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Impact of the New U.S. Department of Agriculture School Meal Standards on Food Selection, Consumption, and Waste

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Abstract

Background—The U.S Department of Agriculture (USDA) recently made substantial changes to the school meal standards. The media and public outcry have suggested that this has led to substantially more food waste.

Purpose—School meal selection, consumption, and waste were assessed before and after implementation of the new school meal standards.

Methods—Plate waste data was collected in 4 schools in an urban, low-income school district. Logistic regression and mixed-model ANOVA were used to estimate the differences in selection and consumption of school meals before (fall 2011) and after implementation (fall 2012) of the new standards among 1030 elementary and middle school children. Analyses were conducted in 2013.

Results—After the new standards were implemented, fruit selection increased by 23.0%, and entrée and vegetable selection remained unchanged. Additionally, post-implementation entrée consumption increased by 15.6%, vegetable consumption increased by 16.2%, and fruit consumption remained the same. Milk selection and consumption decreased owing to an unrelated milk policy change.

Conclusions—While food waste levels were substantial both pre- and post-implementation, the new guidelines have positively impacted school meal selection and consumption. Despite the increased vegetable portion size requirement, consumption increased and led to significantly more cups of vegetables consumed. Significantly more students selected a fruit, while the overall percentage of fruit consumed remained the same, resulting in more students consuming fruits.

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Contrary to media reports, these results suggest that the new school meal standards have improved students' overall diet quality. Legislation to weaken the standards is not warranted.

Background

In the U.S., schools provide government-subsidized meals to roughly 32 million students daily.[1] Until recently, the nutrition standards for the National School Lunch Program and School Breakfast Program were based on outdated 1995 Dietary Guidelines for Americans.[2] In general, meals were high in sodium, saturated fats, and low in whole grains and fiber.[3] In response to these issues and the First Lady's Let's Move! campaign to promote child health, Congress passed the Healthy, Hunger-Free Kids Act of 2010, which required the U.S. Department of Agriculture (USDA) to update the national school meal standards to reflect the most recent (2010) Dietary Guidelines for Americans.[4]

The new USDA *Nutrition Standards in the National School Lunch and Breakfast Program* took effect at the beginning of the 2012–2013 school year.[5] These standards increased the availability of whole grains, fruits, and vegetables, increased the portion sizes of fruits and vegetables offered, and required the selection of a fruit or vegetable. Additionally, grade-specific limits were placed on the total calories and sodium contents of the meals, and trans fats were removed.

Food service directors, teachers, parents, and students criticized the regulations for causing an increase in food waste owing to both larger portion sizes and the requirement that a student must select a fruit or vegetable.[6] To our knowledge, these beliefs were based on unquantified observations and anecdotal reports and not a formal test of consumption in a paired set of children during this time period. Some levels of food waste can be expected in a school cafeteria setting, for reasons including food preferences and ranges in caloric needs.[7] It has yet to be documented whether the new standards result in increased food waste when compared to the substantial food waste, particularly in fruits and vegetables, previously observed in cafeterias before the new school meal standards.[7] This study was conducted in a large prospectively collected sample of school-age children to determine whether the new standards impacted students' selection and consumption of school foods, using plate waste data collected pre- and post-implementation.

Methods

Project Modifying Eating and Lifestyles at School (MEALS) was a school-based study developed by the nonprofit organization Project Bread (www.ProjectBread.org) and the Harvard School of Public Health. In 2011, Project Bread hired a professional chef to work with several schools in a low-income, urban school district in Massachusetts to enhance the palatability and nutrient profile of the school meals. Additionally, some schools received a behavioral psychology intervention to influence the selection and consumption of the healthier foods offered. Eight elementary/K–8 schools within the district were assigned to intervention (n=4) or control status (n=4). The present study focuses on the four control schools.

