MEASURABLE BENEFITS OF TRADITIONAL FOOD CUSTOMS IN THE LIVES OF RURAL AND URBAN ALASKA IÑUPIAQ ELDERS

Janell Smith
Institute for Circumpolar Health Studies, University of Alaska Anchorage, Anchorage, AK 99508, and 5300 East Grant Street, Orlando, FL 32812; janell.smith@hotmail.com

Brian Saylor
Institute for Circumpolar Health Studies, University of Alaska Anchorage (retired), Anchorage, AK 99508; bsaylor@gci.net

Penelope Easton
Robert Stemple School of Public Health, Department of Dietetics and Nutrition, Florida International University, Miami, FL 33199; peaston@nc.rr.com

Dennis Wiedman
Department of Sociology and Anthropology, Florida International University, Miami FL 33199; dennis.wiedman@fiu.edu

Elders from the Alaska Villages of Buckland and Deering
IRA Tribal Administrator and Elders' Council, Buckland, AK 99727, and
IRA Tribal Administrator and Elders' Council, Deering, AK 99736

ABSTRACT

The trend to move Native elderly people from rural communities to urban communities for greater access to medical care and social services prompted the researchers to compare health and nutrition parameters between rural and urban settings. This paper studied existing community-based services for Iñupiaq elders in two rural communities and found no strong evidence to recommend that urban locations are better than rural locations as these individuals age. A total of 101 Iñupiaq elders over fifty years of age were surveyed: fifty-two in the rural villages of Buckland and Deering, and forty-nine in urban Anchorage. Traditional food customs support the nutritional health of the rural Iñupiaq elders as demonstrated by higher intakes of selected nutrients, stronger food-sharing networks, and higher participation in community harvest activities than reported by urban elders.

KEYWORDS: Native elderly, food-sharing networks, food intake, mental and physical health

INTRODUCTION

This article describes the effects of traditional food customs in measurable terms and compares elders from two rural Iñupiaq villages in northwest Alaska with Iñupiaq elders living in urban Anchorage. With Alaska Native older adults living longer, it is important to measure the role of traditional food habits in their lives. Previous researchers have contributed narrative data on aging in the Arctic from the elders' perspective. Interviews by Graves and Shavings (2005) in nineteen Alaska villages, Collings's (2001) work among the Inuit, and the work of Hopkins et al. (2007) among the Yup'ik all recorded elders' views on healthy aging: the importance of being active in community activities, being close to family, and having access to traditional foods. This research suggests considerable capacity for resiliency in the midst of change. Callaway's (2004) assessment of health markers identified in the National Science

Foundation's Social Transition in the North Study of the 1990s began quantifying health impacts on Native older adults resulting from changes in Native communities.

Policy makers often suggest that Native older adults should leave their historical rural home and move to urban communities, where it is believed they have more access to nutrition, health, and social programs. Tribal leaders disagree and have stated, "Elders need to be near the river where they were raised" (Branch 2005:1). Rural villages have kept the core traits of traditional food customs through the influence of their traditional governing bodies such as the Elders Council, even though technologies around them are changing (Craver 2004).

For this essay, "food customs" includes family and community food-related activities that result in the obtainment of protein, energy, and essential nutritional nutrients. Iñupiaq peoples reside north of the Arctic Circle near the Bering Sea coast in northwestern Alaska and are characterized by their continued dependence on harvested fish, game, and plants, known as a subsistence lifestyle (Burch 2006). Although no village today can be considered to embody true subsistence living (i.e., that all raw materials come from the land and sea), the harvest of fish, wildlife, and plants is considered by Native peoples as a vital connection to the land and to cultural tradition.

Native older adults are the fastest growing age group of Alaska's population (Goldsmith et al. 2004; U.S. Census Bureau 2000). Life expectancy has increased from 64.4 years in 1980 to 69.5 years in 1997 (Lanier et al. 2002). Considering that adequate nutrition is fundamental in maintaining health, this study quantifies the current benefits of food systems in rural and urban communities.

Survey methodologies explored the following research questions:

1. What are the demographic differences of Iñupiaq elders living in rural and urban areas?
2. Are there differences in food systems in the rural and urban settings?
3. What are the differences in nutrients provided by the two food systems, rural and urban?

METHODS

Villages were recruited during the summer of 2004, and data from Iñupiaq elders were collected during the summer of 2005. Nutritional food customs survey instruments used by other researchers with Native individuals were adapted to describe food customs. Instruments were reviewed by a committee of Native individuals on faculty at the University of Alaska Anchorage to ensure cultural appropriateness before submission of the tools for Institutional Review Board (IRB) review. Prior to the nutrition survey, measures of food-sharing networks had been developed by Alaska Department of Fish and Game (ADF&G), and rural data were collected during the spring of 2005 (see Callaway 2003; Magdanz et al. 2002 for complete ADF&G protocols). Urban food sharing data were collected with the nutrition survey during the fall of 2005. Signed release forms authorizing use of the ADF&G data were obtained at the same time consent forms were signed for the nutrition study.

