DIETARY PATTERNS OF RESERVATION AND NON-RESERVATION NATIVE AMERICAN YOUTHS

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Objective: A leading cause of morbidity and mortality among Native Americans, cancer is largely preventable through lifestyle habits. Ranked high among those habits is a diet low in fat and high in fiber, fruits, and vegetables. Because Native Americans are not included in national nutritional monitoring systems, limited data exist on the cancer-related dietary habits of this population. To bridge this gap, this study measured the eating patterns of Native American youths in the northeastern United States.

Design: Cross-sectional.

Setting: Urban Indian centers and tribal and reservation settings located in New York, Massachusetts, Connecticut, Vermont, and Maine.

Participants: 191 self-identified Native American parents of children between 8 and 14 years of age.

Main Outcome Measures: Frequency of intake of foods recommended for inclusion in or omission from a diet to reduce cancer risk.

Results: Dietary patterns among Native American youths differed from a national US sample and varied between youths in reservation and non-reservation settings.

Conclusions: A need exists for nutrition education and behavior change programs that reflect the culturally specific eating habits of the indigenous peoples of the Northeast. Ideally, developing nutrition curricula for specific communities will be done in cooperation with these communities and acknowledge barriers that may limit Native Americans' access to healthful foods. (*Ethn Dis*. 2005; 15:705–712)

Key Words: Adolescents, Children, Diet, Native Americans

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INTRODUCTION

An estimated 70% of all cancer is attributed to diet, and diets high in fat and low in fruits, vegetables, and grains are associated with increased cancer risk.[1,2] Although they have lower cancer incidence rates than other US ethnic-racial groups,[3] concern is growing that acculturation to Western lifestyles, including adopting a diet higher in fat and calories and lower in fiber, fruits, and vegetables has occurred in Native American tribes and communities, with concomitant increases in obesity, diabetes, heart disease, and cancer.[4,5] Studies are needed to examine the cancer-related dietary habits of Native Americans. This research is essential to developing dietary modification programs to lower their cancer risk.

Surprisingly, this research is still in its infancy. Because Native Americans are inadequately sampled in national nutrition surveys,[6] quantitative assessments of their current diets are limited. Most published reports focus on nutrient versus food intakes among Native American adults living in the southwestern region of the United States[6,7–14] and, to a lesser extent, on dietary patterns of Native Americans residing in the Southeast.[15–18] These studies report great variety in the nutritional adequacy of Native American diets. A range of sociocultural and economic considerations, as well as differing food availability and food preferences, contribute to this variety. Also confirmed is

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Native people's declining use of traditional foods—those derived largely from plant sources and complemented with fish and low-fat wild meats[5]—as well as their increased dependence on purchased staples and greater dietary monotony.

The limited studies with Native American children and adolescents find youths' nutritional status inadequate. Compared with dietary recommendations, southwestern Native American children consume fewer fruits, vegetables, and grains and exceed recommended levels of fat intake.[19,20] Fruit and vegetable consumption among a population-based sample of Native American and Alaska Native adolescents was well below recommended levels.[21] Less than one fourth of youths consumed recommended daily servings of fruit; less than one third consumed recommended daily servings of vegetables. Although more than half of all Native Americans live in urban areas,[22] studies examining the diets of urban native youths are few.[23] A review of the literature failed to identify any studies comparing the dietary habits of reservation and urban Native youth.

Findings from this research are intended to bridge that gap. Conducted as part of a larger project to develop and test the Native FACETS cancer risk reduction curriculum,[24] the present investigation examined consumption patterns of foods recommended for inclusion in or omission from a diet to reduce cancer risk among Native American youths residing in the northeastern region of the United States. The following questions guided the research: 1) How do the cancer-related dietary intakes of reservation and non-reservation Native American youths living in the Northeast compare with those of a nationally representative sample of similarly aged youths? 2) What are the similarities and differences in food consumption patterns and food preferences of reservation and non-reservation Native American youths living in the Northeast?

