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Ethnicity and Diet of Children: Development of Culturally Sensitive Measures

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Obesity is a growing global concern. Examining dietary habits of individuals can facilitate the development of important prevention approaches, which are needed to decrease the incidence of obesity and other related diseases and improve quality of life indices. Because food preferences and dietary habits vary across cultures, it is essential that prevention programs are based on specific populations. Using both ethnographic and quantitative methods, food-consumption patterns were investigated among 1,125 children in the Commonwealth of the Northern Mariana Islands. Differences were observed related to food frequency, age of children, and grade level. Exploratory factor analyses suggested that the individual foods were best organized into food-consumption groups that reflected cultural characteristics rather than more commonly referenced food organizational systems. In addition to developmental differences in food consumption patterns, results suggest that the ethnicity of parents may play a role in the diet of children.

Keywords: *ethnicity; diet; culture*

Historically, prevention strategies have been employed by families and communities to bring about healthy outcomes for those most affected by health conditions. The growing concern for obesity and chronic diseases in communities around the world suggest the need for more effective food-related prevention strategies. For this process to

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achieve its goals, understanding the dietary habits of populations and smaller cultural groups is necessary. This is because of the role of diet in conditions such as childhood obesity, a known risk factor for adult obesity and chronic diseases (Dietz, 1998; Goran, 2001; O'Loughlin, Paradis, Meshefedjian, & Gray-Donald, 2000).

A child's dietary intake is influenced by a number of environmental factors (Neumark-Sztainer, Story, Perry, & Casey, 1999), including television (Coon, Goldberg, Rogers, & Tucker, 2001), caregivers, peers, and nutrition education intervention programs (Contento, Randell, & Basch, 2002). Research focusing on caregivers' influence on children's food choices suggests that sociocultural, familial, and nutrition knowledge influences children's dietary intake through the transmission of messages from caregivers to children (Bruss, Morris, Dannison, Orbe, Quitugua, & Palacios, 2005). In addition, children's attitudes toward food and eating are learned and reinforced within the home, and food choices are influenced by available food in the home (Garn & Clark, 1976). Across cultures, populations with different dietary practices exhibit different health care status (Drewnowski & Popkin, 1997; Wang, Abbot, & Goodbody, 2002). In multiethnic communities, the importance of examining children's food-consumption behaviors becomes relevant for several reasons. These reasons include the increasing risk of chronic diseases related to diet and the awareness that sociocultural and familial factors, often differentiated by one's group membership and/or ethnicity (Rosenthal & Feldman, 1992), are potent influences on children's diet.

Not surprising, the relationship between ethnicity, disease, and diet (Bruss, Morris, & Dannison, 2003; Shiboski et al., 2003) is a growing area of interest among health care investigators. For instance, ethnic differences were observed in added sugar intake, fruit- and vegetable-consumption patterns, and dietary fat intake among children (Kranz & Siega-Riz, 2002; Ku, Gower, Nagy, & Goran, 1998; Reynolds et al., 1999). Melnik, Rhoades, Wales, Cowell, and Wolfe (1998) found that the measures of food consumption were related to race/ethnicity in elementary school children. De Castro (1997) reported the influence of culture on total energy intake, frequency and size of meals, and food choices in diet. Thompson & Dennison (1994) reported geographic, regional, and national differences in children's food-consumption patterns.

Understanding children's food preferences and dietary habits across cultures is necessary to design more effective nutrition education programs (Bruss et al., 2003). However, a notable limitation of the prior research focusing on ethnic population is the reliance on the ethnic/racial categories of the U.S. Census Bureau (2002) to define ethnic groups. This system of categorization is limited in its ability to differentiate the diverse sociocultural characteristics of subpopulations such as the Asian/Pacific Islanders who are homogenously categorized as one group. This, along with limited dietary intake data for Asian/Pacific Island school-aged children, suggested the need for an investigation of food choices among a multiethnic population such as Asian/Pacific Island children in the Commonwealth of the Northern Mariana Islands (CNMI), which is a commonwealth of the United States.

