

Food Group Preferences of Elementary School Children Participating in the National School Lunch Program

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Please note that this study was published before the implementation of Healthy, Hunger-Free Kids Act of 2010, which went into effect during the 2012-13 school year, and its provision for Smart Snacks Nutrition Standards for Competitive Food in Schools, implemented during the 2014-15 school year. As such, certain research may not be relevant today.

ABSTRACT

Purpose/Objectives

The purpose of the study was to assess the food group preferences of second through fifth grade children based on ethnic background, gender, and grade. Food group preferences were determined by the amount of various food groups consumed in meals served as part of the National School Lunch Program at selected schools. Research indicates that greater consumption of food is directly proportional to preferences; the higher the preference, the greater the consumption.

Methods

A plate waste study was conducted in a culturally diverse city in four predominantly free and reduced lunch eligible elementary schools with a large Hispanic population (58%, 69%, 82%, and 82% of students). Over a 40 day period (10 days at each of the 4 schools), 5,400 plates were evaluated. Individual food items in the school lunch were measured before and after the meals were served. Food group intakes were determined by measuring the difference between the amount served and the amount remaining of each menu item after the meal was complete.

Results

Caucasian children were seen to have better consumption patterns than Hispanic children. The dairy, vegetable, and fruit food groups were better consumed by Caucasians than Hispanics ($P < 0.05$). Girls and second graders were seen to consume less of the school lunch foods than boys and older students ($P < 0.05$). The majority of children in all groups did not meet Food Guide Pyramid recommendations for the grains, fruits, vegetables, dairy, and meat food groups.

Applications to Child Nutrition Professionals

Since food preferences are the major determinant of consumption, poorer consumption patterns for Hispanic students may indicate a reduced preference for those foods being served through the school lunch menus. Child Nutrition Professionals need to consider what foods are nourishing, yet acceptable, for the specific population in their schools to help ensure that the children will consume the foods. This is especially critical in schools where the children are from lower socioeconomic families since the meals received at school may be their major nutrient source for the day.

INTRODUCTION

Increasing awareness of the importance of diet for health promotion and disease prevention has led to a greater concern about the diet and food consumption patterns of school age children (Melnik, Rhoades, Wales, Cowell, & Wolfe, 1998). Schools and communities share the responsibility of providing children access to well-balanced nutrition (Position of the American Dietetic Association [ADA], 2006). With a long-standing interest in the nutrition of school children, the United States Department of Agriculture (USDA) established the National School Lunch Program (NSLP) under the

National School Lunch Act in 1946 “to safe-guard the health and well-being of the Nation’s children” (Gunderson, 2009; Melnik et al.)

The NSLP’s primary focus has been to ensure that all children have access to the nourishment they need to develop into healthy and productive adults. The nutritional goals of the NSLP have been to provide children with one-third of the recommended dietary allowance (RDA) of the key nutrients from a variety of foods (Burghardt, Gordon, & Fraker, 1995; Devaney, Gordon, & Burghardt, 1995; Gunderson, 2009; Martin, 1996).

According to the School Nutrition Dietary Assessment Study (SNDA-III), over 85 percent of schools offered lunches that met the standards for the key nutrients including protein, vitamin A, vitamin C, calcium, and iron (Crepinsek, Gordon, McKinney, Condon, & Wilson, 2009). However, there is still improvement to be made. Fewer than one-third of public schools offered and served school lunches that met the standard of less than 30 percent of calories from fat or less than 10 percent of calories from saturated fat. The percentage of elementary schools meeting the total fat standard has improved from 15 to 34 percent over the 6 years between school years of 1998-1999 and 2004-2005 (U.S. Department of Agriculture, 2007).