METHODS

Participants

Because children have difficulty providing accurate dietary intake data prior to age ten,[25] parental reports of youths' food intake frequencies provided data for this study. Recruited through urban Indian centers and tribal reservation settings, respondents were 191 self-identified Native American parents of children between eight and 14 years of age. Study participants were from several northeastern Native nations, including the Mohawk, Pequot, Powhaten-Renape, Narragansett, MicMac, and Wampanoag, residing in the states of New York, Massachusetts, Connecticut, Vermont, and Maine. Approximately one half of participants and their children (46%) lived on federally recognized Indian reservations. All other subjects lived in urban settings throughout the Northeast. Reservation households ranged from two to 13 members, with a mean of 4.8 members, and had, on average, 1.6 children and adolescents between eight and 14 years of age. Slightly larger, the urban Native American households ranged from two to 12 members, with an average of two children and adolescents aged eight through 14 years.

Procedure

In collaboration with urban Indian centers and reservation health programs, we designed a brief self-report questionnaire of food intake frequencies. Questionnaire items were drawn from the National Health and Nutrition Examination Survey, Cycle II.[26] Items included foods commonly consumed by representatives of the target population and foods recommended for inclusion in or omission from a diet to reduce cancer risk.[27] Foods recommended for inclusion encompassed fruits, vegetables (including fibrous vegetables), high-fiber cereal/bread, poultry, and fish. Salt-cured, nitrite-cured, smoked or pickled foods, high-fat red meats, and foods identified as major contributors to total fat in the US diet were recommended for omission.[28] Foods groups were examined and the foods they contained are listed in Appendix A.

Parents were asked to indicate on a 3-point Likert scale (1—never; 2—sometimes; and 3—frequently) how often their children ate items in each food group. They were also asked to specify their most frequently employed cooking methods and to list their children's three favorite foods.

STATISTICS

Survey responses were compared with data from a nationally representative sample of youths similar in age to Native American youths in the study sample. Because national sample data were composed of percentages only, the relative magnitude of reported food frequencies could not be assessed. Therefore, no significance tests between the study sample and national sample were performed. *T* test analyses examined differences between reservation and non-reservation youths' mean frequencies of consumption for each food item. For characterizing youths' diets, we present descriptive data on foods frequently consumed by participants and their favorite food choices.

RESULTS

Table 1 presents percentages of reservation and non-reservation youths reporting intakes of selected food items relative to the intakes of a nationally representative sample of similarly aged youths (comparisons are limited to foods represented in both surveys). Native American youths living on reservations reported lower percentages of intake of oranges and potatoes than subjects from the national sample. Reservation youths reported higher intake of certain high-fat (American cheese, potato chips) and salt-cured, nitrite-cured, smoked, or pickled foods (bacon) than their national counterparts. A comparison of urban Native subjects with the same national sample revealed urban Native youths' greater consumption of tomatoes. However, urban Native subjects reported greater consumption of all foods in the "other high-fat foods" category. Similar to their reservation counterparts, urban Native youths reported greater consumption of bacon than youths from the national sample. Relative to the national sample, reservation and non-reservation youths reported higher consumption of fish, chicken, and high-fiber cereal/bread (whole wheat bread) and lower consumption of high-fat red meat (beef).