Dietary intake data were collected using the ninety-eight-item Food Frequency Questionnaire (FFQ) that estimates intake of store-bought foods eaten over the last year. An additional page of foods harvested in Alaska (AK Foods) was tested by authors (Smith 2008), and then slightly altered for the Arctic to include local species. Data from both the ninety-eight-item FFQ and AK Foods were tabulated by Block Dietary Associates (Berkeley, CA) then combined to determine the total intake. The Alaska foods list included fish species by name, and items such as *muktuk* (whale fat and meat) and *agutuq* (a mixture of animal fat and some combination of berries, greens, or fish) that are not included in the Block FFQ protocols. All known food composition data were submitted to Block to allow them to compute nutrient intake from the Alaska foods recorded on the survey form. By combining the two food frequency data sets, nutrient intakes were determined for individuals. Where sample sizes were sufficient, mean data were compared by age, gender, and location.

A food frequency questionnaire was selected over the twenty-four-hour food recall methodology because the advisory committee felt that the tool was more respectful when younger researchers were interviewing older Native individuals. The committee suggested that the probing questions in using a one-day twenty-four-hour food recall might be considered disrespectful to the survey participants.

IRB REVIEW

The research protocols of survey questions received IRB reviews by the University of Alaska Anchorage and Florida International University, as well as a courtesy review by the Alaska Region Indian Health Service IRB.

INCLUSION OF COMMUNITIES IN THE RESEARCH PROCESS

All quantitative data collection tools and field methods were reviewed by the communities involved, and their suggestions were incorporated in the final survey. Community leaders in Buckland and Deering suggested that data be collected in a one-to-one setting with the researcher to show respect to their elders, as well as facilitate consistency of data collected. The research process was conducted with community involvement and oversight consistent with the guidelines presented in Principles for the Conduct of Research in the Arctic by the National Science Foundation (1986), and the Alaska Federation of Natives Guidelines for Research (1993). Survey participants were instructed that they could choose to answer some, all, or none of the survey questions; thus sample sizes varied question by question.

STUDY POPULATION AND THEIR COMMUNITIES

The rural villages were isolated, and access was completely by air or boat. The two rural communities have populations of less than three hundred people each. Small grocery stores provide canned and dry goods as well as limited supplies of fresh milk, fruits, and vegetables on a periodic basis. Few nutritional support programs are available for older adults. The rural communities primarily harvested sea mammals, salmon, caribou and local plants and berries. Whales are harvested erratically.

The urban population lived in the largest community in Alaska: Anchorage. Congregate meal and home-delivered meal programs are available, as well as numerous chain-type grocery stores.

RECRUITMENT OF ELDERS

All survey participants were community-dwelling, non-institutionalized individuals. All rural Iñupiaq individuals who lived in the two survey villages, and who had a fiftieth birthday by December 2005 were eligible to participate. This resulted in a census sample of 94% of all eligible rural Native older adults living in the two villages. The urban group was an availability sample recruited using a modified snowball technique. This group was not randomized, and no age stratification or matching to rural sample was attempted. The urban survey group represented the first fifty completed interviews, as opposed to the rural group, which consisted of all eligible individuals in the villages that were willing to participate. The tribal authorities in the two survey villages negotiated that all eligible participants were to be offered a small monetary gift. In the urban community, a similar honorarium was offered to participants at the beginning of the interview.

STATISTICS

Data were analyzed and compared by location using t-test, X^2, and Mann-Whitney U-tests depending on the type and distribution of the data. Strengths of relationships among variables were measured by Spearman's rho correlations.

SURVEY TEAMS

Survey team members had previous work experience with older adults, Alaska Native populations, and Alaska communities. The core research team consisted of the researcher, Janell Smith, and Penelope Easton, professor emerita from Florida International University. Easton had worked as one of the earliest territorial dietitians in 1948–1950. Her age and experience made her welcome at the Tribal Council meetings. During the summers of 2004 and 2005, graduate students taking a master's level course in public health field research methodology at the University of Alaska Anchorage assisted in the collection of data. These students received intense training on survey methodology and use of the specific tools for this project, including IRB training provided by the Epidemiology Program at the Alaska Native Health Board, which is now part of the Alaska Native Tribal Health Consortium. Information on how to show respect to Native older adults and how to work with Native tribal councils was provided by the National Resource Center for American Indian, Alaska Native, and Native Hawaiian elders at the University of Alaska Anchorage. (See Keebler et al. 2005 for students' descriptions of their experiences.)

