The Journal of Child Nutrition & Management
Volume 31, Issue 2, Fall 2007
Published by School Nutrition Association

Food Preferences of School Age Children and Adolescents in an Ohio School District

Natalie Caine-Bish, PhD, RD, LD; Barbara Scheule, PhD, RD

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
The purpose of this study was to identify food preferences of school age children and adolescents in an Ohio school district.

Methods
A survey was administered to 1,818 3rd-12th grade students in one school district in Ohio. Students who volunteered to participate filled out an anonymous questionnaire about their preferences for 80 different foods using a 5-point rating scale. Students were placed into three groups: elementary (3rd-6th), middle (7-8th), and high school (9-12th). Exploratory factor analysis was used to determine if the entrees and the side dish food items could be meaningfully grouped into factors. Cronbach's alpha was calculated for each factor to assess reliability. Analysis of variance was used to examine differences in mean values for each factor by grade level of the respondents.

Results
Many high fat and calorie foods were identified as popular; however, many foods especially fruits that are encouraged as part of a healthy diet were identified as favorites. Furthermore, differences in preferences were demonstrated with respect to school level.

Application to Child Nutrition Professionals
Insight into food preferences reported by children and adolescents is valuable information that may be used to improve the diets of this population. Although this study found many of the top-rated foods were high in fat and calories, there were numerous other foods such as strawberries, grapes, watermelon, and milk that demonstrated strong favor.

INTRODUCTION

Efforts continue to be made to promote healthy eating habits among the nation's youth. In 1994, the USDA's School Meals Initiative for Healthy Children was developed in part to lower the fat and saturated fat content of the school menus by following the USDA Dietary Guidelines for Americans in menu planning (U.S. Department of Agriculture, 2005). In 2003, the U.S. General Accounting Report on the School Lunch Program found schools had reduced the proportion of calories from fat from 38 percent in 1991-92 to 34% in 1998-1999. However, school officials interviewed for this report suggested offering lower fat foods on the menu was considered financially risky due to the perception fewer students would buy lunches.

With the passage of the *Child Nutrition and WIC Reauthorization Act of 2004* (P.L. 108-265) mandating the establishment of a local wellness policy by Fall 2006 in schools participating in the National School Lunch Program, school foodservice directors will need to further explore how to provide and encourage the consumption of healthy foods. Student acceptance of more fruits and vegetables (Georgiou, Martin, & Long, 2005) and lower fat foods are potential concerns; therefore, children and adolescent food preferences will be an important component to consider in successful menu alterations (Cooke & Wardle, 2005; Lytle, Seifert, Geenstein, & McGovern, 2000; Skinner, Carruth, Bounds, & Ziegler, 2002; Wardle, Carnell, & Cooke, 2005).

Compared to young children, adolescents experience greater autonomy and, thus, their food choices may be influenced by growing independence. Some researchers have shown stability in food consumption patterns and/or neophobia throughout childhood and adolescence (Kovisto & Sjoden, 1996; Lein, Lytle, & Klepp, 2001; Pelchat & Pliner, 1995; Skinner et al., 2002) while others have demonstrated food preferences to change across time (Cooke & Wardle, 2005). Neumark-Sztainer, Story, Perry, and Casey (1999) found 7th and 10th grade students indicated hunger and cravings, food appeal, time, and convenience as factors influencing their food choices. When asked what would make eating healthy easier, adolescents indicated healthy foods needed to taste and look better and be more accessible and convenient.

Consideration of methods for altering food offerings to children and adolescents also is important because these mechanisms may impact food preferences and consumption. Food preferences and consumption of fruits and vegetables were found to be strongly correlated in a study of 4th and 5th grade children (Cullen, Eagen, Baranowsky, Owens, & de Moor, 2000). Notably, significantly lower lunch intakes of fruit, juice, and vegetables were reported by the 5th graders who had access to a snack bar compared to the 4th graders without snack bar access. Other researchers have examined ways to encourage increased consumption of lower fat foods (Fulkerson, French, Story, Nelson, & Hannan, 2004) and fruits and vegetables (Hendy, Williams, & Camise, 2005). Researchers in Minnesota found collaborative efforts involving students in the promotion of lower-fat foods within secondary schools were successful in increasing lower-fat a la carte food sales in the school cafeteria (Fulkerson et al.). Hendy et al. found a "Kids' Choice" school lunch program for grade school children promoted fruit and vegetable acceptance.