Table 2 presents percentages of urban and reservation respondents who reported frequent consumption of foods recommended for inclusion in or omission from a diet to reduce cancer risk. Relative to urban Native American youths, lower percentages of reservation

Table 1. Comparison of percentages of Native youths reporting intake of selected foods with youths from national sample

	Native American Youths (*N*=191)		
	Reservation (*n*=88)	**Non-reservation (*n*=103)**	**National Sample (*N*=210)**
Foods to include:	%	%	%
Fruits			
Oranges	40	54	46
Vegetables			
Tomatoes	39	42	27
Potatoes	70	76	81
Fish	56	57	21
Chicken	75	73	45
High-fiber cereal/bread			
Whole wheat bread	25	32	11
Foods to omit:			
High-fat red meat			
Beef	32	31	69
Other high-fat foods			
American cheese	69	68	18
Whole milk	61	75	71
Pork	25	40	31
Potato chips	41	47	30
Salad dressing	31	54	40
Salt-cured, nitrite-cured, smoked, or pickled foods			
Bacon	32	49	27

Note. Only foods represented in both surveys were compared.

youths included grains in their diet. In addition, reservation youths reported relatively infrequent consumption of fruits and vegetables. Except for potatoes and apples, less than one half of reservation youths consumed fresh vegetables and fruits regularly.

Urban Native American youths reported somewhat greater use of fruits and vegetables. Yet, except for string beans, potatoes, onions, apples, and oranges, less than half of these individuals included fruits and vegetables in their diets with any regularity. Further, a large percentage of non-reservation youths reported frequent consumption of butter (49%) and mayonnaise (57%). Both groups of youths frequently consumed foods high in fat—hamburgers, whole milk, American cheese, and margarine. Overall, the diets of Native American youths living in urban settings were characterized by greater consumption of almost all food items studied. Statistically significant differences in frequencies of consumption for the two groups are shown in Table 3.

Native parents of urban and reservation youths were compared on their most prevalent cooking methods (not shown). Both groups often chose to bake. However, whereas reservation subjects most frequently baked and boiled foods, urban subjects reported more baking and frying. Indeed, reservation families boiled their food significantly more often than urban families (t (157)=1.94, $P<.05$). Regardless of their place of residence, a large percentage of Native American families often barbecued meats and smoked fish (87.4% of reservation subjects and 77.6% of non-reservation subjects).

Parents were further asked to list their children's three favorite foods. Foods identified and corresponding frequencies of mention for reservation and non-reservation youths are presented in Table 4. Evident in the table is that subjects in both groups favor high-fat foods (fried chicken and meat, high-fat mixed dishes with meat and cheese). Subjects rarely indicated a preference for low-fat meals (soup, beans, and low-fat mixed dishes with cheese). All but three foods (fruits, fish/seafood, and baked chicken) were favored more strongly by reservation than by non-reservation youths. Non-reservation youths' preferences for baked (vs fried) chicken and for fruit reflect dietary choices consonant with a diet to reduce cancer risk.

DISCUSSION

This study sought to examine food consumption patterns of reservation and non-reservation Native American youths residing in the northeastern United States relative to a national US sample, and to examine similarities and differences in the diets of reservation and non-reservation youths. Native American youths in reservation communities ate fewer fresh fruits and certain vegetables than youths in the national sample, and urban Native children and adolescents consumed more of certain fresh fruits and vegetables. However, urban Native youths also consumed more whole-fat foods than did the national sample. The limited availability of fruit and vegetable intake data for the national sample precludes a thorough assessment of how intake of these foods among youths in our sample compares with that of similarly aged non-Native youths. However, food intake frequency data for reservation and urban youths suggests a pattern of low intake of fruits and vegetables, one that is consistent with findings from previous dietary assessment studies with Native American youths.[19,21,23]

Differences in food preparation patterns were observed between parents of reservation and non-reservation youths. Both urban and non-urban groups reported baking as their most prevalent cooking method. Non-urban

Table 2. Percentages of reservation and non-reservation youths reporting frequent consumption of foods to include or omit from a diet to reduce cancer risk

