

A Study of School Lunch Food Choice and Consumption among Elementary School Students

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Abstract: *Background:* School lunches that are part of the National School Lunch Program must meet specific nutrition requirements. It is unknown whether students eat school lunches in a balanced manner. This study examined which lunch food items children eat/toss, and consumption differences between sexes, and between students at a Non-Title 1 school where most students purchase school lunches and a Title 1 school where most students receive free or reduced-priced lunches.

Methods: Students in both schools were observed unobtrusively for five consecutive days. Trained observers recorded the discarded food items on a checklist listing the menu items for the day. The final analyses (t- tests, z tests) included data from 2,826 student-meals.

Results: Entrees similar to those offered in fast food restaurants (i.e., chicken nuggets, pizza, nachos, corn dogs) were favored by most students. Fresh fruits and vegetables were not selected or consumed frequently. Boys consumed more food in the fast food, starches, and dessert categories, while girls consumed more soup, salads, and vegetables. Title 1 school students consumed more food in all categories except bread, pasta, and sandwiches than Non-Title 1 school students.

Conclusions: Students' preference of unhealthy lunch items may decrease the health benefits that school lunches attempt to provide.

Keywords: Elementary school student, National School Lunch Program (NSLP), school lunch consumption, food preference, economically disadvantaged student.

The prevalence of obesity has nearly tripled since 1980 in the United States with nearly one-fifth of children ages 6-11 years old being obese (BMI percentile ≥ 95 th) in 2007-2008 [1] and an additional 17.4% of children in the same age group being overweight (BMI percentile 85th- <95 th) [2]. Physical inactivity and diets that are high in sugar and fats and low in fruits and vegetables have played a key role in the rise of childhood obesity [3, 4].

Because most children spend up to eight hours a day, five days a week in school, and eat at least one meal a day at school, many believe that school meals are one factor in the childhood obesity epidemic [5, 6]. School lunches offering French fries multiple times per week and offering dessert more than once per week each contributed to a significantly higher likelihood of obesity [7]. Children obtain an average of 35% of their daily energy needs while in school [8] and children who participate in school meals could obtain nearly half of their entire daily energy at school [9]. Since its inception, the National School Lunch Program (NSLP) has provided nutritionally balanced meals to over 30.5 million children each year [10]. When NSLP was

initially created in 1946, not receiving enough calories was the main concern. Today, the opposite is true [11]. A recent study found a higher overall rate of obesity among students who consume free or reduced-price lunches in all states [12]. The same study also found a lower rate of obesity among students who eat the free or reduced-price lunches in states that mandate school meals exceed the standards set by the United States Department of Agriculture (USDA). To combat childhood obesity, and based on evidence-based recommendations, the USDA issued new standards to increase the number and variety of fruits, vegetables, and whole grains and reduce trans fats and calories in school lunches [13]. While the USDA school meal standards have guided schools in providing children with nutritionally sound meals, little is known whether students actually eat the healthy food choices provided by school meals, and whether there are different school lunch choices between boys and girls and between students at Title 1 school where most students receive free or reduced-fee lunches and those enrolled in a non-Title 1 school where most students purchase lunches and there are more competitive food offerings. Competitive food items are those not offered by the school lunch program and students must purchase them such as ice cream, chips, cookies, crackers, etc. To answer those questions, this study was designed to examine what food options

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elementary school children prefer and whether the healthy foods provided by the school lunch programs are consumed by students. It also assessed whether differences exist in school lunch choices and consumption between students enrolled in a Title 1 and a non-Title 1 schools.

METHODS

Participants

An unobtrusive observational study was conducted in a Title 1 and a non-Title 1 elementary school purposefully selected in an urban school district in the Southeastern United States. Participants included kindergarten through fifth grade students who received or purchased lunch in the school cafeteria on the days when data collection took place in both schools in the fall of 2010. The Title 1 school had 995 students with 80% of them classified as economically disadvantaged and received free or reduced-fee school lunches [14]. The non-Title 1 school enrolled 895 students with 5.49% of them considered economically disadvantaged, and most of its students purchased their school lunches at the regular price [15].