Some foodservice directors have expressed concern that children will not participate in the school lunch program or purchase a la carte foods if lower fat foods and more fruits and vegetables are emphasized through menu offerings (U.S. Department of Agriculture, Food and Nutrition Service, 2005). As a first step in improving the diets of children within the school setting, assumptions about student food preferences should continue to be examined. The purpose of this study was to identify food preferences of school age children and adolescents in one Ohio school district.

Specific research questions included:

- What fruits, vegetables, breads and grains, entrees, and dairy foods potentially offered in a school setting are most preferred by children and adolescents in grades 3-12?
- Are some food groups more preferred by children and adolescents compared to other food groups?

- Are food preferences different depending on grade level?

METHODOLOGY

An Ohio school district in rural northeast Ohio agreed to be a site for data collection and students within this district in grades 3rd through 12th were asked to participate in the study. The data from the Ohio Department of Education from the 2005-2006 school year report the district's student enrollment as 2350 with 95.7% of the district white, 2% African American, and 1.9% other ethnicities. The district reports that 21.2% of the student body is economically disadvantaged.

Questionnaire Development

The foods used in the survey included the most typical foods used as menu options in local school districts as well as a list of lower calorie and/or fat options, fruits, vegetables, and dairy that could be used readily to increase consumption of these food groups. The questionnaire was piloted during the fall 2005 school semester for readability for all grade levels. The University Review Board reviewed the research protocol and instruments and approved the use of the data collected for the school district for research purposes. Assent/Consent was gained from all participants.

The questionnaires were completely anonymous and it was voluntary for the students to participate. Participants were asked to determine their preferences for 80 different foods on a 5-point rating scale with anchors of "favorite" (4), "like some" (3), "it depends" (2), "dislike a little" (1), "Yuk" (0). Pictorial smiley faces also were used above the written scale to make it easier for the children and adolescents to determine the best option for each food. Participants also had the option of selecting "I do not know if I like or dislike" if they were unsure of a food. Data were then organized and analyzed by school: elementary (3rd - 6th grade), middle (7th - 8th grade), and high school (9th - 12th grade). This organization was chosen based on the school districts grouping of grade levels for each school.

Data Collection

Questionnaires were distributed by homeroom teachers to all 3rd through 12th grade students to be completed in the classroom. The students were asked to read the directions provided and fill out the questionnaire. Students were given approximately 20 minutes to complete the questionnaires. Students returned the questionnaire to their teacher who then placed it in a sealed envelope. The researchers collected the questionnaires from the participating schools in the district.

Data collected from the pilot questionnaires were compared to the data used in this study and consistency of answers between the questionnaires was demonstrated. A summary of the results was shared with school administrators to assist with planning for school foodservice.

Data Analysis

Statistical procedures of SPSS for Windows (version 11.5.0, 2002, SPSS, Chicago, Ill) were used for all analyses. Initial data analysis included calculation of frequencies, means, and standard

deviations for all questions. Chi Square analysis was used for categorical data. Exploratory factor analysis using the minimum maximum procedure with a varimax rotation was used to determine if the entrees and the side dish food items could be meaningfully grouped into factors. Grouping the data into a smaller number of variables called factors reduces the experimental error associated with multiple comparisons. Thus, the factors that emerged from the factor analysis were used to examine differences in means by school. Only foods with loading values of 0.35 or higher were included in the factors, and not all of the 80 foods could be meaningfully grouped into factors. Cronbach's alpha was calculated for each of the factors as a measure of reliability. All of the factors had an alpha greater than the recommended minimum alpha level of 0.70. Analysis of variance was used to examine differences in mean values for each of the factors by school of the respondents. Bonferroni adjustment was utilized for assessing multiple comparisons.

RESULTS AND DISCUSSION

Of the 1,818 total students in grades 3-12 in the district 1,418 or 78 % of the students returned completed questionnaires. The demographics of the children participating in the study are presented in Table 1. Respondents ranged in age from 8-18 years or older and represented nearly equal numbers of boys and girls.

Table 1. Demographics of school-age children and adolescents in study (N=1418).

	n	%
Age in years (*n*=1387)		
8-9	218	15.7
10-11	372	26.8
12-13	221	15.9
14-15	291	21.0
16-17	243	17.6
18 or older	42	3.0
School (*n*=1418)[a]		
Elementary	642	45.3
Middle School	215	15.2
High School	561	39.6
Gender (*n*=1374)		
Girl	670	48.8
Boy	704	51.2

[a] Elementary School represented two schools with grades 3-6, Middle School represented one school with grades 7-8,nd High School represented one school with grades 9-12.

