Acceptance of a Mushroom-soy-beef Blended Burger among School-aged Children

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***Objective*: We tested children's acceptance and the satiety value of a mushroom-soy-beef blended burger versus an all-beef burger in the school cafeteria setting. *Methods*: Students in 3rd to 8th grade completed self-administered surveys to measure choice (blended vs all-beef burger), acceptance, and satiety during normal school lunch hours. *Results*: Ninety-two students (47.6%) and 101 (52.3%) students chose the blended and all-beef burger, respectively. Only 24 (24.7%) students who choose the blended burger and 23 (25.0%) students who choose the all-beef burger would not choose that burger again. Mean satiety score was similar for the 2 burger types (p = .243). *Conclusion*: Acceptance and satiety of a blended and an all-beef burger are comparable among children in the school cafeteria setting.**

***Key words*: child; school; food preferences; satiety**
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As part of the effort to combat childhood obesity in the United States (US), there have been notable changes in school lunches. In 2010, Congress passed legislation to improve child nutrition and decrease hunger across the US. The *Healthy, Hunger-Free Kids Act of 2010* (S.3307) helps ensure children have access to healthful food options in school by requiring the US Department of Agriculture (USDA) to establish nutrition standards for all foods sold in schools, beginning in 2012.[1,2] Requirements include increasing consumption of fruits, vegetables, and whole grains, while limiting saturated fat, trans-fat, cholesterol, added sugar and sodium. Portion sizes also are reduced for some age groups to align better with caloric needs.[3] School nutrition professionals are challenged to provide foods that meet these new standards, and that are also acceptable among students in both taste and satiety.

Incorporating mushrooms into school meals has the potential to be a viable option to help adhere to school meal regulations by lowering the fat and caloric composition of meals, in addition to exposing students to a greater diversity of foods. Mushrooms are a low energy density [ED, in kcal/g] food and a source of fiber, selenium, vitamin B12 and several

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other vitamins and minerals.[4] Consumption of high ED foods are associated with higher daily energy intake and risk for obesity among US children.[5] Mushrooms also have sensory qualities such as meat-like texture and umami taste that may contribute to the utility of a meat-mushroom blend. Thus, they can be incorporated into familiar meat-based recipes.[4,6]

We previously conducted a series of studies to explore the short, intermediate, and long-term effects of substituting white button mushrooms for beef in a test lunch on energy intake, palatability, appetite, and satiety (general fullness) in normal weight, overweight, and obese adults. Energy intake was significantly higher during meat lunches and total daily energy intake also was significantly greater on the meat days, while ratings of palatability, appetite, satiation, and satiety did not differ significantly.[7,8] These results suggested that the substitution of low ED mushroom foods for high ED foods, such as beef, can be an effective method for reducing total daily energy intake without sacrificing taste and satiety. Thus, mushroom-blend alternatives may have utility in settings, which require innovative ways to meet nutrition requirements.

In the school setting, blending higher ED ingredients with lower ED ingredients, such as meat-mushroom blended recipes, can offer children exposure to diverse ingredients and help achieve a diet lower in red and processed meat, as recommended by the Scientific Report of the 2015 Dietary Guidelines Advisory Committee.[9] We have tested this technique by applying it to a popular item among children in the school meal setting. We examined the palatability and acceptance of mushroom-soy-beef blend burgers in comparison to the traditional beef burger to explore the feasibility of utilizing mushroom-blended recipes for school-age children. In a pilot study, 37 children in grades 2 through 8 participated in a randomized, blinded taste test.[10] Students tasted 2 burger types, regular beef and a mushroom-soy-beef blended burger, and completed an interviewer-administered survey after tasting each burger. Mean scores for acceptability and palatability were similar for both burger types. This study demonstrated a comparable palatability and acceptance of the blend burger and the beef burger, and suggested that there may be advantages to schools considering adding mushroom-soy-beef blended burgers to their menus as a lower-calorie, lower-fat burger option.

The current pilot study builds on the series of experimental results above to test the acceptance and satiety of mushroom-soy-beef blend burgers among school-aged children, and to determine feasibility for expanded use in school food programs. It was hypothesized that acceptance and satiety ratings would be similar between the 2 burger types.

