sample of 1,887 public school cafeteria managers completed a survey on plate waste during the 1995-1996 school year.[18] The managers reported that food waste was highest in the elementary schools and lowest in the high schools. Approximately 78% believed that student attention on recess or free time and socializing rather than eating were reasons for waste.

Given that the goal of the new school nutrition standards and meal patterns is to improve child nutrition, understanding how much food is wasted by students in different grade levels after the new meal patterns were implemented in 2012 is a topic of significant interest. Whether there are differences in NSLP food waste by grade level could inform school foodservice practices. This study investigated whether the amount of NSLP lunch food consumed and wasted differed by grade level for elementary school students in kindergarten through grade 5.

METHODS

Observations of reimbursable school lunch meals were conducted in eight elementary schools in one school district in the greater Houston, TX, area during the spring of 2013. All schools enrolled students in kindergarten through grade 5. The director of the child nutrition department selected the schools based on the percent of children eligible for FRP meals. Four low-income and four middle-income elementary schools were selected, in which 51% to 76% and 8% to 28% of the students, respectively, were eligible for FRP meals. The mean number of students in the schools was 731 (range 600 to 900). Race and ethnicity data for the schools as reported by the school district were 7% African American, 37% Hispanic, 46% white, and 10% other. The mean NSLP participation rate for these eight schools was 62.5%.

The study was approved by the Institutional Review Board of Baylor College of Medicine. It was exempted from obtaining individual parental consent because observations were conducted anonymously. The district superintendent and the principals of each school agreed to participate in the study.

Procedure

The district had a 2-week menu cycle that was followed in all the elementary schools, and offer vs serve was utilized. The daily menus included two entrées, two fruit servings, two vegetable servings, 1% white milk, and nonfat chocolate and strawberry milk. The entrées, fruit, and vegetable servings were preportioned for self-service, were the same for all grades, and met the new menu pattern serving sizes. There were no salad bars.