Children's Food Preferences

Children's food preferences for the eighty foods included on the questionnaire are presented in Table 2. Many foods commonly found on children's menus are found near the top of the list. However, notably fruits and vegetables such as strawberries, fruit juice, watermelon, baked potatoes, and grapes were among the top twenty foods.

Previous investigations reported that children choose what they prefer (Birch, 1979; Drewnowski, 1997; Resnicow et al., 1997), therefore, if a food ranks high with regards to preference the child will be more likely to choose that food. Data from the current study demonstrated that many of the typical fried and fast food choices, such as pizza and French fries, ranked as "favorites" for the participants. The only 'vegetables' that ranked in the 'Top 20' foods in the current investigation were potato options such as french fries, tator tots, mashed and baked potatoes. When looking at national vegetable consumption data, the most popular vegetable choice is fried potatoes (Guthrie, Lin, Reed, & Stewart, 2005). Georgiou et al. (2005) demonstrated that 3rd graders were more likely to select entrees and milk than the vegetable selections. Overall preference for vegetables in the current investigation was low. The

"vegetarian or vegetable emphasis" entrée factor and the "vegetable and sides" side dish factor demonstrated the lowest means (1.6±1.0 and 2.0±1.4, respectively). One of the limitations of this study is that vegetables were not assessed as part of grain and meat mixtures. Vegetables can contribute to a quarter of the weight of grain and meat dishes (Enns, Goldman, & Cook, 1997) and thus an assessment of the preference for vegetables in mixed foods would have provided a fuller understanding of vegetable preferences overall.

Even though pizza, French fries, tator tots, chicken nuggets, tacos, and hamburgers ranked high, it should be noted that many lower fat and calorie entrees, as well as foods in the dairy, fruits, and vegetables groups, were rated as "favorites" or "like some." For example, pizza, French fries, chocolate milk, tator tots, and chicken nuggets were the top five food preferences from this study, but foods that ranked in the "Top 20" included chocolate milk, strawberries, watermelon, sub sandwiches, white milk, grapes, yogurt, and string cheese. It is somewhat surprising to find as many fruits in the 'Top 20' ranked foods when comparing to national intake data that illustrates the average American only consumes 1.4 servings of fruit a day (Guthrie et al., 2005). Other researchers also have found that strawberries and grapes were listed in their participants' 'Top 10' foods (Cooke & Wardle, 2005), which is consistent with the findings of the current study where strawberries were found within the 'Top 10' foods and grapes within the 'Top 20'.

This study demonstrated some dairy foods are highly preferred by children. Chocolate milk was ranked as the third most preferred food on the list and white milk made the 'Top 20' list. Enns, Mickle, and Goldman (2002) found that in 1998 children between the ages of 6-11 drank 1.5 times as much milk as soft drinks. Since soft drinks are not served as part of the National School Lunch Program, managers and menu planners have an opportunity to increase low-fat dairy consumption during breakfast and lunch with dairy choices potentially popular among children and adolescents. These dairy choices can be expanded beyond low-fat flavored milks and include products such as yogurt and low-fat fruit and yogurt smoothies, string cheese, cubed cheese, etc.

It is of concern that children prefer many high calorie, high fat, and fried options such as pizza, French fries, and chicken nuggets, but many of these food preferences may be determined by a combination of genetics and the environment (Benton, 2004). Foods with high energy density have been found to be preferred over lower energy density foods, which could be the reason for preferences in foods that are higher in fat (Benton). Not only do genetic predispositions have an impact on food preferences, but the environment also has an important impact. For example, foods that are used in a reward environment decrease the preference for foods that are not used as part of a reward (Newman & Taylor, 1992). Culture also has an influence on eating habits (Benton). On average, approximately 30.3% of children between the ages of 4-19 consume fast food on a given day and the children who consumed these fast food items on average consumed an excess of 187 kcal/day. These excess calories could yield up to an excess of six pounds gained per year (Bowman, Gortmaker, Ebbeling, Pereira, & Ludwig, 2004). Therefore, if the environment displays a high percentage of high fat, calorie, and sugar foods, then a child and/or adolescent may be more likely to consume these foods. This could be one of the reasons for the high preference for the fast food like items determined in the current study. Other studies also have demonstrated these high preferences to fast and fried foods (Cooke & Wardle, 2005; Lytle et al., 2000; Skinner et al., 2002).