Even though children are provided food that meets the standards, there is no guarantee that they will consume it. Factors that increase waste in school lunch programs include scheduling of the recess period after lunch (Bergman, Buerge, Englund, & Femrite, 2004a), the length of the lunch period, and food preferences (Bergman et al., 2004b). Devaney et al. (1995) used 24-hr dietary recall data from a nationally representative sample of approximately 3,350 students and concluded that NSLP participants waste 12% of the food energy from the meal they select. Bergman et al. (2004a), on the other hand, in a weighed plate waste study of third through fifth graders, found up to 40% waste by weight in elementary schools which offered recess after lunch.

The NSLP has improved the foods offered, yet numerous studies have concluded that most children are not meeting their daily Dietary Guidelines or Food Guide Pyramid (FGP) recommendations for fruits, vegetables, and whole grains (Baxter, 1998; Johnson & Kennedy, 2000; Kirby, Baranowski, Reynolds, Taylor, & Binkley, 1995; Melnik et al., 1998; Position of the ADA, 2008). Regular intake of fruits, vegetables, and whole grains is very important to prevent chronic diseases (Position of the ADA, 2006).

Food preferences are the major determinants of consumption in children (Baxter, 1998). It is important to identify food preferences in children to assist in directing them towards healthy eating habits (Position of the ADA, 2008). Eating habits are formed in childhood and can persist into adulthood. Eating preferred foods is a major source of pleasure, and the fear of having to give up eating a preferred food is reported as a major obstacle to consuming healthier diets (Birch, 1999).

Schools play an important role in the child’s social development by shaping their food preferences and eating habits (Centers for Disease Control and Prevention, 1996). The Position of the ADA (2003) on school-based nutrition programs states that schools need to be healthful environments where students are allowed the opportunity to make healthful food choices.

The focus of the current study is to determine the role of grade, gender, and ethnic background in food preferences and consumption patterns exhibited by elementary school children. For this research, the assumption is made that a smaller amount of plate waste, and hence better consumption, indicates a higher preference for that food.

METHODOLOGY

The current study was conducted at four elementary schools in one school district in central Washington that participated in the NSLP. The selected school district and community is known as a culturally diverse area with a population of 60,000 people. Approximately 50% of the community population is Hispanic. School sites for the study were selected based on a high percentage of meals being served at a free or reduced rate and were generally located within Hispanic

neighborhoods. Study subjects were children in grades 2 through 5 who ate school lunch. A total of 2,285 children of various ethnic groups participated in this study (Table 1).

Table 1. *Distribution of ethnic groups in elementary schools.*

Elementary schools	Total enrollment	Minority (%)	Caucasians (%)	Hispanics (%)	Others (%)
School 1	672	78.13	21.88	69.05	9.08
School 2	574	86.24	13.76	81.71	4.53
School 3	474	84.81	15.19	82.07	2.75
School 4	565	61.06	38.94	57.52	3.54

The study was approved by the Human Subjects Review Committee of Central Washington University (CWU) in Ellensburg, Washington.

The independent variables for this study were (a) Ethnicity: Caucasians and Hispanics; (b) Grade Level: 2 through 5; and (c) Gender. The dependent variables for the study were (a) Mean number of servings consumed by the children from the five food groups (grains, fruits, vegetables, dairy, and meat) and (b) Percentage of food consumed from the five food groups.

A weighted plate waste method was used that included the physical measurements of each of the foods served during lunch. This method provides more accurate information than visual estimation or the 24-hour recall methods (Lee, Lee, & Shanklin, 2001). The results of plate waste analysis were used as a criterion for determining the food preferences in children, given that plate waste has been identified as a source to measure food acceptability and nutrient intake (Lee et al.).

Two digital scales (OHAUS CT 1200) were used to determine the plate waste. Laptop computers with the LabView 61 (National Instruments Inc. Austin, TX, 2000) program were connected to each of the digital scales. The average weight of three to five pre-portioned servings of each menu item was determined and recorded to the nearest 0.1 gram. Each menu item with the average pre-portioned weight was entered into the LabView program.