METHODS

Participants

We recruited one elementary/middle public charter school in the city of Baltimore, Maryland to complete this pilot study. The participating school was recruited based on existing relationships with the research team and due to the diverse student demographics. For example, a considerably high percentage (76.8%) of students received meal benefits through the Free and Reduced Price Meals (FARMs) government program at the time this study was performed. Enrollment and demographic reports by the Baltimore City Public School System indicated that this school's student body was comprised by white (37%), Hispanic (37%), African-American (19%), Asian/Pacific Islander (1%), Native Hawaiian (<1%), American Indian (<1%) and multiracial (6%) children. Approximately 24% of the students did not speak English as their primary language.

The school food environment included cafeteria volunteers (typically parents), a food education class, and a full-time on-site food educator. The school administrators provided a letter of support for the study agreeing to arrange assistance in scheduling the pilot study, and allowed access to their kitchen and cafeteria facilities.

Procedures

All students in grades 3 to 8, who participated in the school lunch program on study days, were invited to participate. Students were given a description of the study to take home; parents were asked to contact the school administrators or the principal investigator if they did not want their child to participate. Parents also were given pertinent information including a consent form and letter stating the study rationale in both English and Spanish.

A burger preference and satiety test was con-

Table 1
Nutrient Comparison between Blend Burger and Beef Burger

	Blend Burger	Beef Burger
Serving Size (ounces)	2.46	2.45
Calories	129	166
Protein (grams)	12	12
Carbohydrates (grams)	2	0
Total Fat (grams)	8	12
Saturated Fat (grams)	3.1	4.8
Trans-fat (grams)	0	0.8
Cholesterol (milligrams)	32	49
Sodium (milligrams)	215	254
Fiber (grams)	1	1
Iron (milligrams)	1	1

ducted in the school cafeteria during normal lunch procedures comparing the same 2 burger products previously tested (traditional beef burger versus a mushroom-soy-beef "blend" burger) (Table 1).[10-12] The Baltimore City Public School System's registered dietitian provided input during the development of the research plan and study procedures, ensuring that the burger products and preparation methods were consistent with the school district's existing product availability and protocol. The purchase of additional kitchen equipment was not necessary to participate in this pilot study, and the preparation of both burger types was similar. The beef burgers were already part of the school menu, and both burgers were available from the same vendor. The cafeteria manager required minimal training regarding how to prepare the blended burgers, and other cafeteria staff were not involved in the preparation process, only the serving process.

Data collection took place on 3 separate school days, spaced approximately 3 weeks apart, in December 2014 and January 2015 during the same lunch periods on each day. The first 2 days of data collection established a baseline preference for each of the 2 burger types on separate days versus a non-burger choice (Day 1: Beef Burger vs Chicken Sandwich; Day 2: Blend Burger vs Meatball Sub). The third day of testing included a head-to-head comparison of the blend burger versus the beef burger. Students in grades 3- 8 who participated in the school lunch program (including free, reduced-price, and paying students), were offered 2 main entrées using normal school lunch procedures, along with their usual choice of side dishes.

Instrumentation and Measures

Paper surveys were administered on all 3 data collection days. Students were given instructions to complete the surveys on their own at the lunch table immediately after they consumed their lunch. During the completion of these surveys, the on-site food educator was not present. The study staff members and the usual school cafeteria volunteers helped make sure students completed the entire survey on their own. The blend burger was referred to as the "power burger" in the paper surveys and during verbal instructions for completing the survey. Upon returning their completed survey on each study day, each student was offered a bookmark or ruler.

Demographic variables, including age, sex, and grade level, were collected to describe the sample. The survey also consisted of questions on food choice, acceptability, and satiety.

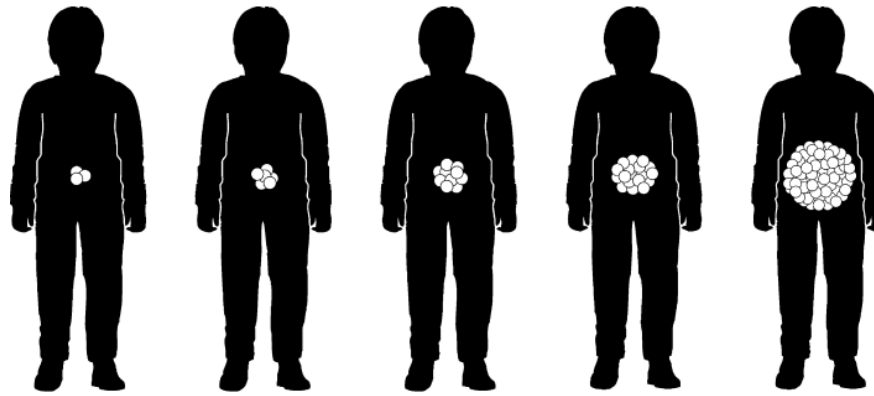
Food choice and acceptability. To determine food choice and acceptability the following questions were asked: "Which did you eat today [entrée 1] or [entrée 2]?" and, "If the item you just ate was offered next week in your school cafeteria, would you choose it again?" Response choices were, "Yes," "No" and "Maybe."