Engaging children in assessing their dietary intake through the use of a food frequency questionnaire is a valid and reliable method used in population-based studies (Speck, Bradley, Harrell, & Belyea, 2001). Although this method is limited by the children's recall (Baxter, Thompson, Davis, & Johnson, 1997) and ethnic differences (Ku et al., 1998), it is commonly used for large samples. Other methods used for collecting data on children are food diary, 24-hour dietary recall, parent interviews, and mealtime observation. Although the food frequency questionnaire has its limitations, in populations where little or no information is available, this quantitative approach can

build on data from studies that include qualitative methods such as participant observation and informal interviews (Scrimshaw & Hurtado, 1987) to design culturally appropriate questionnaires that can provide exploratory data. Designing culturally valid instruments, especially when combined with self-reporting, suggests the need for culturally relevant items to facilitate participants' understanding of the content under study. In this study, we used qualitative methods to develop a food frequency questionnaire that was administered to a sample of school children in the CNMI. We employed factor analysis to identify patterns of food consumption among the foods on the instrument. ANOVA was conducted to look at reported differences in food groups based on gender, ethnicity, age, and grade. We also used logistic regression to investigate how food groups can predict families of different culture/ethnic groups.

METHOD

Participants

With a population of 62,392 (CNMI Census Bureau, 2000), CNMI is a multiethnic community with distinct ethnic populations of Pacific Islanders and Asians. Chamorros and Carolinians are indigenous to the CNMI, although Filipinos and other Micronesians (Palauans and Chuukese) are recent immigrants to these islands. Because of the multicultural makeup of the families in the CNMI, children were asked to report their father and mother's ethnicity. Other requested demographic data included the child's age, gender, teacher, school name, and grade.

According to the CNMI Statistical Yearbook (1999), a total of 6,596 kindergarten through Grade 8 students were enrolled in the public school system. Overall, public schools enroll 76% of all K-12 students in the CNMI. The culturally validated food frequency questionnaire was administered by third- through eighth-grade teachers in 84.6% (11/13) of the elementary and junior public schools in the three CNMI islands of Saipan, Rota, and Tinian. Data were collected from a sample of 1,561 Asian/Pacific Island 8- to 16-year-old children ($M = 11.17$, $SD = 1.32$) during a period of 1 month. However, only 1,125 of respondents had demographic information related to the ethnicity of both parents, which was required for the analysis. The number of incomplete and partially completed questionnaires was extremely low because of the administration protocol.

Procedure and Instrumentation

The School-Based Nutrition and Physical Education Program (SNAPP) is an ongoing CNMI-wide program. Initiated by the CNMI Food and Nutrition Council, SNAPP is a stakeholder community-based initiative that involved the entire public school system. The community, through the school and local media, is informed and updated on information associated with SNAPP. To assist with the design of nutrition education programs, a two-page food frequency questionnaire was developed to better understand children's eating patterns. The questionnaire, which takes approximately 15 minutes to complete, was administered to school-aged children in their classrooms by the teachers in English, the primary language used in the CNMI public school system. In the younger grades, teachers were instructed to read the questionnaire to students who were not yet reading. Students were instructed to rate how often they ate or snacked on each food listed in the survey in the past month; the food list was not inclusive of all food consumed in the CNMI, and

information related to portion size was not obtained. Sample items included milk, bread, rice, and so on. The response scale provided for each of the food items was as follows: (a) *never*, (b) *rarely*, (c) *one time per week*, (d) *two to three times per week*, (e) *one time per day*, (f) *two to three times per day*, and (g) *four or more times per day*. Prior to statistical analysis, the response scale was transformed to represent weekly consumption. The Western Michigan University Human Subject Review Board approved the research proposal for use of secondary data.