Instrumentation and Procedure

A checklist based on the school menus published on each school's website for the days when data collection would take place was developed to record whether and how much a food item was consumed based on a five-point scale with 0 being non-consumed and 4 being fully consumed. During the week of data collection, a salad entrée, a fresh fruit, along with at least one vegetable and one canned fruit side item were offered daily in both schools. Research assistants trained in data collection visited both school cafeterias prior to the data collection. After surveying the layout of the cafeterias and the flow of students during the lunch hours, it was determined that the best location of observation was near the trash cans where students lined up to empty their lunch trays after lunch. A pilot test was conducted to ensure the validity of the data collection checklist and procedure.

Each school was observed on five consecutive days during the entire lunch period. During those days, a good portion of students in both schools brought lunches from home, some only purchased competitive food for lunch, and some were absent. However, it could be certain that students who stood in line to empty their lunch trays were those who purchased or

received school lunches. The observers were able to accurately record the type of food on each student's tray based on what they saw on the tray (such as sauce, food debris, leftover food, etc.) as the student waiting for his/her turn to empty his/her lunch tray. Since this is an exploratory observational study, no attempt was made to determine the "response" rate. To observe as many trays as possible, each line of students waiting to empty their lunch trays was observed by two trained observers with each recording alternate trays. The same observers observe the entire lunch period on the day(s) they were observing. The observers took anecdotal notes during the observation as to whether competitive foods were available and whether students purchased them. Data on whether any students purchased competitive foods were not recorded.

Data Analysis

Data collected were entered into a spreadsheet and analyzed using SPSS. Descriptive statistics were used to determine frequencies and percentages of foods that students selected and consumed. To be consistent with the literature [11], the amount of food consumed was re-grouped into little or none consumed (0-1), about half consumed (2), and most or all consumed categories (3-4). The daily averages of their consumption were obtained and used in data analysis.

To compare food choices and consumption preferences of students between the two schools and between boys and girls, inferential statistics (z tests and t-tests) were conducted, and the entrée items were grouped into the categories of soups and salad (including tomato soup, chicken tender salad, chef salad, Santa Fe salad, power pack, chicken Caesar salad, taco salad, yogurt and fruit plate, Greek salad, and Asian salad), bread, pasta, and sandwich (grilled cheese sandwich, barbeque pork sandwich, chicken sandwich, pasta, deli sandwich, ravioli, and pancake), fast food (chicken nuggets, corndog, pizza, fish-sticks, hamburger, and nachos), and meat and eggs (meatloaf, baked potato with meat and cheese, omelet, and teriyaki chicken nuggets). For the same reason, side items were grouped into the categories of vegetables (corn, cabbage, okra, broccoli, side green salad, green beans, carrots, coleslaw, spinach, peas and carrots, celery, and cucumber and tomatoes), non-fresh fruit (canned fruit cocktail, peaches, baked peaches, fruit salad, applesauce, pineapple, cinnamon apples, mandarin oranges, and pears), dessert (cinnamon bread, cookie, fruit fiesta, juice bar, and

baked peaches), starches (rolls, mashed potatoes, breadsticks, macaroni and cheese, rice, pretzels, tater tots, and French fries), and fresh fruits.

RESULTS

During the five days, a total of 1,532 student meals with 55.3% (n=849) from males at the Title 1 school were observed, and a total of 1294 student meals with 50.2%, (n=652) from males at the non-Title 1 school were recorded. Based on the menus obtained, a total of 16 entrée items and 28 side items (daily average 3.2 and 5.6, respectively) were served at the non-Title 1 school, and 17 entrée items and 35 side items (daily average 3.6 and 7, respectively) were served at the Title 1 school over the five days of observation. Although nearly half of the entrée items served in both schools were identical, the remaining entrée and side items served in both schools were similar. Several side items including breadsticks, fresh fruits, fruit cocktails, and corn were served on multiple days. Because the number of trained observers varied from two to six on different days, the number of trays observed varied from 198 to 409 in the non-Title 1 school (daily average 258) and 231 to 376 in the Title 1 school (daily average 306).