All students in grades 3–8 were recruited to participate with active consent, and *n*=1030 students at the four control schools provided parental/student consent and completed a survey with demographic information (46% of the eligible population). The information collected included the child's gender, date of birth (to calculate age at baseline), and race/ethnicity. All students in grades 1–8 also had the option to participate with passive consent, and 99.8% of the remaining eligible population agreed to participate using this method, with no identifying information collected about the student (0.2% of parents requested that their child not participate). No eligible students declined to participate on a study day. At year two, *n*=864 students with active consent (84%) remained in participating schools and attended lunch on a study day, and passive consent was collected for new students. Students with active or passive consent participated in the study if they attended lunch on a study day (participating schools had closed campuses, so students could not leave to purchase other foods during the school day), and were excluded if they did not receive a school lunch. Roughly 85% of the students in the school came from low-income families and were eligible for free or reduced-price meals. Among students who provided active consent, the mean (SD) age was 10.7 years (1.8) and 54.4% were girls. The majority of students (83.0%) were Hispanic, 4.6% were white, 2.9% were Asian, and 1.8% were black. There were no substantial differences in demographics between the students with active consent and the general population at the participating schools.

Intervention

At the beginning of the 2012–2013 school year, the new school meal standards went into effect in schools participating in the National School Breakfast and National School Lunch Programs (Table 1). This resulted in a natural experiment in the middle of data collection for the Project MEALS study.

While there were some similarities between the old and new school meal standards, there were many important updates as well. Schools must continue to offer five components to students at lunch: a grain, meat/meat alternative, fruit, vegetable, and milk (the grain and meat/meat alternative are often provided together as a combination entrée), and students are required to select three of the components. However, the new standards require that one of the three components selected is a fruit or vegetable. Additionally, the serving sizes for fruits and vegetables are larger, and a greater variety of vegetables must be served, including weekly offerings of legumes, dark green vegetables, and red/orange vegetables. While the previous standards did not specify the type of grain offered, the new standards require that half of the grains offered be whole grains (beginning with the 2014–2015 school year, all grains must be whole grain). Whole and 2% milk can no longer be offered; only fat-free or low-fat (1%) milk can be available to students. Additionally, the regulations finally address sodium by setting maximum levels, with the target level decreasing through the 2022–2023 school year. While both the previous and new guidelines have calorie minimums for the overall meal, the new standards have also placed a maximum level on the calories offered, which varies by grade. The requirements for protein levels and specific micronutrients have been removed from the new standards. The limit on saturated fats (<10% of total calories) remains unchanged, but unlike the previous standards that did not address trans fats, the new standards require zero grams of artificial trans fats in the school meals with products with

less than 0.5 grams per serving count as zero. Unrelated to the new standards, the school district participating in Project MEALS made the decision to remove sugar-sweetened (i.e., flavored) milk from all of its schools during the 2012–2013 school year although sugar-sweetened milk is still allowed under the new standards if it is fat-free.

Plate Waste Measures

Consumption was measured using established plate waste study methods[8–10] on two days per school in the fall of 2011 (pre-implementation for the new school meal standards) and two days per school in the fall of 2012 (post-implementation). Plate waste study days were randomly selected without prior knowledge of what was being served. All lunch periods and consented students were included on each study day.

Before the first lunch period began, all trays were given unique identifying numbers and trash cans were removed from the cafeteria. Ten random samples of each food offered were weighed on a food scale (OXO 1130800, NY New York) to provide a stable estimate of the pre-consumption weights of the foods, and where applicable, serving containers were weighed. Cafeteria staff members were also trained in portion control methods to minimize the variability in the servings. When each lunch period began, students entered the cafeteria and selected their foods. When they exited the cafeteria line with their selected foods, research assistants discreetly standing by the exits recorded their tray number and the food components on the trays. At the beginning of each lunch period, students were reminded about the study and that participation was voluntary. Students who had provided active consent were also asked to include their names on their trays. No personal identifying information was collected for students with passive consent. At the end of the each meal, the trays were collected and each meal component was weighed separately. The Committee on Human Subjects at the Harvard School of Public Health approved the conduct of the study.

Analyses for Children with Active Consent

The primary analyses were conducted using data from the n=1030 students with active consent who provided demographic information. Within-child differences in pre- versus post-implementation for food selection and consumption were examined between years one and two. All students (n=1030) were included in the analyses, and 864 students with both pre- and post-implementation data were used to calculate the point estimates and the additional 166 students who were lost to follow-up contributed to the variance calculations in the analyses.