All student trays were numbered prior to the start of the lunch period. Tray numbers were matched to student numbers as the students entered the lunch line. The foodservice personnel placed all the menu items available for consumption on the students' trays. Researchers were on site for each of the plate waste days and supervised and monitored all procedures.

At the conclusion of the meal, students brought their trays to the disposal area for collection. Numbered trays were stored in high-rise storage racks until weighing could be completed. The procedure included:

- Entering the tray number that corresponded to the student identification number in the LabView program for each tray.
- Separating the menu items left on the tray and weighing them individually on the digital scale to the nearest 0.1 gram.
- Weight of each menu item left on the tray was recorded by the LabView program and entered into a spreadsheet format.

At the end of the collection day, the data was saved into a Microsoft Excel 2000 spreadsheet. One hundred to 200 student trays per day were measured during the data collection period of 40 days

(10 days in each school). All students who ate school lunch were asked to participate in the plate waste study. Students were allowed to decline to participate.

Single servings of individual food items were assigned an equivalent in the respective FGP food group. For example, fruits formed one major food group, while rice, biscuits, and rolls were included in the grains group. Fruits and vegetables were assigned two different food groups as per the FGP recommendations. Combination foods or mixed dishes such as burritos and hamburgers were assigned to their pyramid groups based on their major ingredients. For example, a meat-vegetable casserole was assigned to the meat group and vegetable group based on the amount of meat and vegetable in the product. Since the menu items for the study were weighed in grams, the gram weights of the menu items were converted to serving amounts, as specified by the FGP, using Food for Fifty (Molt, 1997). This method of converting gram weights of each food into the number of food group servings was first implemented by Cleveland and colleagues (USDA, Food and Nutrition Service [FNS], 2003). Child Nutrition label information was also used to determine the serving sizes and the food groups (USDA, FNS, 2003).

Data were analyzed using SPSS (version 11.5, 2003, SPSS Inc., Chicago, IL). Mean numbers of servings for all the five food groups, as well as the sweets, were determined. Pearson's chi square was used to determine significant differences in children meeting or not meeting the recommended food group servings. Differences in food preference, based on plate waste, among children of various ethnic groups, gender, and grade were analyzed using analysis of variance (Univariate ANOVA). Tukey's post hoc tests were conducted to determine which groups differed significantly from one another; $P < 0.05$ was considered significant.

RESULTS AND DISCUSSION

The study sample included a total of 5,420 observations of lunch trays collected from students in the second through fifth grade. The majority of these observations were of trays consumed by Hispanic children ($n = 4,052$) and Caucasian children ($n = 685$). Native Americans, Alaskans, African Americans, and Asians were a minority (n for each group was less than 200). Therefore, in the present analysis, only the Hispanic and Caucasian children were considered.

The FGP recommends 2,200 kilocalories per day for children 6 years and older. Since the NSLP is designed to meet 1/3 of a child's nutrient needs, 1/3 of the recommended FGP servings for a day were used for data analysis. One-third of the recommended FGP servings would be 3 grain servings and one of each of the fruit, vegetable, meat, and dairy servings. Overall, the students in the current study did not meet the 1/3 of FGP recommended daily servings. Table 2 shows that all students consumed more servings of the grain and meat food groups than the fruit, vegetable, and dairy food groups.

Table 2. Mean number of food group servings consumed by grade level, gender, and ethnicity.^a

Grain	Fruit	Vegetables	Dairy	Meat	Sweet
1.65 ± 1.01	0.39 ± 0.38	0.69 ± 0.49	0.50 ± 0.39	1.49 ± 0.78	0.36 ± 0.53
1.51 ± 1.52 ^{b,d,e}	0.32 ± 0.32 ^{b,d,e}	0.71 ± 0.51	0.40 ± 0.39 ^{b,d,e}	1.49 ± 0.86 ^e	0.40 ± 0.62
1.62 ± 0.86 ^{b,g}	0.43 ± 0.4 ^{b,c}	0.71 ± 0.46	0.53 ± 0.39 ^b	1.42 ± 0.73 ^{c,g}	0.35 ± 0.49
1.68 ± 0.81 ^{d,f}	0.38 ± 0.38 ^{c,d,f}	0.68 ± 0.51	0.52 ± 0.39 ^d	1.53 ± 0.79 ^c	0.37 ± 0.55