Satiety. To determine satiety, the following question was asked: "How full are you after the lunch you had today?" Students in grades 2 to 5 rated satiety using a validated, sex-specific silhouette satiety scale with 5 profiles, assigned scores 0 to 4 (Figure 1).[13,14] Students in grades 6 to 8 completed a visual analog scale (VAS), anchored by extremes of hunger and fullness.

Data Analysis

The goal of data analysis was to determine the proportion of students choosing each entrée and to evaluate the acceptability and satiety of the

Figure 1
Satiety Silhouette for Males



Note.
Validated, satiety silhouette used to measure satiety among students in grades 2 to 5. Male and female silhouettes were provided. Reprinted with permission from Elsevier.
Faith MS, Kermanshah M, Kissileff HR, Development and preliminary validation of a silhouette satiety scale for children. *Physiol Behav*. 2002;76(2):173-178.

mushroom-soy-beef blend burger compared to the traditional beef burger, in the school cafeteria setting. Survey responses were tallied to determine the number and percentage of students choosing the blend burger and beef burger from the cafeteria line in comparison to the non-burger alternative and each other. Survey responses also were tallied to determine the proportion of students who suggest they would choose each entrée again in the future. Satiety score for grades 6 to 8 were calculated by measuring the distance in millimeters from 0, and was re-coded into categories (0, 1, 2, 3, 4) with 0 indicating "extremely hungry" and 4 "not at all hungry," so that satiety ratings for all ages could be merged. We calculated mean satiety scores by entrée and significant differences in mean scores between entrées using STATA Version 11 (StataCorp, College Station, TX).

Table 2
Student Acceptance of the Beef Burger, Blend burger and Non-burger Alternatives

	Day 1		Day 2		Day 3	
	Beef Burger	Chicken Sandwich	Blend Burger	Meatball Sub	Blend Burger	Beef Burger
	(N = 28)	(N = 199)	(N = 115)	(N = 68)	(N = 97)	(N = 92)
No	2 (7.1%)	24 (12.1%)	26 (22.6%)	22 (32.4%)	24 (24.7%)	23 (25.0%)
Yes	13 (46.4%)	99 (49.8%)	28 (24.4%)	10 (14.7%)	15 (15.5%)	18 (19.6%)
Maybe	13 (46.4%)	76 (38.2%)	61 (53.0%)	36 (52.9%)	58 (59.8%)	51 (55.4%)

Note.
Student responses to "If the item you just ate was offered next week in your school cafeteria, would you choose it again?"

Table 3
Day 3-Beef Burger versus Blend Burger, Entrée Choice by Sex and Age

		N	Beef Burger	Blend Burger	p
Sex					
	Girls	100	51 (51.0%)	49 (49.0%)	.701
	Boys	93	50 (53.8%)	43 (46.2%)	
Age					
	≤10 years old	92	54 (58.7%)	38 (41.3%)	.090
	≥10 years old	101	47 (46.5%)	54 (53.5%)	

RESULTS

Surveys were completed during the same 3 lunch times on each of the 3 data collection days. For all 3 study days, the mean age of survey participants was 10.7 years old (range: 8-15).

Day 1: Beef Burger vs. Chicken Sandwich

On Day 1 of testing, 228 students (110 girls, 117 boys, 1 missing) chose one of the 2 featured entrées from the cafeteria line and completed the survey. The chicken sandwich was chosen by 200 students (87.7%), and the beef burger was chosen by 28 students (12.2%). When asked if they would choose their selected entrée again next week if offered for lunch, 46.4% (N = 13) of students who chose the beef burger said "yes," and 49.8% (N = 99) of students who chose the chicken sandwich said "yes" (Table 2). Mean satiety score was similar for the beef burger and the chicken sandwich (2.3 versus 2.4, p = .884).