To analyze differences in selection of each food component, logistic regression was used, applying a marginal model approach (generalized estimating equations) with the SAS program PROC GENMOD (version 9.1, 2003, SAS Institute, Cary NC). This method was used to account for the correlations associated with repeated measures of students nested within schools. The analyses were also adjusted for gender, age at baseline, and race/ethnicity.

To calculate differences in meal consumption among students who selected a meal component, mixed-model ANOVA, with school and student as a random effect (students

nested within schools) were conducted using the SAS program PROC MIXED. The models were also adjusted for gender, age, and race/ethnicity.

Analyses for Children with Passive Consent

Selection and consumption was also examined among the students with active and passive consent (99.8% of the entire population) using logistic regression and mixed-model ANOVA adjusted for lunch period and accounting for clustering of observations within schools. Because no identification was collected for students with passive consent, students could not be tracked over time; therefore, each student observation within a school over the four study days was treated as independent (i.e., no repeated measures were included in this analysis). Analyses were conducted in 2013.

Results

At baseline, the participating schools met the previous USDA school meal standards and at follow-up were compliant with the new requirements for all food groups and nutrient standards, with the exception of one vegetable offering (the portion size offered on the study day was only 0.5 cup). Table 2 shows the percentage of students that selected each meal component pre- and post-implementation of the new standards. There were no changes in entrée selection, with all students selecting this meal component; a list of the foods offered is presented in Appendix A. There were also no significant differences in vegetable selection. However, compared to pre-implementation, the percentage of students selecting a fruit after the new standards took effect increased significantly by 23.0% (52.7% vs 75.7%, respectively, $p<.0001$). Milk selection decreased from 79.8% during the first year to 55.1% during the second year after the districts' milk policy changed (−24.7%, $p<.0001$).

The consumption levels of each meal component both before and after implementation of the new standards are shown in Table 3. The percentage of entrée consumed increased from 72.3% pre-implementation to 87.9% post-implementation (15.6%, $p<.0001$). Compared to pre-implementation, among the children who selected a vegetable, consumption increased both as the percentage consumed (24.9% vs 41.1%, respectively, $p<.0001$) and as cups per day consumed (0.13 cups/day vs 0.31 cups/day, respectively, $p<.0001$). There were no significant differences in the percentage or quantity of fruit consumed. Because of the significant increase in students selecting fruits without a corresponding increase in fruit waste, this resulted in a substantial increase in the number of students consuming fruits. Before the district's new milk policy took effect, students consumed roughly 64.0% of their milk, compared with 53.9% after the policy's implementation (−10.1%; $p<.0001$).

Students who agreed to participate through active consent may have differed from those who did not consent; therefore, global differences in consumption and waste in the entire lunchroom before and after implementation were calculated. In these analyses, among students selecting a meal component (milk, vegetables, and fruit), the percentage consumed was not substantially different than that among the active consent group (Table 4). The percentage of the total entrée consumption was lower among the whole group than among

those who provided active consent, although the absolute improvement in entrée consumption was similar between the two groups.

Discussion

The impact of the new USDA *Nutrition Standards in the National School Lunch and Breakfast Program* on school meal selection and consumption was examined. Contrary to public concerns, the new school meal standards did not lead to increases in meal waste for entrées, fruits, or vegetables in this urban, low-income population. Entrée and vegetable selection remained unchanged, and their overall consumption increased significantly. The increase in portion size for vegetables also resulted in more cups of vegetables consumed. No potato products were served on the plate waste study days after the USDA standards were implemented, thus students were consuming other vegetable subgroups. As a result of the new regulation requiring that a fruit or vegetable must be selected, significantly more students selected a fruit. This regulation did not lead to increases in fruit waste; there was no change in the percentage of fruit consumed among students who selected this meal component, and therefore the new standards resulted in more students consuming fruits. No differences in the amount of cups of fruits consumed were observed, largely because the cafeterias served primarily whole fruits (e.g., fresh apples, oranges, and bananas), which already met the new standards and therefore the amount of fruit offered to students was minimally changed.

