Amount of Time to Eat Lunch Is Associated with Children's Selection and Consumption of School Meal Entrée, Fruits, Vegetables, and Milk

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ABSTRACT

Background There are currently no national standards for school lunch period length and little is known about the association between the amount of time students have to eat and school food selection and consumption.

Objective Our aim was to examine plate-waste measurements from students in the control arm of the Modifying Eating and Lifestyles at School study (2011 to 2012 school year) to determine the association between amount of time to eat and school meal selection and consumption.

Design We used a prospective study design using up to six repeated measures among students during the school year.

Participants/setting One thousand and one students in grades 3 to 8 attending six participating elementary and middle schools in an urban, low-income school district where lunch period lengths varied from 20 to 30 minutes were included.

Main outcome measures School food selection and consumption were collected using plate-waste methodology.

Statistical analyses performed Logistic regression and mixed-model analysis of variance was used to examine food selection and consumption.

Results Compared with meal-component selection when students had at least 25 minutes to eat, students were significantly less likely to select a fruit (44% vs 57%; $P<0.0001$) when they had <20 minutes to eat. There were no significant differences in entrée, milk, or vegetable selections. Among those who selected a meal component, students with <20 minutes to eat consumed 13% less of their entrée ($P<0.0001$), 10% less of their milk ($P<0.0001$), and 12% less of their vegetable ($P<0.0001$) compared with students who had at least 25 minutes to eat.

Conclusions During the school year, a substantial number of students had insufficient time to eat, which was associated with significantly decreased entrée, milk, and vegetable consumption compared with students who had more time to eat. School policies that encourage lunches with at least 25 minutes of seated time might reduce food waste and improve dietary intake.
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THE NATIONAL SCHOOL LUNCH PROGRAM IN THE United States provides free or inexpensive meals to >30 million students every day.[1] Many children from low-income families rely on school meals for nearly half of their daily energy intake.[2] Therefore, policies that improve the school food environment can have important public health implications in addressing the growing socioeconomic disparities in the prevalence of obesity and in improving the overall nutrient quality of children's diets.[3]

Recently, the Healthy Hunger-Free Kids Act of 2010 enhanced the nutritional quality of school meals and set nutrition standards for competitive food sold in schools, which has resulted in improvements in student's school food selection and consumption.[4,5] However, current national standards do not address lunch period length, which can result in many students having insufficient time to eat their meals. Students frequently have lunch periods that are 20 minutes or less, which can be an insufficient amount of time to eat.[6,7] A previous study conducted by Bergman and colleagues[8] examined lunch-period length and found that students with 30-minute lunch periods consumed more foods and nutrients than those with 20-minute lunch periods. Their study examined aggregate food consumption, but did not differentiate between the types of foods consumed by students (eg, entrées, fruits, vegetables, or milk). A similar study found that longer lunch periods were associated with increased odds of consuming a fruit or vegetable, but the amounts consumed were not assessed.[9]

In addition, lunch-period length might not reflect the amount of time that students actually have to eat because

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students typically spend a considerable amount of time waiting in line to receive school-prepared lunches.[10,11] In a survey of school cafeteria managers, 44% of respondents reported that students did not have enough time to eat, which they believed resulted in increased plate waste.[12] Similarly, surveys of students have found that a high percentage felt rushed at lunch and report insufficient time to eat their meal.[13] Consuming food too quickly is associated with adverse gastrointestinal hormone responses to the meal and with decreased perceived satiety post consumption, which can increase the risk of overweight.[14-16] Therefore, it is important to examine whether students have sufficient time to eat their meals and the association between time to eat with school food selection and consumption, which is currently unknown.

To address this gap in knowledge, the amount of time students had to eat school food was examined for associations with selection and consumption. This study was conducted during the course of the 2011 to 2012 school year among elementary and middle school students attending control schools participating in the Modifying Eating and Lifestyles at School (MEALS) study with varying lunch period lengths in a large, urban school district.