1.78 ± 0.84 ^{d,e,f,g}	0.45 ± 0.36 ^{d,e,f}	0.67 ± 0.49	0.54 ± 0.38 ^{d,e}	1.58 ± 0.75 ^{e,g}	0.35 ± 0.49
1.71 ± 1.00. ^h	0.40 ± 0.39	0.70 ± 0.49	0.55 ± 0.39 ⁱ	1.55 ± 0.78 ^k	0.38 ± 0.55
1.60 ± 1.01 ^h	0.39 ± 0.37	0.68 ± 0.49	0.47 ± 0.39 ⁱ	1.45 ± 0.78 ^k	0.36 ± 0.52
1.72 ± 0.84	0.44 ± 0.38 ^m	0.75 ± 0.47 ^p	0.65 ± 0.34 ^r	1.56 ± 0.73	0.36 ± 0.49
1.63 ± 1.04	0.39 ± 0.38 ^m	0.68 ± 0.49 ^p	0.48 ± 0.39 ^r	1.49 ± 0.79	0.37 ± 0.54
<p>Note. Cauc. = Caucasian, Hisp=Hispanic ^a Values are mean servings ± standard deviation. Recommended servings for the lunch meal would be 3 grain servings and 1 serving of each of the fruit, vegetable, dairy, and meat groups. ^{b,c,d,e,f,g,h,i,k,m,p,r} Indicates significant difference between grades, gender, or ethnicity within food group, analysis of variance, Tukey's honestly significant difference; <i>P</i> < 0.05.</p>					

Significant differences (*P* < 0.05) in the consumption of the fruit, vegetable, and dairy food groups were seen between Caucasian and Hispanic students (Figure 1). Caucasians had better consumption patterns for all the food groups when compared to Hispanic students. Caucasian students consumed 17% more of the dairy food group, which was predominantly low-fat white milk, than the Hispanic students.