Psychometrics

In establishing cultural validity of the instrument, content and construct validity were determined. For content validity, which includes face validity, the authors with work experience in CNMI used ethnographic methods of participant observation and informal interviews to identify typical food items in the CNMI. These methods are useful tools to capture ethnic/cultural characteristics of food-consumption patterns in multiethnic populations. Both participant observation (Scrimshaw & Hurtado, 1987) of children in school, at home, and at community events as well as informal interviews of the children, primary caregivers, educators, and health care professionals were conducted. The descriptive and interpretive nature of these ethnographic methods allowed for determining the foods most commonly consumed by the children and supported the design and development of a culturally appropriate, short, and simple food frequency questionnaire. A list of 43 food items commonly consumed by school-aged children in the CNMI was included in the food frequency questionnaire (CNMI Food and Nutrition Council, 1999).

Construct validity supposes that there are well-established theories underlying the relationship between selected variables. Food frequency questionnaires have been used as a valid method of data collection measuring dietary patterns and habits in children (Speck et al., 2001). Factor analysis is a commonly used empirical method of deriving eating patterns (Newby & Tucker, 2004). Validity by factor analysis was conducted to identify patterns of food consumption among the items. Reliability of the items in food groups identified by the factor analysis was established using Cronbach's alpha. Cronbach's alpha coefficient analyses tested the internal consistency among the items.

Data Analysis

All statistical analyses were conducted using SAS software (SAS Institute, 2000). Responses to the food frequency questionnaire were transformed to represent weekly consumption for each food item due to the potential variability in daily intake of any specific food item. Because food items are consumed in groups and generally at different times of the day, it is quite plausible that food consumption patterns can be explained in any number of ways, such as time of day (i.e., breakfast, lunch, dinner) or food groups (i.e., breads, dairy, meats, etc.). Initially, food items were categorized into five groups using the CNMI Food Guide Pyramid. Most food items on the CNMI Food Guide Pyramid are the same as the USDA Food Guide Pyramid, with appropriate item substitutions made to accommodate the islands' food system. This analysis of individual foods organized by the food guide pyramid provided a conventional look at a population-based food frequency data. ANOVA was conducted to look at reported differences in the five food groups based on gender, ethnicity, age, and grade. In addition, children were asked to identify the cereals that they most commonly consumed. The list of cereals was categorized into three groups by grams of sugar per 1-cup serving: 0.0-9.9, 10.0-14.9, and 15.0-19.9.

The instrument was developed using ethnographic data from the population; hence, it was necessary to identify foods related by patterns unique to the community rather than conventional classifications such as the food groups prescribed by formal nutrition sources of information. Therefore, exploratory factor analysis with promax rotation (common factors model with squared multiple correlations as the initial communality estimate) was conducted on the 43 food items to examine the possibility of discovering any underlying constructs that could represent the variation among the items. In this analysis, we explored the food items consumed with the same frequency pattern that make up the factors and not some other a priori pattern (e.g., breakfast, lunch, and dinner).

Using the results of the exploratory factor analysis, we examined how the food-consumption factors or groups were similar or dissimilar among the ethnic or culturally defined groups. Because the majority of the family households in the CNMI are married-couple families (CNMI Census Bureau, 2003), we therefore investigated the food-frequency consumption in ethnically homogenous and heterogeneous familial groups using ANOVA. Last, logistic regression analysis was conducted to examine the contribution of food group factors to predicting culture and/or ethnicity group.

RESULTS

Sample Characteristics

Table 1 presents the demographic characteristics of 1,125 participants included in the study. No significant differences were found between gender and ethnicity or grade and ethnicity. However, data analyzed in a 3×6 chi-square indicated that there was a statistically significant relationship among the three age categories and six ethnic groups, $\chi^2(10, N = 1{,}125) = 28.6447$, $p = .0014$, with fewer children in the 14- to 16-year-old group for all ethnicities.

CNMI Food Guide Pyramid

The 43 food items were grouped using the CNMI Food Guide Pyramid (see Table 2). As seen on this table, rice was reported as the most frequently consumed food during the week, followed by milk and soft drinks. ANOVA was conducted to test for differences between gender, ethnicity, age, and grade in parallel analysis for each food group separately. No statistically significant differences were found for any of the factors among the six ethnic groups or for the males and females or among the three age categories.