Table 2. Food preferences of children and adolescents (N= 1418).

	n	<--- % frequency of responses --->					
		Favorite	Like some	It depends	Dislike a little	I will not eat this food	I do not know
pizza[a]	1397	75	14.2	5.6	1.6	3.5	0.1
French fries[a]	1388	74.8	16.8	4.4	1.1	2.8	0.1
chocolate milk[a]	1390	72.4	14.2	5	1.4	6.7	0.3
tator tots[a]	1381	70.5	16.5	5.4	2.5	3.9	1.2
chicken nuggets[a]	1386	67.3	19.5	6.8	2	4.2	0.2
tacos[a]	1382	66.6	15.1	7.8	2.5	7.2	0.7
donuts[a]	1392	66.1	19.7	8	2.4	3.5	0.3
mashed potatoes[a]	1389	65.6	17.3	7.5	2.2	6.8	0.4
strawberries[a]	1393	62	19	8	3.1	6.9	0.9
hamburger[a]	1395	60.1	21.4	9.7	2.4	6.2	0.3
fruit juice[a]	1385	58.3	24.3	11	2.3	3.4	0.6
watermelon[a]	1392	58.2	19.8	8.8	5.3	7.3	0.6
sub sandwich[a]	1389	57.6	18.1	12	3	7.3	1.9
white milk[a]	1392	56.1	19.5	10.1	3.6	10.1	0.6
bagels[a]	1392	55.7	22.6	11.6	3.4	5.2	1.2
baked potatoes[a]	1396	55.6	19.3	9.2	4.5	9.7	1.7
grapes[a]	1379	55.1	27.8	9.5	3	4.3	0.2
macaroni and cheese[a]	1391	54.5	20.4	11.6	4.5	8.5	0.6
yogurt[b]	1390	53.2	18.8	14.1	3.2	10.3	0.5
string cheese[b]	1397	51.7	18.2	10.6	5.6	13	0.9
corn[a]	1386	51.7	24.8	10.8	4	8.3	0.4
muffins[a]	1401	51.7	23.6	15.9	3.9	4.6	0.4
banana bread[b]	1392	50.9	16.9	9.3	5.7	12.6	4.5
white bread[a]	1380	48.9	29.3	10.5	3.3	6.8	1.2
sliced cheese[b]	1401	46.7	18.1	13.6	6.6	13.6	1.4
cheese cubes[b]	1395	46.6	17.9	12	6.3	14.5	2.7
grilled cheese sandwich[b]	1393	46.4	25.7	14.5	4.5	8.4	0.4
tossed salad[b]	1387	46.1	18.5	8.8	3.1	18.2	5.3
lasagna[b]	1391	45.5	17.2	12.6	4.8	15.2	4.7
spaghetti[b]	1381	45.4	23	14.8	4.9	10.8	1
quesadillas[b]	1402	44.4	17.5	8.8	3.1	12.8	13.6
strawberry milk[b]	1373	44	15.7	8.9	5.5	21.8	4.1
white rice[b]	1385	43.5	19.6	12.9	5.1	16.3	2.6
hot dog[b]	1391	43.4	24.6	13.9	5.3	12.4	0.4
fajitas[b]	1401	41.9	16.8	10.7	4.5	11.5	14.6
green beans[b]	1388	39.8	21.4	15	6.5	16.9	0.4