Day 2: Blend Burger vs. Meatball Sub

On Day 2 of testing, 184 students (81 girls, 103 boys) chose an entrée from the cafeteria line and completed the survey. The blend burger was chosen by 117 (63.2%) students, and the meatball sub was chosen by 68 (36.8%) students. When asked if they would choose their entrée again next week if offered at lunch, 24.4% (N = 28) of students who chose the blend burger said "yes," and 14.7% (N = 10) of students who chose the meatball sub said "yes" (Table 2). Most responses were "maybe" for the blend burger (N = 61, 53.0%) and meatball sub (N = 36, 52.9%), respectively (Table 2). Mean satiety score was similar for the blend burger and the meatball sub (2.3 vs 2.4, p = .7431).

Day 3: Blend Burger vs. Beef Burger

On Day 3 of testing, 193 students (100 girls, 93 boys) chose an entrée from the cafeteria line and completed the survey. The blend burger was chosen by 92 students (47.6%) and the beef burger was chosen by 101 students (52.3%). No significant differences were observed based on sex or age for burger choice (Table 3). When asked if they would choose their entrée again next week for lunch, 19.6% (N = 18) of students who choose the blend burger said "yes," and 15.5% (N = 15) students who choose the beef burger said "yes." Most responses were "maybe" for the blend burger (N = 58; 59.8%) and beef burger (N =51; 55.4%), respectively (Table 2). Mean satiety score was similar for the blend burger and the beef burger (2.2 vs 2.0, p = .243).

DISCUSSION

We demonstrated a comparable acceptance and satiety value of the blend burger compared with the beef burger, while maintaining strict adherence to federal school lunch guidelines. When asked if they would choose their entrée again the following week, 77.4% and 79.4% of students who choose the blend burger said "yes" or "maybe" on Day 2 and Day 3, respectively. On Day 3, head-to-head comparison of the burgers, only 24.7% (N = 24) of students who chose the blend burger would not

choose that burger again next week, compared to 25.0% (N = 23) of students who chose the beef burger.

All entrées except the blend burger were on the usual menu rotation at the school. Test days 1 and 2 provided a baseline for each burger option, but also exposed most students to the blend burger as an entrée option for the first time (however, not all students tried the blend burger). The chicken sandwich was a clear favorite when offered with the beef burger and was chosen by the highest proportion of students in comparison to all other options.

Previous studies have found that blended recipes (such as soy-enhanced ground beef) were acceptable to students through measuring plate waste or purchase data.[15-17] For example, plate waste data was used to measure the acceptability of both soy-substituted and soy-enhanced products during a 4-week period among >1000 elementary school students (grades 1-6). The researchers found that the percentage of foods consumed was similar for soy-based and traditional entrées, except for "chicken-like" nuggets.[17] In another study, Maryland middle school students were served 4 soy-based products. Three of the 4 soy-based products were selected at a similar frequency to the traditional versions at lunch time. No significant differences were observed in amounts consumed of macaroni and cheese with soy pasta (Midland Harvest Pasta), a "hybrid" patty with half ground beef and half soy (Healthy Grillers Beef Patties), and soy-based nuggets (Morningstar Farms Veggie Chick'n Nuggets) compared to traditional versions based on plate waste; however, significantly fewer of the soy-based "chicken-less" slices (Garden Veggie Chick'n) were consumed compared to traditional chicken in Caesar salad.[18]

Satiety values were similar for both entrées served on each of the 3 study days. Although the blend burger provides 27% fewer calories and 33% fewer fat grams per serving than the beef burger, both are the same portion size (2.45 ounces), which may have contributed to the similar satiety ratings of the 2 burgers. These data, along with nutritional data on the lower fat and calorie content of the blend burger, and the previous experimental studies on palatability and acceptance, demonstrate that there are potential advantages for schools considering adding mushroom-blend burgers to their menus.

Strengths and Limitations

Our study has several strengths. The emphasis on mushrooms as the primary blending ingredient makes this pilot study both unique and innovative, in addition to examining differences in satiety. If this pilot study were to be implemented on a larger scale, additional training and kitchen equipment should not represent a significant challenge as the preparation process was similar for the blended and beef burgers. Based on personal communication with the JTM Food Group regional sales manager, the blended burger is approximately 14¢ less expensive than the all-beef burger. This cost difference is based on the "commercial" cost that includes the full value of the ingredients, which does not include USDA donated foods to reduce the cost of the beef or mushrooms (Personal communication, Lisa Pline, JTM Food Group Regional Sales Manager, July 15, 2016). Because the blended burger had a comparable acceptance and satiety response when compared to other choices already included in the school menu, our study might suggest a potentially cost-effective strategy aiming to lower, or at least maintain, preparation costs while reducing energy density.