However, when comparing the children by grade, there was a statistically significant difference between those in Grades 3 through 6 (elementary school) as compared to those in Grades 7 and 8 (middle school), $F(1, 1123) = 5.59$, $p = .0182$. Tukey's HSD test showed that children in Grades 7 through 8 reported more frequent consumption ($M = 4.1$, $SD = 4.31$) of foods from the tip of the food pyramid than children in Grades 3 to 6 ($M = 3.3$, $SD = 3.78$).

Although the amount of consumption may be different, it seems that the majority of the children reported to have consumed all the foods listed on the food frequency questionnaire, which may be an artifact of the instrument construction. Ninety-six percent of the sample reported that they consumed all 9 of the foods from the grain and root group; 93.0% consumed all 17 foods from the tip of the food pyramid; 89.0% consumed all 7

Table 1. Demographic Characteristics of the Respondents ($N = 1,125$)

Characteristic	*n*	%
Father and mother's ethnicity		
Chamorro (CHAM)	578	51.4
Carolinian (CAR)	94	8.4
Filipino (FIL)	155	13.8
Other Micronesian[a] (MICRO)	129	11.5
Chamorro and Filipino (CHAM/FIL)	97	8.6
Chamorro and Carolinian (CHAM/CAR)	72	6.4
Child's gender		
Male	553	49.2
Female	572	50.8
Child's age		
8 to 10 years old	365	32.4
11 to 13 years old	702	62.4
14 to 16 years old	55	4.9
Grades		
3 to 6	978	86.9
7 to 8	146	12.9

a. The other Micronesian group included Palauan, Chuukese, Marshallese, Yapese, and Pohneipian/Kosraen.

of the meat and meat products; 88.0% reported to have consumed all 5 of the dairy foods; and 87.7% consumed all 5 of the fruit and vegetable foods. Another important finding was the reported cereal consumption among the children. Although the majority reported to have consumed cereals, only 66.0% of the children ($n = 820$) reported the name of a cereal that they most commonly consumed. From among this list, 70.0% ($n = 578$) reported a cereal with 10.0 to 14.9 grams of sugar per 1 cup serving, and 24.0% ($n = 197$) reported a cereal with 15.0 to 19.9 grams of sugar per 1 cup serving. Only 5.5% ($n = 45$) of the children reported a cereal with 0.0 to 9.9 grams of sugar per 1 cup serving.

Exploratory Factor Analysis

Exploratory factor analysis was used to construct or identify food items that relate to each other in terms of frequency of consumption. Eigenvalues less than 1 and scree plot analysis indicated that a four-factor solution, which accounted for more than 98% of the common variance, was likely to be the most interpretable. Consequently, four factors were retained for rotation. Because food items are consumed in groups and almost never in isolation, an oblique (promax) rotation was employed. Food items with factor loadings in the factor pattern matrix ≥ .40 were considered interpretable and thus contributed to understanding of the factor. Table 3 presents the food item with factor loadings in the reference structure (semipartial correlations) factor pattern matrix ≥ .40, which shows correlation of variable with the variance of the factors removed, meaning independent contribution of variable to factor. See Table 3 for the variance explained by each factor.

Within the context of the CNMI, exploratory factor analysis suggests that foods included in Factor 1 are fairly popular among the children in the islands—thus labeled "popular foods"—whereas Factor 2 represents foods that may present variability of use among different ethnic groups, named "variable exposure foods." Factor 3 is suggestive of local and ethnic foods and is thus labeled "local/ethnic foods," and Factor 4 includes

Table 2. Food Grouping and Weekly Consumption Mean (*M*) and Standard Deviations (*SD*) for Each Food ($N = 1,125$)