oranges[b]	1372	39.6	29.7	14.4	7.4	7.6	1.4
tortilla[b]	1383	39.2	28	13	3.1	8	8.7
banana[b]	1391	39	27.7	14.9	8.6	16.2	4
pineapple[b]	1390	38.3	21.2	10.9	6.8	19.4	3.4
chili[b]	1385	38	16.6	15.2	6.6	21.8	1.8
carrot sticks[b]	1388	37.8	19	13.6	7.6	19.2	2.8
mandarin oranges[b]	1379	37.5	21.4	11.2	7.8	13.3	8.8
cantaloupe[b]	1381	36.8	19.9	11.1	9	18.8	4.5
applesauce[b]	1387	36.6	29.9	13.8	7	11.3	1.4
chicken Caesar salad[b]	1402	36.5	17.3	11.5	4.7	18.1	11.9
peaches[b]	1369	35.8	24.5	13.3	7.8	15	3.7
wheat bread[b]	1372	35.7	26.9	12.9	7.1	14.7	2.8
apple[a]	1409	35.5	41.1	17	3.3	2.6	0.2
Spanish rice	1383	33.8	14.2	9.8	5.3	27.8	9.1
meatball sub[b]	1383	33.1	20.1	13.4	7.4	22.6	3.4
peanut butter jelly sandwich	1377	32.7	24.6	17.9	9	15.3	0.6
salad with meat and cheese	1378	32.7	19	12.8	6.8	21.7	6.9
broccoli	1393	32.4	15.6	12.4	7.2	29.6	2.7
brown rice	1385	31.7	15.9	12.5	7.1	23.2	9.5
blueberries[b]	1381	31.5	21.2	16	8.8	18.5	4.1
corn bread[b]	1384	30.8	24.6	16.3	7.4	16.6	4.3
BBQ beef sandwich	1377	30.8	18.4	12.9	6.8	23.3	7.8
raspberries[b]	1381	30.5	21.4	13.8	8.3	20	6.1
bean burrito	1372	29.3	16.7	11.8	7.1	26.7	8.5
BBQ pork sandwich	1379	28.9	15.9	14.4	7.8	25.7	7.4
green peas	1384	28.9	14.5	9.6	8	35.4	3.6
celery sticks	1378	28.8	16.6	13.6	6.2	30.8	3.9
pears[b]	1386	28.6	27.7	14.9	8.6	16.2	4
stir fry	1383	28.6	16.3	11.5	6.2	19.3	18.1
cherry tomatoes	1380	26.7	9.4	7.3	7.2	40.4	9
chicken noodle casserole	1380	26.2	13.8	13.3	7.2	25.7	13.8
cauliflower	1381	21.1	13.4	11.6	8.8	37.2	8
green bean casserole	1386	19.6	8.6	11.1	7.9	39.8	13.1
refried beans	1384	19.4	11.5	12.4	7.6	34.9	14.2
tuna noodle casserole	1383	16.9	10.4	10.6	6.6	45.3	10.3
fish sandwich	1388	15.9	11.1	12.6	7.1	47.9	5.4
tuna salad sandwich	1375	15.1	10.9	10.8	9.7	48.9	4.6
beef French dip	1388	12.7	8.9	10.1	7.1	32.5	28.7
raisins	1378	13.9	18.5	15.9	12.8	37.4	1.4
spinach salad	1384	13.3	7.4	9.1	6.6	52.7	10.9

vegetable lasagna	1388	10.7	7.3	8.5	7.2	42.5	23.8
collard greens	1364	10	8.2	9.2	6.1	38.5	27.9
vegetarian chili	1408	8.5	6.3	8.7	5.7	42.2	28.6
black eyed peas	1379	8.3	7	9.9	8	45.4	21.3

[a] 75 percent or more rated this food as a "favorite" or as "like some"
[b] 50-74 percent rated this food as a "favorite" or as "like some"

Food Preferences in Relationship to Grade Level

The entrée and side dish factor loadings and mean ratings by school are presented in Table 3. Five entrée factors were identified using an exploratory minimum maximum factor analysis with a varimax rotation, and four side dish factors emerged. Differences were found among the children based on their grade level for all of the entrée and side dish factors.

For all entrée factors determined in this study there were differences in preference ratings based on school level. The entrée factors of "ethnic," "vegetarian or vegetable," "fish or casserole," "beef, pork, and BBQ," and the side dish factors of "vegetables and sides" were all demonstrated as being more favorable at the high school level than either elementary or middle school level, or both the elementary and middle school level. Two side dish factors, "fruit" and "starches" were rated more favorably by the elementary students compared to the middle or high school students, or both the middle school and high school students. This may contradict studies that have shown stability in food consumption patterns and/or neophobia over time (Kovisto & Sjoden, 1996; Lein et al., 2001; Pelchat & Pilner, 1995; Skinner et al., 2002). However, differences in age ranges, types of foods reported, and methodology make it difficult to directly compare these research studies to the current study.

Other researchers have found changes in diet with age. Cooke and Wardle (2005) found that as the age of their sample increased so did the number of foods tried as well as the number of foods disliked. This could be due to the possibility there may be deterioration in the diet with age (Cooke & Wardle; Lytle et al. 2000). Lytle et al. demonstrated decreases in fruit, vegetable, milk, and fruit juice consumption with an increase in soft drink consumption between elementary and middle school children. The current data also may demonstrate this decline in dietary habits whereby the "fruit" side dish factor is ranked more favorable at the elementary school. However, at the same time, the "fast and familiar" foods entrée factor that included items such as chicken nuggets, hot dogs, and hamburgers was less preferred by middle school and high school students compared to the elementary students.

Table 3. Differences in children's and adolescents' ratings of food factors by school (N=1418).