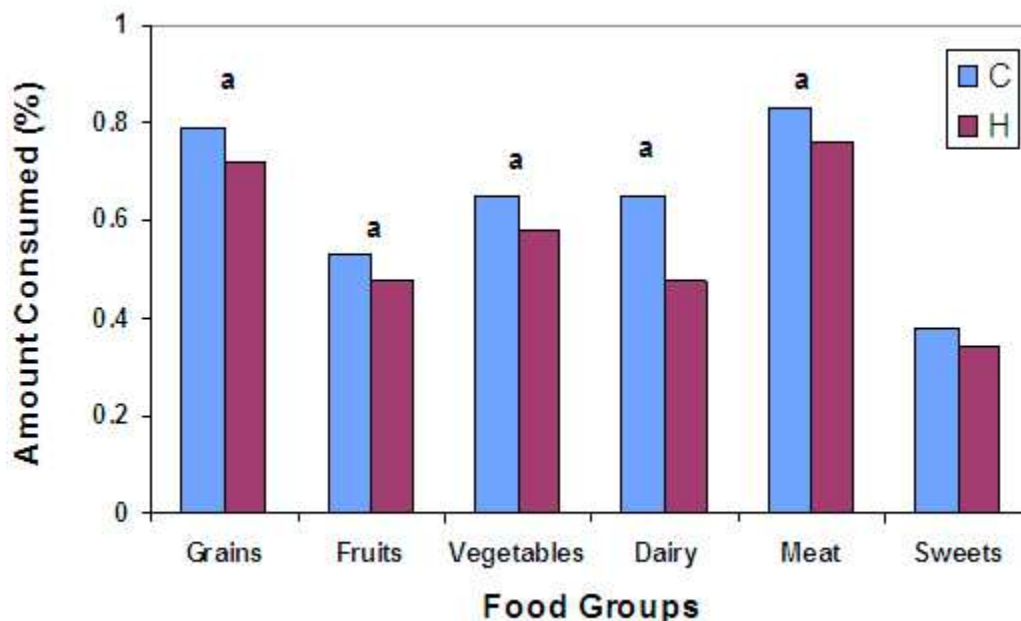


Figure 1. Food group intake of Caucasians (C) and Hispanics (H) as percent of total served. The letter "a" above each column indicates significant difference based on analysis of variance, Tukey's honestly significant difference; *P* < 0.05.

Table 2 shows the mean number of food group servings consumed by boys and girls. Boys had a

higher consumption of all the food groups than the girls. Those differences were significant for the grain, dairy, and meat groups. However, unlike earlier studies, significant differences in fruit and vegetable consumption between boys and girls were not seen. Sweets were equally consumed by boys and girls.

Figure 2 shows that Caucasian boys had a higher intake of the dairy food group than Hispanic boys ($P < 0.05$). Caucasian boys consumed more grain and meat than their counterparts. No differences were seen in vegetables, fruit, and sweet intake between Caucasian and Hispanic boys.

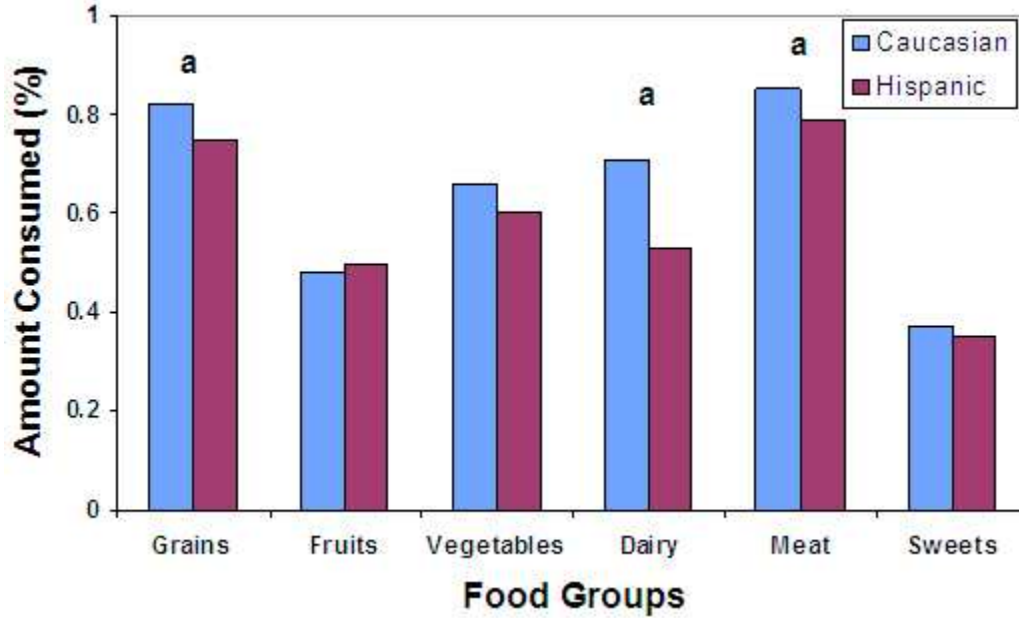


Figure 2. Food group intake of Caucasian (C) and Hispanic (H) males as percent of total served. The letter "a" above each column indicates significant difference based on analysis of variance, Tukey's honestly significant difference; $P < 0.05$.

Similar to Caucasian boys, Figure 3 shows that Caucasian girls consumed 17% more of the dairy foods served than the Hispanic girls ($P < 0.05$). Caucasian girls also consumed significantly more of the grains, fruit, vegetable, and meat food groups than the Hispanic girls ($P < 0.05$).