During the five days of the observation, at least three entrée items including a salad entrée and multiple side items that include a fresh fruit and at least one vegetable and one canned fruit were served each day at each school being observed (Table 1). It was also

noted that the Title 1 school offered one competitive food item (i.e. ice cream) daily, whereas the non-Title 1 school had multiple competitive food options daily including Rice Krispie treats, ice cream, fruit snacks, Sun Chips, Baked Cheetos, and Doritos. Some children purchased competitive foods for lunch only, while some purchased competitive foods as additions to their meals.

Food Preference by Individual Food Item in the Title 1 School

Since each entrée food item was served only once during the data collection period and there were at least three entrée items and multiple side items for students to select per day, the report of food preference by individual food item is based on the proportion of students who selected a particular food item when that food was served on a particular day. The entrée items selected by over half of the students included pizza (90%), followed by chicken nuggets (84%), hamburger (82%), omelet (76%), and pancakes (57%). Over nine of ten students (93%) who had chicken nuggets on their trays ate most or all of the nuggets. Similarly, nearly four out of five students who had pizza, omelet, and pancakes on their trays (78%, 74%, 72%, respectively) ate most or all of those foods, and nearly half (47%) of those who had hamburgers on their trays ate most or all of the hamburgers. The remaining 11 entrée items that were selected by fewer than one-third of the students included various salads (Greek, Asian, taco, chicken tender, and chicken and

Table 1: Entrée and Side Items Served at the Non-title 1 and Title 1 School

Day	Title 1 School		Non-title 1 School	
	Entrée	Side	Entrée	Side
1	Nachos, deli sandwich, Asian salad	Pretzels, corn, celery, pears, fruit salad, fresh fruit	Tomato soup, grilled cheese sandwich, chicken nuggets, chicken tender salad	Roll, corn, cabbage, fruit cocktail, cinnamon bread, fresh fruit
2	Teriyaki chicken, chicken nuggets, hamburger, taco salad	Rice, roll, peas and carrots, French fries, coleslaw, fruit cocktail, a juice bar, fresh fruit	Corndog, meatloaf, chef salad	Mashed potatoes, okra, canned peaches, fresh fruit
3	Baked potato with meat and cheese, pizza, yogurt and fruit plate	Spinach, side green salad, peaches, fruit fiesta, applesauce, breadstick, fresh fruit	Pizza, baked potato, Santa Fe salad	Breadstick, broccoli, side green salad, fruit salad, cookie, fresh fruit
4	Ravioli, omelet, pancakes, Greek salad	Breadstick, tater tots, side Caesar salad, carrots, mandarin oranges, baked peaches, fresh fruit	Fish sticks, BBQ pork sandwich, power pack (chicken & nut salad)	Mac & cheese, green beans, applesauce, coleslaw, fruit fiesta, fresh fruit
5	Tomato soup, grilled cheese sandwich, chicken nuggets, chicken tender salad	Roll, corn, cabbage, fruit cocktail, cinnamon bread, cucumber and tomato, fresh fruit	Chicken sandwich, pasta, chicken Caesar salad	Carrots, canned pineapples, cinnamon apples, breadstick, corn, fresh fruit

nuts), sandwiches (deli, grilled cheese), baked potato with meat and cheese, pasta, tomato soup, and yogurt and fruit plate. At least one of those entrée items that are mostly the healthier choices were served on each of the days during the study period. Students who did select those items did not eat or ate very little of them.

The top five sides selected by students included French fries (64%), mandarin oranges (49%), tater tots (40%), breadsticks (39%), and cinnamon bread (39%). With the exception of breadsticks that nearly 70% of the students who had them on their trays did not eat, over 61% of the students who had the other four of the top five side items consumed most or all of them. Nearly three-quarters of the students who selected French fries ate most or all of them. Although fresh fruit was selected by 38% of the students, nearly half of them did not eat the fruit. Similarly, among about 35% of the students who selected canned mixed fruits, over half (55%) ate none or very little of them. All of the vegetable sides were selected by fewer than a third of the students while baked peaches, cucumber and tomato, peaches, coleslaw, cabbage, and peas and carrots being selected by fewer than 10% of the students. Of the twenty students who selected coleslaw, none ate any or close to half it. Among those who had other healthy choices, such as cabbage, peaches, carrots, celery, side green salad, spinach, and pears on their trays, the majority ate none or little of those sides.