	Reservation (n=88)	Non-reservation (n=103)
Foods to include:	%	%
Fruits		
Apples	67	77
Cantaloupe	28	32
Watermelon	46	25
Peaches	35	33
Oranges	40	54
Blueberries	8	19
Vegetables		
Broccoli	38	37
Tomatoes	9	42
Potatoes	70	76
Spinach	18	23
Onions	26	50
Cabbage	18	23
Sweet peas	22	36
Dandelion greens	4	8
String beans	43	57
Fibrous vegetables		
Pinto beans	9	15
Black beans	3	3
Lentils	3	3
Yellow-eyed peas	3	2
Lima beans	17	13
Corn	25	42
High-fiber cereal/bread		
Whole wheat bread	25	32
Oatmeal, cream of wheat	20	40
Poultry		
Chicken	75	73
Turkey	40	35
Fish	56	57
Foods to omit:		
Salt-cured, nitrite-cured, smoked, or pickled foods		
Bacon	33	49
Sausage	15	43
Cold cuts, bologna	35	52
Hot dogs	42	46
High-fat red meats		
Beefsteak	32	31
Beef roast	31	28
Beef hamburger	53	57
Lamb	5	14
Other high-fat foods		
Pork roast	13	24
Pork chops	25	40
Whole milk	61	75
American cheese	69	68
Cream cheese	21	27
Ice cream	38	50
Butter	35	49
Margarine	59	64
Shortening	12	30
Lard	1	14
Mayonnaise	36	57
Non-pork animal fat dripping	3	13
Salad dressing	31	54
Doughnuts	19	37
Pastries	19	31
Cake	14	27

respondents reported boiling as another routine cooking method. In contrast, urban respondents frequently reported frying as a typical cooking method.

Regardless of their residence, Native American youths reported a preference for foods high in fat. This pattern is consistent with findings from a published review of dietary intake studies conducted with American Indians and Alaska Natives which found their diets as a group to be moderately high in fat.[4] This pattern is also consistent with food preferences of American majority-culture youth.[29–31] Evidently, a preference for high-fat foods cuts across regional lines and ethnic background. High-fat dairy products such as whole milk and American cheese, hamburgers, and potato chips figured prominently in the study samples' reported preferences, as did bacon, a salt- and nitrite-cured food that is also high in fat. Children and adolescents rarely consumed fibrous vegetables such as beans and peas, in fact, with the exception of apples and potatoes, their consumption of fruits and vegetables of any kind was low overall.

These findings attest to the relevance of sociocultural aspects of food behavior. In this study, as in others, geographic location, urbanization, and ethnicity influenced food preparation and consumption behaviors.[32–34] Knowledge of these factors is essential to the design and implementation of culturally sensitive nutritional interventions.

A number of limitations to the study exist. First, survey data are based on adult observations of their children's eating habits. Quite possibly, parents have incomplete knowledge of the foods their children and adolescents consume. Second, measures of food intake are prone to problems of reliability and validity, even when administered to adult subjects.[35] More accurate results will likely emerge by collecting data directly from youths by using measures that have been developed and validated for this purpose.[25,36–38] Third, the time difference

Table 3. Reservation and non-reservation youths' mean frequencies of consumption of foods to include or omit from a diet to reduce cancer risk

	Reservation (n=88)		Non-Reservation (n=103)				
	M	SD	M	SD	*t*	*df*	*P*
Foods to include:							
Fruits							
Oranges	2.31	.623	2.51	.562	2.23	177	.17
Vegetables							
Onions	1.99	.731	2.30	.783	2.62	158	.09
Fibrous vegetables							
Pinto beans	1.36	.653	1.69	.729	2.84	164	.02
Yellow-eyed peas	1.15	.430	1.33	.521	2.33	156	.09
Corn	2.13	.607	2.36	.593	2.55	178	.12
High-fiber cereal/bread							
Oatmeal	1.91	.696	2.29	.659	3.74	173	.001
Foods to omit:							
Salt-cured, nitrite-cured, smoked, or pickled foods							
Sausage	1.98	.573	2.33	.654	3.77	176	.001
Cold cuts, bologna	2.20	.683	2.44	.626	2.49	177	.18
High-fat red meats							
Lamb	1.28	.556	1.60	.728	3.22	165	.02
Other high-fat foods							
Pork chops	2.09	.648	2.35	.575	2.83	176	.07
Whole milk	2.35	.868	2.66	.652	2.63	178	.08
Butter	2.01	.829	2.30	.772	2.41	179	.18
Lard	1.12	.371	1.59	.726	5.00	181	.001
Salad dressing	2.15	.668	2.44	.684	2.81	183	.05