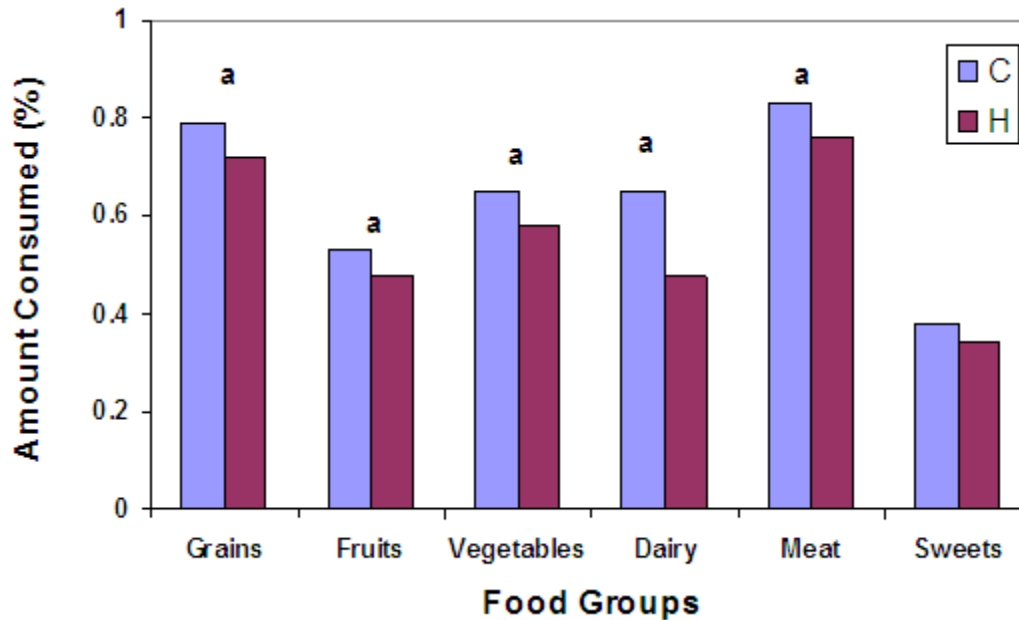


Figure 3. Food group intake of Caucasian (C) and Hispanic (H) females as percent of total served. The letter "a" above each column indicates significant difference based on analysis of variance, Tukey's honestly significant difference; $P < 0.05$.

Table 2 shows the mean number of food group servings consumed by second-, third-, fourth-, and fifth-grade students. Significant differences ($P < 0.05$) in food consumption between students of various grade levels were observed. Younger children had relatively lower intakes of all the food groups than the older children. Fifth graders generally had a greater intake of all food groups than the second graders. With the exception of meat, second graders had the lowest consumption of all the food groups. Overall, grain and meat were the most consumed food groups.

Caucasian children were generally seen to have better consumption patterns compared to the Hispanic children. This may be attributed to repeated exposure or familiarity with the foods offered in the NSLP. Birch and Fisher (1998) stated that children's food preferences and consumption patterns are largely influenced by repeated exposures to food and the social context in which the food was offered (Birch, 1999). Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland (1997) also demonstrated that Caucasian children were more likely than black or Hispanic children to meet the recommendations for the grains and dairy food groups, but were less likely than black children to meet the recommendations for the vegetable food group.

The consumption patterns noticed in Hispanic children are of concern. Since food preferences are the major determinants of consumption, it may be concluded that Hispanic children have a lower preference for many foods that are served in school lunch when compared to the Caucasian children. Dunifon and Kowaleski-Jones (2001) addressed the fact that programs, such as the NSLP, have been conceived to decrease food insecurity among children, thus improving their overall well-being. Lack of familiarity with foods served at school may be one of the reasons for lower consumption patterns. The majority of the participants in the study were Hispanics (75%) who have immigrated to central Washington from Mexico. The food the children are familiar with eating at home may be totally different from what is offered at school. Comfort foods can be defined as foods whose consumption evokes a psychologically comfortable and pleasurable state for a person (Wansink, Cheney, & Chan, 2003). Although Mexican favorites such as burritos and tacos are served as part of school lunches, these foods tend to be more "Americanized" and may not appeal to the palate of Hispanic children.