Food Group and Items	*M*	*SD*
Dairy		
Milk	8.08	10.40
Ice cream	5.50	9.02
Cheese	2.46	6.03
Pudding	2.12	6.00
Yogurt	1.33	4.76
Meats and meat alternates		
Spare ribs	5.52	9.40
Canned meat products	5.34	9.15
Eggs	4.49	7.69
Luncheon meats	3.64	7.90
Beans	2.30	6.40
Peanut butter	1.81	4.97
Nuts	1.55	5.03
Grains and roots		
Rice	14.69	12.30
Cereal	6.48	9.50
Bread	5.40	8.80
Noodles/pasta	3.45	7.10
Pancake/muffin/rolls	2.95	6.95
Yam/potato	2.83	6.90
Crackers	2.73	6.50
Tortilla	1.64	5.06
Taro	1.37	5.04
Fruit and vegetables		
Vegetables	6.60	10.00
Other fresh fruit	6.31	9.60
100% fruit juice	5.75	9.40
Bananas	4.73	8.43
Items from tip of food pyramid		
Soft drinks	7.10	10.05
Sweetened noncarbonated drinks	6.80	10.15
Fruit drinks	4.90	8.79
Chips	4.80	8.40
Candy	4.66	8.60
Cookies, cakes	3.80	7.45
Japanese rice crackers	3.57	7.71
Empanada	3.30	7.34
Donuts	3.20	7.11
Lumpia	3.05	7.03
Raisins, fruit rollups	2.17	5.97
Butter/margarine	2.01	5.71
Ahu	1.89	6.02
Jam/jelly	1.88	5.30
Apigigi	1.77	5.59
Jello	1.53	4.82
Pork fat	1.59	5.32
Applesauce	0.97	4.16

NOTE: Apigigi is a Chamorro delicacy steamed and grilled from a mix of young coconut meat, fresh coconut milk, and tapioca. Ahu is a Chamorro treat is made from grated coconut that is boiled in sugar water. Taro is a tropical plant consumed for its roots, leaves and flowers. Lumpia is a Filipino eggroll filled with vegetables, meat, and spices.

Table 3. Food Items and Factor Loadings (Promax Rotation) Semipartial Correlations for the Four Factors of the SNAPP Food Frequency Questionnaire

Factor No.	No. of Items	Food Items	Factor Names	% of Variance Explained	Range of Factor Loading
1	6	Chips, candy, soft drinks, ice cream, spare ribs, and sweetened noncarbonated beverages	Popular foods	31.1	.36346-.58871
2	3	Nuts, cheese, peanut butter	Variable exposure foods	24.6	.34566-.42088
3	4	Apigigi, ahu, taro, lumpia	Local/ethnic foods	22.3	.38798-.51149
4	5	Fruit, vegetables, milk, fruit juice, banana	Guideline foods	22.0	.35414-.48674

NOTE: SNAPP = School-Based Nutrition and Physical Education Program.

foods promoted by the CNMI Dietary Guidelines and is called "guideline foods." Descriptive statistics for all four factors, along with interfactor correlations, are presented in Table 4. Cronbach's alpha for the four factors ranged from .47 (Factor 2) to .76 (Factor 1). The "variable exposure foods" label assigned to Factor 2 suggests that the weaker internal consistency may be explained by the variability and low endorsement among different ethnic groups in exposing children to such foods. This is illustrated by the low mean score on this factor as presented in Table 4.

Ethnic/Cultural Differences

Based on the exploratory factor analysis results, we hypothesized that food items consumed with the same frequency pattern make up the factors and not some other pattern (e.g., breakfast, lunch, and dinner). To investigate how the food groupings identified by the exploratory factor analysis are similar or dissimilar among children from parents with distinct ethnic groups, we conducted ANOVA. We tested for differences for gender, grade, and age category in the four factors. No statistically significant differences were found on any of the four factors among the six ethnic groups or for gender. However, ANOVA results showed that there was a statistically significant difference among the different age groups, $F(2, 1121) = 4.91$, $p = .0075$. Post hoc tests (Tukey's HSD, $\alpha = .05$) indicated that 8- to 10-year-old children reported more frequency of foods consumed from "variable exposure foods" ($M = 2.1$, $SD = 4.1$) than 11- to 13-year-olds ($M = 1.7$, $SD = 3.5$). Also, when comparing the children by grade, there was a statistically significant difference among the elementary school and middle school children on the factors "popular foods" and "variable exposure foods." Results for grade category and "popular foods" were $F(1, 1123) = 13.14$, $p = .0003$, and for grade category and "variable exposure foods" were $F(1, 1123) = 4.32$, $p = .0378$.