Scoring: 1=never; 2=sometimes; 3=frequently.

in data collection for our study and that of the national sample, and the limited availability of food intake frequencies for the national sample, make comparisons between the two crude, at best. Finally, insufficient sample size prevented exploration of possible differences among the various tribes. This small study revealed differences between urban and non-urban, or reservation-based, Native Americans. Further research would better identify these differences, as well as potential differences within tribal groups. Because of these limitations, this study's findings on Native American youth's dietary patterns are more suggestive than definitive.

Table 4. Reservation and non-reservation youths' frequency of mention of favorite foods

Children's Favorite Foods	Reservation (n=88)	Non-reservation (n=103)
Fried chicken and meat	36	31
Mixed dishes w/cheese (high-fat; eg, pizza)	27	14
Mixed dishes w/meat (high-fat; eg, lasagna)	19	18
Cereal/rice	12	10
Vegetables	12	10
Salty snacks	11	7
Sweet snacks	9	8
Mixed dishes w/meat (low-fat; eg, tacos)	8	5
Dairy products	5	5
Fish/seafood	4	9
Fruits	4	6
Baked chicken	3	15
Soup	3	1
Beans	1	2
Mixed dishes w/cheese (low-fat; eg, spaghetti)	0	1

Implications for Future Research

The findings of this cross-sectional study suggest a number of implications for the development of culturally sensitive nutrition education and behavior change programs for Native American youths. Effective interventions should consider similarities and differences in food consumption patterns between Native and non-Native youths, as well as the relationship between diet and chronic disease.[39–41] The finding that both Native and non-Native youths in this study prefer foods high in fat, for example, is a similarity that should be acknowledged, and the link between a high-fat diet and cancer should be addressed. Although a fundamental premise of culturally sensitive interven-

Regardless of their residence, Native American youths reported a preference for foods high in fat.

tions is that populations differ, recognizing these differences without appreciating similarities can result in interventions that are ineffective.[41]

In this study, youths in both urban and non-urban households regularly consumed a variety of fish, a practice in keeping with some Native American cultural traditions. Providing education about the health benefits associated with consuming a variety of fish—such as the role omega-3 fatty acids appear to have in cancer prevention—can reinforce healthful dietary practices. However, equally important is recognizing the ways in which Native American dietary practices may increase exposure to health risks. The excess of high-fat products in Native American youths' diets, the high percentage of subjects who report frying foods, barbecuing meats, and smoking fish, and the relatively low intakes of fruits and vegetables among Native American youths in this study warrant concern. These eating patterns are indicative of a diet associated with increased cancer risk.

Correcting misinformation and educating youths about traditional Native American foods and food preparation methods should be part of culturally sensitive nutritional intervention programs. For example, there is a widespread belief that fried bread is a "traditional Native American food," when it is in fact an invention created in response to federal government rationing of white flour, baking powder, and lard.[42] At the turn of the century, when Native Americans were moved onto reservations, they became dependent on such rations.[22] Working Native American history into the curriculum could help break unhealthy nutrition habits and reinforce healthy choices.