Socioeconomic status may be a predominant factor that determines the availability or accessibility of fruits and vegetables at home since fresh fruits and vegetables, especially during the winter months, are expensive (Crockett & Sims, 1995; Kirby et al., 1995). Lower consumption of fruits (48%) and vegetables (58%) among Hispanics may be attributed to the lack of access to these foods at home and thus less familiarity for these foods among the Hispanic children. Studies have consistently found that fruit and vegetable intake is lowest among low-income populations (Havas, et al., 1998). Children from more affluent homes were seen to have a greater consumption of fruits and vegetables than children from less affluent homes (Crockett & Sims, 1995). The findings of the current study, which show decreased consumption of fruits and vegetables for Hispanic children, are consistent with that of Jimenez-Cruz, Bacardi-Gascon, and Jones (2002) who analyzed fruit and vegetable consumption among Mexican children in Baja California, Mexico. Hampl and Sass (2001) found that mothers of Hispanic children, when faced with poverty, reported their greatest concern was to provide satiating foods for their children. Generally, these mothers perceived fruits and vegetables as expensive and unappealing to their children and did not consider them a priority. They fed their children grains and meat to satisfy them. Also, these mothers stated they were not familiar with the wide variety of fruits and vegetables that are available within the United States. Secondly, they were unaware of the nutritional value of the fruits and vegetables that are available here, and the ways these foods could be incorporated into their traditional Mexican recipes (Hampl & Sass).

Hispanic children were also seen to have a lower intake of the dairy food group (48%). The findings of lower preference for low-fat (1%) milk among Hispanics are in agreement with the findings of Turner (1996). These findings could be attributed to the fact that Hispanic households have a higher incidence of whole milk purchased and consumed than the general population (Wechsler, Basch,

Zybert, Lantigua, & Shea, 1995). Secondly, research shows that Hispanics have a higher preference for soft drinks, fruit juices, and fruit-flavored beverages (Cullen, Ash, Warneke, & de Moor, 2002; Jimenez-Cruz et al., 2002). Food sales show a high consumption of soft drinks among the Mexican population. In fact, Mexico is second only to the United States in soft drink consumption (Jimenez-Cruz et al.).

Based on the findings, fifth-grade students had better food group consumption patterns compared to students in the other grades. One reason for this may be that older students simply require more food. Another reason, however, for the greater preference of school lunch foods among fifth graders could be their repeated exposure to these lunches over the 5 years these students had been attending school and eating lunch. Birch and Fisher (1998) indicated children's food acceptance patterns are influenced by repeated exposure to foods and the social affective context in which they are offered. Further, elementary school lunch menus typically follow a cycle that is repeated several times during the year. Therefore, over a period of time, the fifth graders may have become familiar with the school lunch foods, hence having fewer inhibitions for consuming these foods. These results contradict the findings of Reger, O'Neil, Nicklas, Myers, & Berenson (1996) who in a plate waste study in South Louisiana, found that fifth-grade students wasted more of the fruit, bread, and rice over students of other grades. The results of the current study are in agreement with other studies that indicate younger children waste more food (Buzby & Guthrie, 2002; Devaney et al., 1995).

Another finding was that boys were seen to have better consumption patterns than girls. Although Munoz et al. (1997) found that girls generally tend to eat more fruits and vegetables for dieting purposes, the current study did not indicate higher fruit and vegetable consumption among the girls.