RESULTS

DEMOGRAPHIC CHARACTERISTICS OF THE SURVEY GROUPS

Demographic characteristics of the Iñupiaq elders living in rural and urban locations are presented in Table 1. Mean ages for rural elders were older: rural = 62.3 years and urban = 57.6 ($p = 0.007$). Major differences were found in

Table 1. Characteristics of Iñupiaq elders living in rural and urban locations

	Rural (n = 52)		Urban (n = 48)		X^2	p
	#	(%)	#	(%)		
Age					9.78	0.021
50–59 years	24	(46%)	34	(71%)		
60–69	14	(27%)	10	(20%)		
70–79	12	(23%)	2	(4%)		
80+	2	(4%)	2	(4%)		
Education					5.99	0.112
1–6 grades	9	(17%)	4	(8%)		
7–12 grades	29	(56%)	29	(59%)		
> 13 grades	14	(27%)	12	(25%)		
No response	0	(0%)	3	(8%)		
Time at Rural/ Urban Location					30.29	<0.001
< 4 years	1	(2%)	27	(57%)		
5–20 years	13	(25%)	17	(35%)		
> 21 years	38	(76%)	4	(8%)		
Living Status					0.82	0.364
Lives alone	8	(15%)	11	(22%)		
Lives with others	44	(85%)	37	(78%)		
Number in household					1.75	0.417
1	10	(19%)	12	(25%)		
2–4	28	(54%)	28	(59%)		
> 5	14	(27%)	8	(16%)		
Employment					0.27	0.601
No employment	18	(35%)	19	(39%)		
Full/part-time employment	33	(64%)	27	(57%)		
No response	1	(12%)	2	(4%)		
Income					1.99	0.734
< $5,000	17	(33%)	12	(25%)		
$5,000 to $19,999	15	(30%)	18	(37%)		
$20,000 to $49,999	12	(23%)	10	(21%)		
>$50,000	4	(8%)	4	(8%)		
No response	4	(8%)	4	(8%)		

the age distribution of the rural and urban samples (p = 0.021), which may suggest irregularities in sampling design but may also suggest the greater ability of rural communities to maintain the health and well-being of their aging elders. Rural elders had lived longer at their current residences (p < 0.001). Rural and urban elders were similar in years of education, living status, the number of individuals living in the household, current employment, and income. The short length of the residence of Iñupiaq elders in the urban sample may have prevented detection of differences in food customs. In the future, as younger urban Native individuals reach older age, more significant differences may be found.

DIFFERENCES IN FOOD SUPPORT SYSTEMS

In rural Native communities, extended family members and family-based food-sharing networks provide food for Native elderly (Caulfield 2002; Manson 1995) but also contribute socially structured and valued food activities, such as planning for the hunt or harvest, food practices such as the actual harvest, and preparation, storage and distribution of food (Callaway 2003; Magdanz et al. 2002). These food activities are essential in organization of food production activities, serve to increase personal interactions between Native older adults and the community, and provide opportunities for the sharing of traditional knowledge. Rural elders reported a similar frequency of hunting and fishing as urban elders (Table 2), but a higher frequency of berry picking/harvesting wild greens (p = 0.020) and activities for food preparation/preservation (p = 0.028).

For this study, a food sharing event was defined as an occasion that a Native older adult was given an amount of harvested foods. Edible pounds were calculated to be approximately 50% of the harvested weight. Rural elders from Buckland and Deering reported fifty-five sharing events versus three by the Anchorage Iñupiaq sample. Rural participants reported that they received more food (p = 0.001), and had more sharing events than reported by their urban cohorts (p = 0.001) (Table 3). Urban households reported using less than 10% of the edible pounds of subsistence foods reported by rural elders and only 5% of the sharing events. Rural households with individuals over fifty years of age reported sharing 2,600 pounds, compared to just 250 pounds reported by urban households.

DIFFERENCES IN INTAKE OF ENERGY AND MACRONUTRIENTS

Mean self-reported food intakes using two food consumption survey instruments were calculated, and the totals compared between rural and urban respondents (Table 4). Both groups were similar in mean reported macronutrient intake of energy, grams protein, grams fat, fat as percent of calories, grams carbohydrates, and carbohydrates as percent of calories.

For evaluation, data were grouped by gender, age and location. Dietary Reference Intakes (DRI) issued by the Institute of Medicine (1997, 1998, 2000a, 2000b, 2000c, 2005) were used as intake standards. Mean intakes are presented in Table 4 by age above and below seventy years, and by gender. Urban women over seventy years

Table 2. Participation in selected community activities by Iñupiaq elders living in rural and urban locations