We also call to attention several limitations of this study. First, the study was conducted in a single public charter school with an existing emphasis on nutrition and health promotion, exposing their students to various foods and nutrition education opportunities. This may limit the generalizability of the findings to schools and school districts without these resources. We recommend additional testing in schools with a varying level of exposure to alternative menu items and food education opportunities as a next step. Second, whereas there was no evidence of this, as the survey was self- administered, there is the potential for misinterpretation of instructions. Third, although age-appropriate rating scales and a validated satiety scale were used, future studies should examine the reliability and validity of the food acceptance measure used in this study. Finally, traditional beef and blend burgers were not compared against the same non-burger alternative.

Despite these limitations, this pilot study demonstrated a practical method for serving a lower energy density entrée following standard school operating procedures, which was also accepted

by students. Incorporating a mushroom-blended recipe into school menus is only one of the many components that may improve the school food environment, and has the potential to help achieve school nutrition quality standards and introduce students to a lower fat, lower calorie option. An examination of the strengths and limitations of this pilot study can inform efforts to design future studies in additional school settings to assess the feasibility of a large-scale expansion.

IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

Although testing in additional schools with a broader range of student demographics in various settings is warranted, school nutrition professionals may wish to consider mushroom-blended recipes for helping meet school nutrition guidelines and as a nutrition education opportunity. This will expose students to more diverse ingredients and offer the potential to provide a new way to incorporate delicious, low energy density foods into their diets. Incorporating mushrooms into traditionally-offered recipes or commercial products, such as burgers, spaghetti, lasagna, and meatloaf, may be most feasible. This can be combined with other strategies suggested to increase acceptance of lower-fat options, such as having school personnel encourage students to try new foods when served, providing education about food origin when serving novel foods in the classroom and cafeteria setting, and having an appealing presentation.[19,20] One large school food service provider, Sodexo, has reported its plans to incorporate blended burgers into school meals nationwide through their 250 K-12 school district accounts, further indicating the potential feasibility of this practice.[21]

In addition to student preferences and federal school nutrition standards, multiple factors influence the feasibility of incorporating new options into school meals, such as a school environment supportive of the change, adequate labor and training, and food costs.[22] A supportive school environment can be fostered by involving the entire school community in menu planning decisions (such as through school health councils, focus groups, and surveys). We suggest conducting taste tests or otherwise exposing students to the new option prior to serving it on the cafeteria line; this increases familiarity and exposure. We further suggest that menu changes be communicated with personnel, students, and parents, and that such communications include the rationale for considering menu changes and the potential benefits to student nutrition and health of new types of offerings.

In our pilot study, minimal training for the cafeteria manager was needed to prepare the blended burgers. Whereas the cost of blended and all-beef burgers was comparable in this pilot study, an exploration of cost effectiveness for school lunch operations is valuable. Future research could explore the quantitative impact substituting the lower ED mushroom-soy-beef blend burger and other mushroom-blended recipes for traditional school meals has on students' overall dietary intake, as well as explore the impact of marketing strategies in schools on choice and acceptance of such new food options.

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Human Subjects Approval Statement

The Johns Hopkins Bloomberg School of Public Health Institutional Review Board reviewed and approved study procedures (IRB# 00005591), as did the Office of Research and Accountability Institutional Review Board of the Baltimore City Public Schools System (IRB# 0000114).

Conflict of Interest Disclosure Statement

All authors of this article declare they have no conflicts of interest.