METHODS
Study Design and Participants
Data for the study were collected on 6 nonconsecutive days throughout the 2011 to 2012 school year as part of the MEALS study, a large, school-based randomized controlled trial. The MEALS study was a collaboration between the nonprofit organization Project Bread (www.ProjectBread.org) and the Harvard T. H. Chan School of Public Health to improve the selection and consumption of healthier school foods using a chef-based model and/or choice architecture (ie, environmental modifications to "nudge" consumers toward healthier options).[17] The present study focuses on the six control schools with set lunch-period times (ie, schools without rolling lunch periods), and were elementary, middle, and kindergarten through grade 8 schools located in a low-income, urban school district in Massachusetts. Among the participating schools, three schools had a 30-minute lunch period, two schools had a 25-minute lunch period, and one school had a 20-minute lunch period. The majority of the students attending these schools were eligible for free or reduced-price meals (range=88% to 94%) and all schools were implementing the Offer Versus Serve provision, which allows students to select only three of the five meal components offered (ie, fruit, vegetable, milk, grain, and meat/meat alternative) and these meal components were available to students throughout all of the lunch periods. Competitive foods (ie, snacks sold in vending machines or à la carte) were not available in these schools and recess occurred after lunch in the elementary schools. Only traditional lunch periods were measured (ie, special feeding programs, such as At-Risk Afterschool Meals programs, were not included).

Students participated in the study if they received a school lunch on a study day (schools participating in the study had closed campuses). The study sample included students in grades 3 through 8 who were recruited using active consent methods that included parental consent, student assent, and a survey that asked parents for demographic information (eg, child sex, grade, and race/ethnicity). Of the eligible population, 30.1% provided active consent. Previous analyses have indicated that there were no significant differences in food selection or consumption between students who actively consented and those who did not.[5,17]

Data Collection Measures
Lunch period times and lengths were reported by the schools and verified by research assistants (RAs) on data-collection days. Consumption was determined using established plate-waste study methods collected on randomly selected, nonconsecutive days in the fall (n=2 days), winter (n=2 days), and spring (n=2 days) of the 2011 to 2012 school year (n=6 days total).[18,19] The study days were randomly selected for plate-waste measurements without prior knowledge of what was being served.

On each study day, RAs arrived before the beginning of the first lunch period to provide each tray with a unique identifying number and to remove trash cans from the cafeteria. RAs weighed 10 random samples of each food offered on a food scale (Oxo 1130800), which provided a stable pre-consumption estimate of the foods served that day. Students then entered the cafeteria when the lunch period began and selected their school meals. As students left the lunch lines, RAs stood discreetly by the exits and recorded the tray number, the food components, and the time using synchronized watches. An announcement was also made at the beginning of lunch periods reminding students about the study and that participation was voluntary. Students who had provided active consents were asked to include their names on their trays. After the meal ended, RAs collected all of the trays and weighed each remaining meal component individually. The amount of time that students had to eat was calculated as the interval between the time they exited the lunch line and the end of the lunch period (students were not allowed to leave the cafeteria until the end of the lunch period). This study was approved by the Committee on Human Subjects at the Harvard T. H. Chan School of Public Health and all participants provided written informed consent and child assent.

Statistical Analyses
Data from the 1,001 students with active consent at the participating schools were included in the analyses (30.1% of all eligible students in the participating schools). Differences in the student and school characteristics across the schools were examined using the Mantel-Haenszel χ^2 test for categorical characteristics and analysis of variance for continuous characteristics. Logistic regression with multilevel modeling was used to examine differences in school meal component selection, accounting for the repeated measures of students nested within schools (SAS PROC GLIMMIX, version 9.4, 2013, SAS Institute). To examine consumption among students who selected a meal component, mixed-model analysis of variance was used, accounting for the repeated measures of students and school as a random effect (students nested within schools), using SAS PROC MIXED (version 9.4, 2013). All analyses adjusted for students' sex, grade, race/ethnicity, and time of the lunch period (morning [start time of 11 AM to before 12 PM], midday [start time of 12:00 PM to before 12:30 PM], or afternoon [start time of 12:30 PM to 1 PM]).