Food Preference by Individual Food Item in the Non-Title 1 School

Of the 16 entrée items served during the study period, the top five entrée items selected by students included corndogs (68%), pizza (62%), chicken sandwiches (55%), fishsticks (35%), and chicken nuggets (28%). About half of the students who had those entrée items on their plates ate most or all of them. Similar to their counterparts in the Title 1 school, very few students selected salad or soup entrées and most ate little or none of those food items.

The top five sides selected by students included macaroni and cheese (62%), applesauce (54%), mashed potatoes (41%), cookies (41%), and pineapple (40%). While nearly half of the students who had mac and cheese, applesauce, and mashed potatoes on their trays ate most or all of them, almost four out of five students who ordered cookies ate most or all of them and nearly half of those who ordered pineapple did not eat any or ate little of it. Similar to the Title 1 school,

fewer students selected the healthy side items. Of those side items, about half of the students who had peaches, green beans, and broccoli on their trays ate most or all of them. A majority of students (>60%) who ordered fresh fruit and carrots ate none or very little of them. Nearly 45% of the students who had canned mixed fruits, okra, side green salad, and coleslaw ate none or very little of them. None of the students who ordered cabbage ate it.

Comparison of Food Choice and Consumption by Food Category

No significant differences regarding the selection of entrée items and side items were found between the boys and girls in both schools except that girls were significantly more likely to have more servings of vegetables than boys (.2951 vs. .2485, $p=.010$) (Table 2).

Table 2: The Comparison of Mean Number of Servings of Sides between Boys and Girls

	Boys	Girls	<i>t</i>	<i>p</i>
Vegetables	.2485	.2951	-2.573	.010
Fruits	.3598	.3464	.710	.479
Desserts	.2132	.1955	1.156	.248
Starches	.5047	.5019	.130	.896

Table 3 shows that significantly more girls than boys consumed half of the entrée items in the soup and salad category (70.8% vs. 29.2%, $p=.00080$) and side items in the vegetable category (55.9% vs. 44.1, $p=.04426$). Significantly more boys than girls consumed more than half or all of the entrée items in the fast food category (57.1% vs. 42.9%, $p=.00184$) and the side items in the desserts and starches categories (59.8% vs. 40.2%, $p=.01137$; 57.6% vs. 42.4%, $p=.01328$; respectively).

As presented in Table 4, significantly more students in the Title 1 school than those in the non-Title 1 school selected an entrée from the fast food category and from the meat and eggs category (61.2% vs. 38.8, $p=.00000$; and 80.7% vs. 19.3%, $p=.00000$; respectively); whereas significantly more students in the non-Title 1 school than students in the Title 1 school ordered an entrée in the bread, pasta, and sandwich category (56% vs. 43.8%, $p=.00002$). In addition, students in the Title 1 school were significantly more likely to select more servings of vegetables, desserts, and starches than students in the

Table 3: The Comparison of the Consumed Amount of Entrée and Sides between Boys and Girls

Food Choice	Amount consumed	Boys (N=1501)		Girls (N=1325)		z score	p
		N	%	N	%		
Soup and Salads	little or none	19	47.5	21	52.5	-.71658	.47363
	half	14	29.2	34	70.8	-3.35329	.00080
	most or all	41	60.3	27	39.7	1.20103	.22974
Bread, Pasta, Sandwiches	little or none	52	44.1	66	55.9	-2.01159	.04426
	half	37	56.9	28	43.1	.62260	.53355
	most or all	107	57.5	79	42.5	1.24779	.21211
Fast Food	little or none	89	42.8	119	57.2	-3.10040	.00193
	half	113	44.3	142	55.7	-2.95238	.00315
	most or all	562	57.1	422	42.9	3.11429	.00184
Meat, Eggs	little or none	40	44.4	50	55.6	-1.67501	.09393
	half	20	58.8	14	41.2	.67119	.50210
	most or all	151	58.1	109	41.9	1.68291	.09239
Vegetables	little or none	187	49	195	51	-1.75254	.07970
	half	52	44.1	66	55.9	-2.01159	.04426
	most or all	110	51.2	105	48.8	-.59644	.55088
Non Fresh Fruit	little or none	228	50.9	220	49.1	-1.02697	.30443
	half	67	53.2	59	46.8	.01396	.98886
	most or all	227	57.3	169	42.7	1.81014	.07027
Desserts	little or none	87	50.6	85	49.4	-.68680	.49221
	half	42	49.4	43	50.6	-.69450	.48737
	most or all	189	59.8	127	40.2	2.53101	.01137
Starches	little or none	256	49.3	263	50.7	-1.91411	.05561
	half	108	50.9	104	49.1	-.65848	.51023
	most or all	345	57.6	254	42.4	2.47622	.01328
Fresh Fruit	little or none	322	55.9	254	44.1	1.53015	.13280
	half	65	49.2	67	50.8	-.91291	.18064
	most or all	195	52.6	176	47.4	-.22913	.81877