Table 4. Correlations Among the Four Factors ($N = 1,125$)

	Factor 1	Factor 2	Factor 3	Factor 4	*M*	*SD*	Cronbach's α
Factor 1: Popular foods		.29	.38	.40	5.78	6.51	.76
Factor 2: Variable exposure foods			.25	.30	1.94	3.74	.47
Factor 3: Local/ ethnic foods				.34	2.02	4.20	.66
Factor 4: Guideline foods					6.29	6.38	.68

Tukey's HSD test showed that children in Grades 7 through 8 reported more frequent consumption ($M = 7.6$, $SD = 7.13$) of "popular foods" than children in Grades 3 to 6 ($M = 5.5$, $SD = 6.4$). However, Tukey's HSD test showed that children in Grades 3 to 6 reported more frequent consumption ($M = 2.03$, $SD = 3.86$) of "variable exposure foods" than children in Grades 7 to 8 ($M = 1.34$, $SD = 2.72$).

To further understand whether any culture and/or ethnic differences existed in the data, logistic regression analysis was conducted to examine how homogenous or heterogeneous families (see Table 1) can be predicted from food consumption patterns among the food group factors. In separate analysis, only the "popular food" group significantly predicted familial ethnicity for children of both Filipino parents as compared to children of non-Filipino parents, Wald $\chi^2(4, N = 1125) = 10.375$, $p < .05$. The frequency of consumption for "popular foods" was .0418 less for Filipino children than non-Filipino children ($p = .0111$). When the frequency of consumption is projected to 1 year ($.0418 \times 52$ weeks = 2.17), the point estimated odds ratio is 8.76. This data suggests that non-Filipino children report consuming 8.76 times more "popular foods" per year than do Filipino children.

DISCUSSION

Understanding children's food preferences and dietary habits across cultures is necessary to design more effective nutrition education programs (Rosenthal & Feldman, 1992). The focus of this study was to examine food choices among a multiethnic population: Asian/Pacific Island children in the CNMI.

In addition to examining culture and ethnic differences among children's eating habits based on the CNMI Food Guide Pyramid, factor analysis was used to identify food-consumption patterns. This was done to provide a logical basis for grouping foods as an alternative to the conventional food grouping commonly conceived, such as meals or food guide pyramid. Exploratory factor analysis indicated that four factors were present in the food frequency data: (a) popular foods, (b) variable exposure foods, (c) local/ ethnic foods, and (d) guideline foods. Review of nutrition education studies assessing behavior among school-aged children suggest that most have reported alpha coefficients of .6 to .8, with a few reporting a coefficient of .9 (Contento et al., 2002). An analysis of the study limitation suggests a weaker internal consistency among the "variable exposure foods." This may be explained by the variability among different ethnic groups in exposing children to such foods. Retaining such a factor in the analysis was indicated because it explained more than 20% of the variance.

The three most commonly consumed foods among this population were reported as rice, milk, and soft drinks. With the highest consumption mean from among all the foods, rice has sociocultural significance for this population (Bruss et al., 2005) and did not share common variance with other variables; therefore, it was not correlated to other items in any of the four factors. However, milk was categorized in Factor 4, and soft drinks were correlated with foods in Factor 1. Another important finding was that the foods in Factor 3 identified as local and ethnic food items. These findings are especially important in the design of culturally relevant nutrition-education intervention programs and examination of changes in the diet of a population. Findings from our study suggest that investigating sociocultural influences on children's food preferences and dietary habits across different ethnic groups is necessary to design more effective nutrition programs.