After implementation of the district's policy to remove sugar-sweetened milk from the cafeteria during the second year of the study, both milk selection and consumption decreased. However, the plate waste study occurred immediately following the policy change while students were still acclimating to the modification in milk availability. A previous study examining the long-term impact of a similar policy change found that students acclimated over time and had little difference in white milk consumption compared with control students with access to sugar-sweetened milk.[11]

While the new school meal standards did not result in increased food waste, the consistently high levels of fruit and vegetable waste are concerning. Students discarded roughly 60%–75% of the vegetables and 40% of the fruits on their trays. These levels of waste are similar to those previously found in other urban, low-income schools in Massachusetts with a different ethnic mix.[7] This suggests that the high levels of fruit and vegetable waste have been a continuous problem that warrants serious attention. While the new standards make important changes by requiring reimbursable school meals to have increased quantities of fruits and vegetables and more vegetable variety, this may not be sufficient. Schools must also focus on the quality and palatability of the fruits and vegetables offered and on creative methods to engage students to taste and participate in selection of menu items to decrease overall waste levels.[12,13]

Many low-income students rely on school meals for up to half of their daily energy intake.[14] Therefore, school meals can have important implications for student health. Increased consumption of healthier foods during the school day may result in the displacement of energy-dense, nutrient-poor foods that many students are exposed to after leaving school

grounds.[15,16] Food service directors and staff should receive additional assistance as they implement these important changes for school meals, including increased access to healthy commodity food options, financial support, culinary training opportunities, and creative programs to engage students to enhance the meals served. Additionally, strong competitive food standards are needed to support food service directors' efforts to create a healthy school environment.

Recently, politicians have pressured the USDA to make certain school meal standards more lenient.[17] This has resulted in the USDA lifting the limits on meat/meat alternatives and grains. However, lawmakers continue to express concerns about the waste levels of school meals.[17] This study suggests that further weakening of the new school meals standards should not be considered, as this could potentially lead to decreased fruit and vegetable selection and consumption.

Limitations

Only elementary and middle school children in an urban, low-income district were examined. Additional studies should examine the impact of the new standards on food selection and consumption in higher-income school districts, in high schools, and/or in other regions of the U.S. Also, little is known about the waste levels of meals consumed at school but packed at home. Additionally, it is unknown how changes in consumption at lunch may alter dietary habits throughout the rest of the day. While consumption was evaluated on only two days at each school for the pre- and post-assessments, there was no reason to suspect that consumption on study days was different from that on other days. Students also had to be their own controls in this study because the school meal standards went into effect throughout the nation, and thus no control group was possible. While it is possible that some of the changes in consumption observed were due to increased calorie requirements as the students aged, data collection occurred over the span of only one year, thus the difference in caloric needs were likely small and had a minimal impact on the study results.[18] Additionally, the ability to have students as their own controls led to an increase in power and limited the student-to-student variability, increasing the precision of the analyses. The large sample size further strengthened this study. While it is possible that there was some selection bias among students who agreed to participate using active consent and remained in the study for both years, the consumption of students with active consent was also compared to students with passive consent, with similar results observed.

Conclusions

To our knowledge, this is the first study to examine the implications of the new school meal standards on student meal selection and consumption. Overall, the new requirements have led to improvements in student diets and have not resulted in increased food waste. These results, together with previously reported levels of food waste in schools, suggest that additional efforts must be taken to reduce fruit and vegetable waste. Lawmakers should not consider further weakening the school meal standards. The new school meal standards are the strongest implemented by the USDA to date, and the improved dietary intakes will likely have important health implications for children.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Comparison of previous versus current school lunch standards[a]