Table 4: The Comparison of Entrée Selections between Students in Non-Title 1 and Students in Title 1 Schools

Food Choice	Title 1 School		Non-Title 1 school		z score	p
	N	%	N	%		
Soup and Salads	90	57.3	67	42.7	-.80584	.42034
Bread, Pasta, Sandwiches	162	43.8	208	56.2	4.31830	.00002
Fast Food	886	61.2	561	38.8	-7.67191	< .000001
Meat and Eggs	310	80.7	74	19.3	-11.22018	< .000001

non-Title 1 school (.3290 vs. .2009, $p < .0001$; .0997 vs. .2937, $p < .0001$; and .6332 vs. .3496, $p < .0001$; respectively) (Table 5).

Table 6 shows that significantly more students in the Title 1 school consumed most or all of the entrée items in the fast food category and little or none of the

Table 5: The Comparison of Mean Number of Servings of Sides between Students in Two Schools

	Title 1 School	Non-Title 1 school	t	p
Vegetables	.3290	.2009	7.385	< .0001
Fruits	.3570	.3493	-.410	.682
Desserts	.2937	.0997	-13.433	< .0001
Starches	.6332	.3496	-13.984	< .0001

Table 6: The Comparison of the Consumed Amount of Entrée and Sides between the Two Schools

Food Choice	Amount consumed	Title 1 School		Non-Title 1 School		z score	p
		N	%	N	%		
Soup and Salads	little or none	24	60	16	40	-.74014	.45922
	half	27	56.3	21	43.8	-.28599	.77488
	most or all	38	55.9	30	44.1	-.28004	.77945
Bread, Pasta, Sandwich	little or none	60	50.8	58	49.2	.74914	.45377
	half	22	33.8	43	66.2	3.33399	.00086
	most or all	79	42.5	107	57.5	3.32432	.00089
Fast Food	little or none	117	56.3	91	43.8	-.61326	.53970
	half	112	43.9	143	56.1	3.45755	.00055
	most or all	657	66.8	327	33.2	-9.79296	< .00001
Meat, Eggs	little or none	67	74.4	23	25.6	-3.91559	.00009
	half	23	67.6	11	32.4	-1.58204	.11364
	most or all	220	84.6	40	15.4	-10.3266	< .00001
Vegetables	little or none	240	62.8	142	37.2	-3.63427	.00028
	half	78	66.1	40	33.9	-2.64844	.00809
	most or all	148	68.8	67	31.2	-4.47829	.00001
Non Fresh Fruit	little or none	254	56.7	194	43.3	-1.15110	.24969
	half	51	40.5	75	59.5	3.16581	.00155
	most or all	224	56.6	172	43.4	-1.01427	.31046
Desserts	little or none	152	88.4	20	11.6	-9.27916	< .00001
	half	57	67.1	28	32.9	-2.41407	.01578
	most or all	236	74.7	80	25.3	-7.75073	< .00001
Starches	little or none	331	63.8	188	36.2	-4.84098	< .00001
	half	126	59.4	86	40.6	-1.58709	.11249
	most or all	425	71	174	29	-9.23678	< .00001
Fresh Fruit	little or none	288	50	288	50	2.27330	.02301
	half	64	48.5	68	51.5	1.35240	.17625
	most or all	248	66.8	123	33.2	-5.24100	< .00001

entrée items in the bread, pasta, and sandwich group than their counterparts in the non-Title 1 school (66.8% vs. 33.2%, $p=.00000$; 42.5% vs. 57.5%, $p=.00089$; respectively). For side items, significantly more

students in the Title 1 School than students in the non-Title 1 school ate more than half or all of the items in the vegetables, desserts, starches, and fresh fruit groups (68.8% vs. 31.2%, $p=.00001$; 74.7% vs. 25.3%,