CONCLUSIONS AND APPLICATION

There are three major findings of this study:

- Caucasian students had better consumption patterns in NSLP meals than the Hispanic students indicating the Caucasian students may be more familiar with the foods offered than the Hispanic students and therefore, more likely preferred the foods offered more than the Hispanic students.
- The fifth grade students ate more of their school lunches than the younger children, indicating they may become familiar with the foods offered over time. Greater exposure to a food may have increased the familiarity and preference for these foods.
- The boys, regardless of ethnic background ate more than the girls. Caucasian boys consumed more than Hispanic boys and Caucasian girls ate more than Hispanic girls.

The NSLP is a secure food source for students in schools. Students whose families qualify for free and reduced price status for lunches may rely on the school lunch to meet the nutrient needs of the children eating the meal. School foodservice personnel need to provide nutritious, yet familiar food to students in their districts and schools to help ensure that the students consume the food. By consuming the foods the student will reap the nutritional advantages of the meal, helping the student maintain good health and reduce the risk of chronic diseases such as cardiovascular disease, osteoporosis, type 2 diabetes, and cancer (Position of the ADA, 2004).

Hispanic children in the schools investigated may be unfamiliar with the foods served at school and, because of this, may not consume the food that is available in the school lunch. Since food preferences are established in childhood, it is essential to provide children with healthy foods during this critical developmental time period. As evidenced by the results of the study, decreased consumption of the fruit, vegetable, and dairy food groups is becoming a concern because poor intake leads to shortfalls in the consumption of key vitamins and minerals and may affect development and growth (Position of the American Dietetic Association, 2004).

Recognizing that students from this and other studies do not always consume the school lunch that is provided, how do foodservice professionals provide meals that are nutritious, and consumed in

their districts and schools? The solution needs to consider region and be specific to the district and the school in question. A strategy needs to be developed that helps the foodservice professional establish meals that are both designed to meet the NSLP standards and will be consumed at a high rate among the students in the school.

One possible strategy for increasing children's consumption of well-balanced meals is to provide familiar nutritious meals without encouraging them to eat more calories than they need. This strategy could include:

- Surveying students and families about foods which are consumed in the home.
- Gathering recipes from parents and modifying these recipes to be appropriate for the NSLP.
- Standardizing the recipe to be produced in the quantities needed.
- Allowing the students to be involved in the selection of new menu items through student taste testing of new recipes to determine preferences.
- Including the students in the roll-out of the new menu item as a celebration day in the cafeteria to encourage student participation.

A second possible strategy is to provide the best possible environment and timing to ensure that the student is in a ready state to eat. This could include:

- Increase meal flexibility by allowing children to serve themselves, and tailoring portion sizes to their appetites and needs.
- Scheduling lunch periods to be served after recess to insure the students are in a ready state to eat.
- Scheduling lunch so that there is sufficient time to eat and socialize with their neighbors.
- Scheduling lunch so that there is optimum time between the start of school and lunch time so that lunch isn't too early or too late.
- Providing an esthetically pleasing environment that is comfortable and not too noisy.

A third strategy to improve the quality and acceptability of food is to use the cafeteria as a food lab and an extension of the classroom. Providing nutrition education to school children has been shown to improve consumption patterns in school children (Buzby & Guthrie, 2002). The cafeteria may be used as an extension of the classroom in the following ways.

- Nutrition education in the classroom can have food components that are extended into the cafeteria such as new fruits and vegetables.
- Cultural lessons in the classroom, including common foods found in different cultures can dovetail into ethnic celebrations and cuisine served in the cafeteria.
- History lessons can show differences in foods served throughout history and school wide celebrations including historical cafeteria cuisine.
- Geography lessons may include the types of food grown and consumed in different parts of the world.

Providing foods that meet the required NSLP standards while also being accepted and consumed by students is a multi-faceted problem and will take a multi-faceted solution. The above suggestions are only a few ideas that may help with the ultimate goal of meeting the nutrition needs of school children.

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