References

1. US House of Representatives and Senate (111th Con-

gress). Healthy Hunger-Free Kids Act of 2010 (Public Law 111-296). Washington, DC; US House of Representatives and Senate; 2010. Available at: http://www.gpo.gov/fdsys/pkg/PLAW-111publ296/pdf/PLAW-111publ296.pdf. Accessed June 13, 2015.
2. US Department of Agriculture, Food and Nutrition Service. Final Rule: Nutrition standards in the National School Lunch Program and School Breakfast Program. 2012. *Fed Regist*. 77(17). 7 CFR Parts 210 and 220. Available at: http://www.gpo.gov/fdsys/pkg/FR-2012-01-26/pdf/2012-1010. Accessed on June 13, 2015.
3. French SA, Story M. Commentary on nutrition standards in the national school lunch and breakfast programs. *JAMA Pediatr.* 2013;167(1):8-9.
4. Feeney MJ, Dwyer J, Hasler-Lewis CM, et al. Mushrooms and health summit proceedings. *J Nutr.* 2014;144(7):1128S-1136S.
5. Mendoza JA, Drewnowski A, Cheadle A, Christakis DA. Dietary energy density is associated with selected predictors of obesity in U.S. children. *J Nutr.* 2006;136(5):1318-1322.
6. Feeney M, Myrdal Miller A, Roupas P. Mushrooms—Biologically distinct and nutritionally unique: exploring a "Third Food Kingdom." *Nutr Today.* 2014;49(6):301-307.
7. Poddar KH, Ames M, Hsin-Jen C, et al. Positive effect of mushrooms substituted for meat on body weight, body composition, and health parameters: a 1-year randomized clinical trial. *Appetite.* 2013;71:379-387.
8. Cheskin LJ, Davis LM, Lipsky LM, et al. Lack of energy compensation over 4 days when white button mushrooms are substituted for beef. *Appetite.* 2008;51(1):50-57.
9. US Department of Agriculture and US Department of Health and Human Services. *Scientific Report of the 2015 Dietary Guidelines Advisory Committee*. Washington, DC. US Government Printing Office; 2015. Available at: http://www.health.gov/dietaryguidelines/2015-scientific-report/PDFs/Scientific-Report-of-the-2015-Dietary-Guidelines-Advisory-Committee.pdf. Accessed June 14, 2015.
10. Summers AC, Smith P, Ezike A, et al. A pilot study to compare a mushroom-soy-beef burger to an all-beef burger in school meals. *J Child Nutr Manag.* 2015.39(2).
11. JTM Food Group. Regular all-beef burgers (JTM. Food Group, Item # CP5670). Available at: http://www.jtmfoodgroup.com/tcpdf/ppi.php?partcode=CP5670&div=sch. Accessed May 15, 2015.
12. JTM Food Group. Mushroom-soy-beef blend burger (JTM. Food Group, Item # CP 5637). Available at: http://www.jtmfoodgroup.com/tcpdf/ppi.php?partcode=CP5637&div=sch. Accessed May 15, 2015.
13. Faith MS, Kermanshah M, Kissileff HR. Development and preliminary validation of a silhouette satiety scale for children. *Physiol Behav.* 2002;76(2):173-178.
14. de Ruyter JC, Katan MB, Kuijper LD, et al. The effect of sugar-free versus sugar-sweetened beverages on satiety, liking and wanting: an 18 month randomized double-blind trial in children. *PLoS One.* 2013;8(10):e78039.
15. Ashraf H, Schoeppel C, Nelson J. Use of tofu in preschool meals. *J Am Diet Assoc.* 1990;90(8):1114-1116.
16. Endres J, Barter S, Theodora P, Welch P. Soy-enhanced lunch acceptance by preschoolers. *J Am Diet Assoc.* 2003;103(3):346-351.
17. Klein B. Soy school lunch offers healthier alternatives. *Soy Connection.* 2006;14:1-3.
18. Lazor K, Chapman N, Levine E. Soy goes to school: acceptance of healthful, vegetarian options in Maryland middle school lunches. *J Sch Health.* 2010;80(4):200-206.
19. Demas A. Low-fat school lunch programs: achieving acceptance. *Am J Cardiol.* 1998;82(10B):80T-82T.
20. Perry CL, Bishop DB, Taylor GL, et al. A randomized school trial of environmental strategies to encourage fruit and vegetable consumption among children. *Health Educ Behav.* 2004;31(1):65-76.
21. Crawford E. Sodexo will blend mushrooms into burgers at schools to boost produce consumption. Available at: http://www.foodnavigator-usa.com/Markets/Sodexo-blends-mushrooms-in-burgers-at-schools-to-boost-produce-intake. Accessed August 2, 2016.
22. Briggs M, Mueller CG, Fleischhacker S, American Dietetic Association, School Nutrition Association, Society for Nutrition Education. Position of the American Dietetic Association, School Nutrition Association, and Society for Nutrition Education: comprehensive school nutrition services. *J Am Diet Assoc.* 2010;110(11):1738-1749.