$p=.00000$; 71% vs. 29%, $p= .00000$; and 66.8% vs. 33.2%, $p= .00000$; respectively). Also, significantly more students in the non-Title 1 school than those in the Title 1 school ate half of the side items in the non-fresh fruit group (59.5% vs. 40.5, $p=.00155$).

DISCUSSION

This study found that the healthier entrée choices were selected by a small percentage of the students (between 2% and 33%), as compared to the unhealthy entrée items selected by a majority (60- 90%) of the students in both schools. Noteworthy is the large proportion of the students, especially those in the Title 1 school, that consumed most or all of the unhealthy portion of the meals such as the fast food items, and threw away the healthy items that made the meals nutritionally balanced. The popular entrée items, selected and consumed mostly or all by more students in both schools, appeared to be less healthy including pizza, chicken nuggets, corndogs, fish-sticks, and hamburgers. The not-so-popular entrée items seemed to be those in the categories of soups and salad; bread, pasta, and sandwiches; and meat and eggs. The popular side items were those in the dessert and starches categories such as cookies, French fries, macaroni and cheese, mashed potatoes, and tater tots. The less popular sides were the healthy options such as vegetables, fresh fruits, and non-fresh fruits. Those findings are consistent with previous studies [11, 16] that although school lunches that are part of the NSLP program meet nutritional standards, the actual average lunch children received and consumed did not meet nutritional standards.

Such phenomena could be explained by the fact that children are more likely to choose foods based on their taste [11], parental influences [17], previous food experience [18], and influence of food marketing that link less-nutritious foods to toys and popular cartoon and movie characters [18, 19]. Although previous research [11] found that over 60% of the elementary school children had a fruit on their lunch tray and at least 80% of those who had a fruit on their lunch tray ate the fruit, the present study only found about one third of the students had a fruit serving on their lunch tray. As high as 62% of the students in the non-Title 1 and 55% of those in the Title 1 schools did not eat or only ate little of the fruit on their tray. Contrary to the finding that children are more likely to eat more fruits and vegetables when they have easy access to those foods [20], a majority of the students observed in this study did not select a salad entrée, a fruit, or a

vegetable side that were served daily. For the small number of students who did select one or more of those healthy choices, they threw away most, if not all, of them.

The differences in preference of food choices between boys and girls observed in this study are consistent with previous research [21] that girls enjoyed vegetables more, and boys preferred meat, fish, and poultry items. During the five days of observation, the Title 1 school served significantly more sides than the non-Title 1 school. It is possibly due to the fact that a majority of the Title 1 school students received free or reduced-fee lunches must have at least two side items.

As compared to their counterparts in the non-Title 1 school, students in the Title 1 school were more likely to have entrée items in the fast food, and meat and eggs categories and more servings of vegetables, desserts, and starches on their trays. In addition, they also were more likely to consume most or all of their lunch items including fruits and vegetables on their trays. This finding is consistent with a previous study [22] that students from low-income families consumed more lunch items in all food groups. Such differences in food choices and consumptions among students could be due to the possibility that individual food preference is influenced by past experience of the foods and parental influence [17, 18]. They could also be related to the difference in socioeconomic status of students in the two schools with significantly more students in the Title 1 school being classified as economically disadvantaged and most of the students in the non-Title 1 school were from families with higher socioeconomic statuses [14, 15]. It is known that healthy foods such as fruits and vegetables are less accessible to low-income families [23], and many low income families have very low food security [24]. As compared to middle income families, low income families are almost twice as likely to reduce or miss meals or have limited income to pay for food [25]. As a result, students from low income families may be less likely to have been exposed to healthy food choices and may not have enough food at home. On the other hand, students from higher social economic statuses are more likely to have been exposed to healthy food choices and less likely to be concerned with not having food available at home [26].