Finally, nutrition curricula targeting Native American youths should be cognizant of economic constraints that may limit Native Americans' access to a variety of healthful foods. Poverty is widespread in Native American communities. Census data reveal that the number of Native Americans living at or below the poverty level in 1990 was more than double the number of poor persons in the total US population.[43] Moreover, Native Americans living on reservations were the poorest segment of the Native American population, with over half (51%) living below the federal poverty level.[44] Lack of transportation, refrigeration, fuel, and running water have been identified as factors contributing to Native American nutritional deficiencies.[14,45] For low-income, reservation-based Native American households, initiatives such as the Food Distribution Program on Indian Reservations (FDPIR) have been developed to ensure food sufficiency. Until very recently, however, fresh fruits and vegetables were not available through this program, and there is concern over the continuing provision of items high in fat, sodium, and sucrose in this as well as related supplemental food programs that serve Native Americans.[46,47] Reliance upon food subsidies is unavoidable for many Native Americans.[6,46] Awareness of the factors that shape the unique limitations of their food sources is essential to the development of culturally sensitive dietary interventions for Native American youths. Increasing awareness of healthful food choices based on what is made available through food assistance programs can aid in promoting the adoption of a healthful diet.[48]

Ideally, developing nutrition curricula for specific populations will be done in cooperation with these communities. Not only are community members the best informed about food availability and their own food preferences, but also they are more likely to support programs in which they are actively involved and feel a sense of ownership. The collection of data on Native youths' cancer-related dietary intakes, food preferences, and parental food preparation methods described in this study was the first in a series of steps employed to develop the Native FACETS program, a cancer risk reduction intervention for Native American youths residing in the northeastern United States.[24] These data informed the development of a draft curriculum for improving Native youths' dietary habits.

To ensure that curriculum content was responsive to the needs of the youths for whom it was intended, representatives from collaborating Indian centers and reservation settings reviewed the curriculum. The program was revised based on their feedback to incorporate stories of respectful relationships between humans and their social and physical environment, specific information about ancestral life, and artistic expressions for promoting stronger identification with Native American heritage. Thereafter, we convened a focus group of Native American youths to review the revised curriculum. Focus group participants shared their views, knowledge, and concerns regarding their eating habits and the importance of culture in their daily lives, information that informed further revisions to the program. Finally, to enhance cultural sensitivity and acceptability of the program within targeted communities, Native Americans from participating field sites were recruited and trained to deliver the intervention. The promising results observed among youths exposed to the FACETS intervention attest to the value of the participatory approach used to develop, implement, and evaluate this program. Other examples of community-based participatory research with Native American youths include Pathways, a school-based obesity prevention program for American Indian children and the Kahnawake Schools Diabetes Pre-

vention Project for middle-school-aged Native youths.[49,50] Lessons learned from these studies underscore the value of participatory research and provide insights on how best to develop, implement, and evaluate prevention programs in Native American communities.

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AUTHOR CONTRIBUTIONS

Design and concept of study: Di Noia, Schinke, Contento
Acquisition of data: Di Noia, Schinke
Data analysis and interpretation: Di Noia, Schinke, Contento
Manuscript draft: Di Noia, Schinke
Statistical expertise: Di Noia
Acquisition of funding: Schinke, Contento
Administrative, technical, or material assistance: Di Noia, Schinke
Supervision: Schinke

APPENDIX A. LIST OF FOODS IN FOOD GROUPS

Vegetables: broccoli, tomatoes, spinach, onions, cabbage, sweet peas, dandelion greens, string beans, potatoes (excluding fried).

Fibrous vegetables: dried beans and peas, corn.

Fruits: Apples, blueberries, cantaloupe, oranges, peaches, watermelon.

High-fiber cereal/bread: whole wheat bread, oatmeal/cream of wheat.

Poultry: chicken, turkey.

Fish: fish, shellfish.

Salt-cured, nitrite-cured, smoked, or pickled foods: bacon, sausage, cold cuts, bologna, hot dogs.

High-fat red meats: beefsteak, beef roast, beef hamburger, lamb.

Other high-fat foods: pork roast, pork chops, whole milk, American cheese, cream cheese, ice cream, butter, margarine, shortening, lard, mayonnaise, non-pork animal fat dripping, salad dressing, doughnuts, pastries, cake.