	Factor[a]	<--------School Mean[b]±SD-------->			
	Loading	Total[c]	Elementary[d]	Middle[e]	High[f]
ENTREE FACTORS					
Fast and Familiar Foods (α=.74)		3.0±0.7	3.2±0.7 [l,m]	2.9l	3.0±0.7 [m]
Chicken Nuggets	0.54				

Hot Dog	0.54				
Hamburger	0.52				
Macaroni & Cheese	0.50				
Lasagna	0.49				
Pizza	0.47				
Spaghetti	0.41				
Peanut Butter & Jelly Sandwich	0.38				
Grilled Cheese	0.38				
Ethnic (α=.83)[g]		2.7±1.0	2.6±1.1 [l]	2.6±1.0 [m]	2.9±0.9 [l,m]
Fajitas	0.73				
Quesadillas	0.68				
Taco	0.60				
Chili	0.57				
Bean Burrito	0.56				
Sub Sandwich	0.51				
Chicken Caesar Salad	0.46				
Meatball Sub	0.39				
Beef, Pork, & BBQ (α=.80)		2.0±1.4	2.0±1.5 [j]	1.9±1.3 [h]	2.2±1.3 [h,j]
BBQ Beef Sandwich	0.87				
BBQ Pork Sandwich	0.75				
Beef French Dip	0.39				
Vegetarian or Vegetable Emphasis (α=.75)		1.6±1.4	1.5±1.5 [l]	1.4±1.3 [m]	1.8±1.3 [l,m]
Vegetarian Lasagna	0.82				
Vegetarian Chili	0.67				
Stir Fry	0.48				
Fish or Casserole (α=.76)		1.5±1.3	1.4±1.3 [j]	1.4±1.2	1.7±1.2 [j]
Tuna Noodle Casserole	0.80				
Tuna Sandwich	0.65				
Chicken Noodle Casserole	0.56				
Fish Sandwich	0.37				
SIDE DISH FACTORS					
Starches & Sweets (α=.81)		3.2±0.6	3.3±0.6 [h,l]	3.1±0.7 [j,l]	3.2±0.5 [h,j]
French Fries	0.62				
Tater Tots	0.60				
Bagels	0.54				
Muffins	0.53				
Baked Potatoes	0.52				
Donuts	0.52				
Mashed Potatoes	0.51				
White Bread	0.51				
Tortilla	0.43				
Fruit Juice	0.43				

Corn	0.43				
Chocolate Milk	0.42				
Yogurt	0.37				
Banana Bread	0.36				
Cheese (α=.89)		2.8±1.3	2.9±1.3 [l]	2.5±1.4 [l,m]	2.9±1.2 [m]
Cheese Cubes	0.87				
Slice Cheese	0.77				
String Cheese	0.59				
Fruit (α=.88)		2.7±0.8	2.8±0.8 [j]	2.6±0.8	2.7±0.7 [j]
Pears	0.69				
Oranges	0.66				
Mandarin Oranges	0.62				
Strawberries	0.60				
Raspberries	0.57				
Blueberries	0.56				
Pineapple	0.54				
Cantaloupe	0.52				
Grapes	0.49				
Applesauce	0.48				
Apples	0.45				
Bananas	0.44				
Watermelon	0.43				
Raisins	0.39				
Vegetables & Sides (α=.91)		2.0±1.0	2.0±1.1 [l]	1.8±1.0 [l,m]	2.1±1.0 [m]
Cauliflower	0.67				
Collards	0.65				
Spinach	0.64				
Brown Rice	0.61				
Green Bean Casserole	0.61				
Black Eye Peas	0.60				
Broccoli	0.60				
Refried Beans	0.57				
Spanish Rice	0.57				
Green Peas	0.56				
Celery	0.52				
White Rice	0.52				
Carrot Sticks	0.47				
Green Beans	0.46				
Cherry Tomatoes	0.44				
Tossed Salad	0.39				

[a] Items loading 0.35 or higher were included in the factors.

[b] Scale ranged from 4=Favorite: I love this food, 3=Like some: I will eat this food, 2=It depends, 1=Dislike a little, 0=Yuk! I will not eat this food. Respondents could also respond (?) I do not know if I like or dislike. These responses were coded as missing data for the factor analysis.
[c] *n* varies from 1268-1372, represents school grades 3-12
[d] *n* varies from 534-620, represents school grades 3-6
[e] *n* varies from 196-208, represents school grades 7-8
[f] *n* varies from 538-545, represents school grades 9-12
[g] Cronbach's alpha
[h-i] (p = .05) significant differences between values in the row with the same letter.
[j-k] (p = .01) significant differences between values in the row with the same letter.
[l-m] (p = .001) significant differences between values in the row with the same letter.