Students at the Title 1 school could purchase one competitive food, whereas students at the non-Title 1 school could purchase and consume multiple competitive food offerings. Again the economic

statuses of families could explain why the non-Title 1 school offered more competitive food options than the Title 1 School did. Those findings are consistent with the report by Wharton, Long, and Schwartz [27] that the introduction of competitive foods has been shown to significantly reduce the amount of fruit and vegetables that children consume, and, students who received a free or reduced-price lunch, were more likely to consume fruits and vegetables and less likely to consume competitive foods.

LIMITATIONS

As an exploratory study, only one Title 1 School and one non-Title 1 school were observed. Results of this study may not be typical of all Title 1 or non-Title 1 schools. Therefore, the generalization of the findings from this study must be made with caution. Because the content on each lunch tray was observed and recorded by one observer, it is possible that some trained observers might have mismarked certain food items or consumption amount, which might have had certain impact on the accuracy of the results. To increase the accuracy of data in future studies, each tray should be observed by two trained observers. Because the number of lunch trays observed varied on different days, results from this study are intended to provide a general overview of student lunch item preferences and consumption. Lastly, the lunch items served in the two schools were not identical, making the comparison of students' food selections and consumptions not as accurate. Future studies should work with the schools to set and serve exactly the same menu items on the same days of the observation.

CONCLUSIONS

Although both schools examined in this study provide balanced meal options for their students, the actual lunches most students in both schools consumed included mostly food items commonly served in fast food restaurants, with few or none of the healthier food options. Girls and boys had different food preferences with girls liking vegetables more, and boys enjoying meat, fish, and poultry items more. The school lunch seemed to be a main meal for the day for students from disadvantaged families, and more competitive food choices were offered in the non-Title 1 school than that offered in the Title 1 school. It is clear that students' food choices, their actual consumption of different foods, and the influence of competitive foods, may decrease the health benefits that school meals attempt to provide.

IMPLICATIONS

The results from this study strongly suggest that schools should develop effective nutrition education programs that not only provide general nutrition knowledge, but also influence children's food preferences and empower students to make wise nutrition decisions. Although stricter school lunch standards have improved weight status among school lunch participants [12], it is more important to help students, especially those who purchase school lunches, to develop the ability to select and eat healthy food offerings voluntarily. Because school aged children consume at least half of their meals outside of schools on average and will make food choices when they become adults, it is critical that they are able to make healthy dietary choices.

As parental influences have a major impact on student food choices [17], school nutrition programs should target the parents, especially those from disadvantaged families. Schools should involve Parent Teacher Association and work with local community, businesses, and grocery stores to offer nutrition classes, healthy meal planners and recipes, cooking demonstrations, and hands-on cooking practices. Because students' food preference is influenced in part by their past experiences of the foods [18], school nutrition programs should provide food tasting opportunities to expose students to the healthy food items that they may not have had at home or in the past. As students are more likely to have had experience with locally grown foods, schools should serve those foods as much as possible.

Since schools cannot compete with commercial marketing of less-healthy foods [17, 18], they can develop and implement fun and educational activities for their students and parents. For example, the school districts could organize monthly healthy food recipe contests and invite students and parents to vote for the winners. The winning recipes would be included in the following month's school lunch menu, and posted on district websites for parents to use.

In an attempt to reduce food waste, the USDA issued Updated Offer versus Serve Guidelines for the NSLP and School Breakfast Program in School Year 2013-2014 [28]. School district nutrition services should design school lunch menus that meet not only the USDA requirements, but the food preferences of children to increase the chance that the lunches students actually consume are nutritionally balanced

and less food is wasted. Schools can invite students with different demographic characteristics and backgrounds each week to taste a selection of healthy food items from the menu and provide feedback on how those foods should be modified to meet their preference. Those students would be more likely to select and eat the modified offerings based on their feedback and it may also influence their peers to select and eat those foods. Lastly, schools should evaluate competitive foods offerings and determine if changes should be made to promote healthier dietary choices among students.

HUMAN SUBJECT APPROVAL STATEMENT

This study was approved by the Kennesaw State University's institution review board and Cobb County School District Office of Accountability.

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