Jahns and colleagues (2001) found an increase in the prevalence of snacking in the United States in all age groups from 1977 to 1996, resulting in an increase in the average daily energy from snacks. However, in the CNMI, we found that children in Grades 7 through 8 reported more frequent consumption of Factor 1 "popular foods" than children in Grades 3 to 6; also, children in Grades 3 to 6 reported more frequent consumption of Factor 2 "variable exposure foods" than did children in Grades 7 and 8. In addition, we found that children in middle school reported consuming more foods from the tip of food pyramid than children in elementary school. This may be because older children (Grades 7 and 8) may be more independent and thus have greater access to popular foods or foods from the tip of the food pyramid.

The majority of the children in our study reported to have consumed all the foods listed on the food frequency questionnaire, especially grain and root products and foods from the tip of the food pyramid. Furthermore, the consumption of higher-sugar-content cereals was also reported by most of the children. These results appear consistent with findings by Kranz and Siega-Riz (2002), who reported high levels of added sugar among children.

Analysis of data from 1989 to 1991 USDA Continuing Survey of food intake by individuals suggests that only 20% of the children consumed 5 or more servings of fruits and vegetables per day. Twenty-five percent of all vegetables consumed by children were French fries, whereas intake of dark green and yellow vegetables was very low as compared to recommendations (Krebs-Smith et al., 1996). Other studies have found ethnic differences in regards to fruit and vegetable consumption (Reynolds et al., 1999).

In our study, the contribution of the factors to a child's ethnicity was examined. Factor 1 ("popular foods") was negatively associated with the children of both Filipino parents as compared to children of non-Filipino parents. Other studies have examined the difference in health behavior knowledge by ethnicity and gender (Vega et al., 1987) and found that ethnicity was related to health knowledge. Although our study did not investigate the health behavior knowledge of the students, we found that differences in mothers' and fathers' ethnicity may affect children's dietary patterns. This finding suggests the need for culturally appropriate nutrition-knowledge interventions that target parents of specific ethnic groups within larger racial or ethnic groups categorized by the U.S. Census Bureau (2002). The USDA Food Pyramid lists food portions or serving sizes consumed daily. However, as indicated earlier, the CNMI Food Pyramid, which is based on the USDA Food Pyramid, was used to organize reported consumption of each food and to provide a logical basis for grouping foods. This study did not collect information on portion sizes. Additionally, this study did not propose a new dietary assessment instrument. Rather, our findings suggest that food frequency questionnaires and factor analysis may be used to

determine culturally based food groupings and general eating patterns. Moreover, factor analysis may be especially useful to establish validity of food groupings in large samples. However, as indicated earlier, variability among different ethnic groups in exposing children to foods may explain a weaker internal consistency among some of the factors.

APPLICATION/CONCLUSION

This study suggests that food frequency patterns among different segments of the population, such as children, merit further investigation. Such information differentiated by ethnicity can aid in the design of prevention strategies and development of school-based nutrition-education interventions for children and their families. Engaging children in assessing their dietary intake through the use of a food frequency questionnaire is a valid and reliable method used in population-based studies (Speck et al., 2001). Although this method is limited by the children's recall (Baxter et al., 1997) and ethnic differences (Ku et al., 1998), it is commonly used for large samples. Other methods used for collecting data on children are food diary, 24-hour dietary recall, parent interviews, and mealtime observation. In populations in which limited dietary information is available in the literature, data from qualitative methods, such as participant observation and informal interviews (Scrimshaw & Hurtado, 1987), can support the design of culturally appropriate questionnaires such as the food frequency questionnaire. Although such instruments have limitations with regards to individual diets, they can provide rapid exploratory quantitative data for population-based nutrition education programming with limited funding sources. Diet has been associated with childhood obesity, a risk factor for adult obesity, and chronic diseases (Dietz, 1998). Furthermore, there is limited empirical data that describes the relationship between the father's and mother's ethnicity and their children's dietary intakes. This study is especially important for public health nutritionists who are working with different ethnic groups to consider the relationship between familial ethnicity and children's food-consumption patterns. In addition, this study suggests that an ethnographic approach to this kind of research is essential in understanding community-based food consumption patterns and differences in eating patterns by culture and/or ethnicity.

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