CONCLUSIONS AND APPLICATIONS

Insight into the food preferences reported by children and adolescents is valuable information that may be used by foodservice managers and others who are seeking to improve the diets of school age children while developing life-long healthy eating habits. It is important to determine food preferences of children in addition to food consumption data because the two data sets may not always parallel each other and therefore preference data may give foodservice directors useful information to help with school menu planning.

This study found many of the top rated foods were high in fat and calories, but numerous other foods such as strawberries, grapes, watermelon, and milk also demonstrated strong favorability. Even though not all of the dairy and fruit choices listed on the questionnaire were ranked in the top five, many dairy and fruit selections were within the top 25% of the foods listed and may represent healthier options that children and adolescents enjoy and may choose as part of the school lunch. It may be that children and adolescents like dairy and fruit choices, but these foods may not be offered regularly in many settings (i.e., home, school, restaurant) causing the discrepancy between preference and consumption. When making school foodservice menu changes to increase and/or enhance healthier menu options that will have high marketability, it will be important not only to consider consumption data, but also preference data.

School foodservice professionals and dietitians have been promoting the consumption of a wide variety of foods for a healthy diet. Likewise, those planning menus and meals for children should include a wide variety of menu selections. Many foods recommended to be consumed in greater frequency by children were rated as favorites or as liked by more than 50% of the students. Menu planners should consider the inclusion of these selections in their menus as means to improve nutritional quality as well as satisfaction. Even some of the most favored foods are disliked by some students and thus these children are at a disadvantage when menus lack variety.

This study also found the preferences of students was not static, but was different among elementary, middle, and high school students. This was a cross-sectional study and did not follow the participants longitudinally, which may have provided different outcomes, but the possible differences in food preferences with regards to grade level are important. Furthermore, differences between grade levels demonstrated in this study signify the importance of measuring food preferences of children at different ages to increase the opportunities for students to participate in the National School Lunch Program. Menu offerings should reflect the changing preferences of children as well as dietary recommendations for health. District school foodservice directors who plan very similar menus for all ages may want to look more closely at preferences by grade level.

Results of this study should be considered in relation to study limitations. Children and adolescent food preferences reported in this research are likely to reflect regional as well as local food preferences because data were collected in only one school district in Northeast Ohio. Additionally, food preferences were not measured in relationship to the preparation or source of the food. For example, a student may like broccoli if raw with dip but not when cooked. Likewise, students may like only specific brands or sources of some foods such as hamburgers or pizza. Therefore, it is unknown if when rating preferences, students reported preference in relationship to the food in general or the food as served at school, home, or a restaurant.

Future research should examine preferences of children in additional regions of the country or on a national basis. As schools further assess the healthy eating environment within the school setting, food preferences for snacks that may be sold in school vending operations should be examined in effort to identify healthy, yet preferred selections. A greater understanding of the implications of food quality or product brand on the preferences and consumption of children in the school setting also should be explored.

ACKNOWLEDGEMENTS

The authors gratefully recognize Jodie Luidhardt, graduate student in Nutrition, for the many hours devoted to computer data entry. Also recognized are Karen Givens Larwin and Patricia Peters, Kent State University Bureau of Research Training and Services for their advice and counsel in the statistical analysis of the data.

REFERENCES

Benton, D. (2004). Role of parents in the determination of the food preferences of children and the development of obesity. International Journal of Obesity, 8, 858-869. Birch, L. L. (1979). Preschool children's food preferences and consumption patterns. *Journal of Nutrition Education*, 11, 189-192.

Birch, L. L. (1979). Preschool children's food preferences and consumption patterns. *Journal of Nutrition Education,* 11, 189-192.

Bowman, S. A., Gortmaker, S. L., Ebbeling, C. B., Pereira, M. A., & Ludwig, D. S. (2004). Effects of fast food consumption on energy intake and diet quality among children in a national household survey. *Pediatrics,* 113, 112-118.

Child Nutrition and WIC Reauthorization Act of 2004. Pub L No. 108-265 § 204. (2004). Retrieved February 18, 2006, from http://www.fns.usda.gov/tn/Healthy/108-265.pdf

Cooke, L. J., & Wardle, J. (2005). Age and gender differences in children's food preferences. *British Journal of Nutrition,* 93, 741-746.