Food group	Previous requirements K–12	Current requirements k–12
Fruit and vegetables	0.5–0.75 cup of fruit and vegetables *combined* per day	0.75–1 cup of vegetables *plus* 0.5–1 cup of fruit per day[b]
Vegetables	No specifications as to type of vegetable subgroup	Weekly requirement for (1) dark green; (2) red/orange; (3) beans/peas (legumes); (4) starchy; (5) other (as defined in 2010 Dietary Guidelines)
Whole grains	No requirement	At least half of the grains must be whole grain rich as of July 1, 2012. Beginning July 1, 2014, all grains must be whole grain rich.
Milk	1 cup; variety of fat contents allowed; flavor not restricted	1 cup; must be fat free (unflavored/flavored) or 1% low fat (unflavored)[c]
Nutrient standards		
Calories	Minimum only (based on grade)	Minimum and maximum (based on grade)
Sodium	No requirement	Limits (based on grade), with the target levels decreasing through the 2022–2023 school year
Saturated fats	<10% of total calories	<10% of total calories
Trans fats	No requirement	0 grams per serving[d]

[a] Adapted from "Comparison of Previous and Current Regulatory Requirements under Final Rule "*Nutrition Standards in the National School Lunch and School Breakfast Programs.*"

[b] While students must be *offered* 0.75–1 cup of vegetables *and* 0.5–1 cup of fruits per day (versus previous requirements that allowed students to be offered a combined total of 0.5–0.75 cup fruit and vegetables), students are allowed to *select* only 0.5 cup of fruits or vegetables (previous requirements allowed students to select only 0.125 cup of fruits or vegetables).

[c] This is a U.S. Department of Agriculture (USDA) requirement. The participating district's decision to remove all flavored milk (including fat-free options) exceeded the USDA requirements.

[d] Products with less than 0.5 grams per serving count as 0.

Table 2

Meal component selection before and after implementation of the new USDA standards for school meals

Meal component	Mean % pre[a]	Mean % post[a]	Difference (post–pre)	*p*-value[b]
Entrée	100%	100%	0	N/A
Milk	79.8%	55.1%	**−24.7**	<.0001
Vegetable	68.5%	68.6%	−1.1	0.21
Fruits	52.7%	75.7%	**23.0**	<.0001

Note: Boldface indicates significance.

[a]Results are unadjusted.

[b]Calculated using logistic regression, accounting for correlated data, with students nested within school and adjusted for gender, age, race/ethnicity, and lunch period time.

USDA = U.S. Department of Agriculture

Table 3

Meal consumption before and after implementation of the new USDA standards for school meals (n=1030)[a]

Meal component	Mean pre[b]	Mean post[b]	Difference (post–pre)	p-value
Entrée (% consumed)	72.3	87.9	**15.6**	<.0001
Milk (% consumed)	64.0	53.9	**−10.1**	<.0001
Vegetable (% consumed)	24.9	41.1	**16.2**	<.0001
Vegetable (cups)	0.13	0.31	**0.18**	<.0001
Fruits (% consumed)	58.1	55.2	−2.9	0.10
Fruits (cups)	0.42	0.42	0.00	0.87

Note: Boldface indicates significance.

[a]Point estimates were calculated using the n=864 students with both pre- and post-implementation data and all students (n=1030) were used to calculate the variance. Results are calculated based on students who selected the meal component, using mixed-model ANOVA, with school and student as a random effect (student nested within schools). Estimates are adjusted for gender, age, race/ethnicity, and lunch period time.

[b]Calculated using Least-Mean-Square regression

USDA = U.S. Department of Agriculture

Table 4

Meal consumption before and after implementation of the new USDA standards for school meals for all students (*N*=5936)[a]

Meal component	Mean pre[b]	Mean post[b]	Difference (post–pre)	*p*-value
Entrée (% consumed)	63.4	73.6	**10.2**	<.0001
Milk (% consumed)	62.4	50.1	**−12.3**	<.0001
Vegetable (% consumed)	25.8	40.3	**14.5**	<.0001
Vegetable (cups)	0.13	0.30	**0.17**	<.0001
Fruits (% consumed)	59.1	56.9	−2.2	0.05
Fruits (cups)	0.44	0.45	0.01	0.29

Note: Boldface indicates significance.

[a] Includes all students with active and passive consent and information on the students' gender (provided through active consent or recorded by a research assistant for students with passive consent).

[b] Results are calculated based on students who selected the meal component, using mixed-model ANOVA, with school as a random effect. Estimates are adjusted for gender and lunch period time. Means calculated using Least-Mean-Square regression.

USDA = U.S. Department of Agriculture