Cullen, K. W., Eagen, J., Baranowsky, T., Owens, E., & de Moor, C. (2000). Effect of a la carte and snack bar foods at school on children's lunchtime intake of fruits and vegetables.*Journal of the American Dietetic Association,* 8, 1482-1486.

Drewnowski, A. (1997). Taste preferences and food intake. *Annual Review of Nutrition,* 17, 237-253.

Enns, C. W., Goldman, J. D., & Cook, A. (1997). Trends in food and nutrient intakes by adults: NFCS 1977-78, CSFII 1989-91 and CSFII 1994-95. *Family of Economic Nutrition Reviews,* 10(4), 2-15.

Enns, C. W., Mickle, S. J., & Goldman, J. D. (2002). Trends in food and nutrient intakes by children in the United States. *Family Economics and Nutrition Review,* 14(2), 56-68.

Fulkerson, J. A., French, S. A., Story, M., Nelson, H., & Hannan, P. J. (2004). Promotions to increase lower-fat food choices among students in secondary schools: description and outcomes of TACOS (Trying Alternative Cafeteria Options in Schools). *Public Health Nutrition,* 7, 665-674.

Georgiou, C., Martin, L., & Long, R. (2005). What third graders select and eat from school lunches when they have choices. *Journal of Child Nutrition and Management,* Retrieved October 8, 2006, from http://docs.schoolnutrition.org/newsroom/jcnm/05fall/georgiou/index.asp

Guthrie, J. F., Lin, B. H., Reed, J., & Stewart, H. (2005). Understanding economic and behavioral influences on fruit and vegetable choices. *Amber Waves,* 3(2), Retrieved May 10, 2006, from http://www.ers.usda.gov/AmberWaves/April05/pdf/awapril05.pdf

Hendy, H. M., Williams, K. E., & Camise, T. S. (2005). "Kids' Choice" School lunch program increases children's fruit and vegetable acceptance. *Appetite,* 45, 250-263.

Kovisto, U. K., & Sjoden, P. O. (1996). Food and general neophobia in Swedish families: Parent-child comparisons and relationships with serving specific foods. *Appetite,* 26, 107-118.

Lein, N., Lytle, L. A., & Klepp, K. I. (2001). Stability in consumption of fruit, vegetables, and sugary foods in a cohort from age 14-21. *Preventative Medicine,* 33, 217-226.

Lytle, L. A., Seifert, S., Greenstein, J., & McGovern, P. (2000). How do children's eating patterns and food choices change over time? Results from a cohort study. *American Journal of Health Promotion*, 14(4), 222-228.

Neumark-Sztainer, D., Story, M., Perry, C., & Casey, M. A. (1999). Factors influencing food choices of adolescents: Findings from focus-group discussions with adolescents. *Journal of the American Dietetic Association,* 99, 929-937.

Newman, J., & Taylor, A. (1992). Effect of a means-end contingency on young children's food preferences. *Journal of Experimental Child Psychology*, 53(2), 200-16.

Pelchat, M. L., & Pliner, P. (1995). Try it. You'll like it. *Appetite*, 24(2), 153-65.

Skinner, J. D., Carruth, B. R., Bounds, B., & Ziegler, P. J. (2002). Children's food preferences: A longitudinal analysis. *Journal of the American Dietetic Association*, 102, 1638-1647.

Resnicow, K., Davis-Hearn, M., Smith, M., Baranowski, T., Lin, L. S., Baranowski, J., Doyle, C., & Wang, D. T. (1997). Social-Cognitive predictor of fruit and vegetable consumption.*Health Psychology*, 16, 272-276.

U.S. Department of Agriculture, Food and Nutrition Service. Road to SMI Success: A guide for school foodservice directors. Introduction. (2005, December) Retrieved June 17, 2006, from http://www.fns.usda.gov/tn/Resources/roadtosuccess.html

U.S. General Accounting Office. *School lunch program: Efforts needed to improve nutrition and encourage health eating.* (2003, May). Retrieved June 14, 2006, from http://www.gao.gov/cgi-bin/getrpt?GAO-03-506

Wardle, J., Carnell, S., & Cooke, L. (2005). Parental control over feeding and children's fruit and vegetable intake: How are they related? *Journal of the American Dietetic Association,*105, 227-232.

BIOGRAPHY

Caine-Bish and **Scheule** are, respectively, assistant professor and associate professor for the School of Family and Consumer Studies at Kent State University in Kent, OH.