	Frequency of Participation				Likert Score[1]			
	Rural (n = 52)		Urban (n = 47)		mean ± sd		t-test	p
	#	(%)	#	(%)	Rural	Urban		
Hunting and fishing					2.1 ± 1.3	2.2 ± 1.0	–0.81	0.420
Never	29	(56%)	18	(37%)				
Rarely	6	(12%)	8	(16%)				
Sometimes	8	(15%)	19	(39%)				
Most of the time, regularly	6	(12%)	4	(8%)				
All the time	3	(6%)	0	(0%)				
Berry picking/harvesting wild greens					3.0 ± 1.5	2.3 ± 1.0	**2.38**	**0.020**
Never	17	(33%)	16	(33%)				
Rarely	1	(2%)	13	(27%)				
Sometimes	15	(29%)	15	(31%)				
Most of the time, regularly	9	(17%)	5	(10%)				
All the time	10	(19%)	0	(0%)				
Food preparation/preservation					3.1 ± 1.5	2.6 ± 1.2	**2.25**	**0.028**
Never	16	(31%)	12	(25%)				
Rarely	4	(8%)	12	(25%)				
Sometimes	10	(19%)	15	(31%)				
Most of the time, regularly	8	(15%)	8	(16%)				
All the time	14	(27%)	2	(4%)				

Significant p-values are presented in **boldface**.

1. Likert rating for survey responses: 1 = never, 2 = rarely, 3 = sometimes, 4 = most of the time or regularly, and 5 = all of the time.

Table 3. Characteristics of food-sharing networks used by Iñupiaq elders living in rural and urban locations

	Rural (n = 40)	Urban (n = 48)	Mann-Whitney U Test	
	mean ± sd		z value	p
Edible pounds of subsistence foods per household	2,606 ± 2,724 Range 0 to 12,738	251 ± 421 Range 0 to 1,600	–6.07	**0.001**
Food-sharing network events	55.1 ± 8.4 Range 12 to 217	2.9 ± 0.5 Range 0 to 13	–7.28	**0.001**

Significant p-values are presented in **boldface**.

Table 4. Mean nutrient intake reported by Iñupiaq elders by location, gender, and age with comparison to dietary reference intakes (DRIs)

	DRIs[1, 2, 3, 4, 5]			Rural = 52		Urban = 49	
	Age, y	M	F	M = 25 < 70 = 20 > 70 = 6	F = 27 < 70 = 18 > 70 = 8	M = 29 < 70 = 28 > 70 = 0	F = 19 < 70 = 17 > 70 = 3
Energy, calories	51–69 70+	2,204 2,054	1,978 1,873	4,152 4,159	3,063 2,972	5,505	2,928 1,359
Protein, g	51–69 70+	56	46	186 227	142 157	238	119 69
Fat, % calories	51–69 70+	20–35%		36% 35%	37% 34%	37%	37% 36%
Carbohydrates, % calories	51–69 70+	45–65%		44% 40%	43% 43%	45%	47% 41%
Vitamin A, RE	51–69 70+	900	700	1,598 1,910	1,013 1,204	1,919	947 420
Vitamin B12	51–69 70+	2.4		6.9 5.9	4.8 3.9	11.3	5.3 2.6
Vitamin C, mg	51–69 70+	90	75	310 346	184 288	318	216 57
Vitamin E, a-TE	51–69 70+	15		21 18	15 15	23	14 5
Folate, mcg	51–69 70+	400		533 498	416 367	836	424 223
Calcium, mg	51–69 70+	1,200		1,099 924	853 1,071	1,424	837 244
Iron, mg	51–69 70+	8		40 36	27 32	48	20 13
Sodium, g	51–69 70+	1.3 1.2		4.7 4.3	3.5 3.3	6.9	3.6 1.7
Fiber	51–69 70+	30	21	19 16	13 13	34	18 10

1. Institute of Medicine, Food and Nutrition Board. DRIs for vitamin A, vitamin D, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc. Washington, D.C.: National Academy of Science, 2001.
2. Institute of Medicine, Food and Nutrition Board. DRI for calcium, phosphorus, magnesium, vitamin D, and fluoride. Washington, D.C.: National Academy Press, 1997.
3. Institute of Medicine, Food and Nutrition Board. DRI for energy, carbohydrates, fiber, fat, protein, and amino acids (Macronutrients). Washington DC: National Academy Press, 2002.
4. Institute of Medicine, Food and Nutrition Board. DRI for thiamine, riboflavin, niacin, vitamin B6, folate, vitamin B12, pantothenic acid, biotin, and choline. Washington, D.C.: National Academy Press, 1997, 1998, 2000a, 2000b, 2000c, 2005.
5. Institute of Medicine, Food and Nutrition Board. DRIs for vitamin C, vitamin E, selenium and carotenoids. Washington, D.C.: National Academy Press, 2000a.

of age (n = 3) reported the lowest average intake of calories (1,359, range 1,354 to 1,365); in contrast, urban men under seventy years of age (n = 28) reported the highest average calorie intakes (5,505, range 1,286 to 12,934). Due to the unequal distribution by age groups, statistical comparisons were not deemed valid, although interesting. Percent fat of total calorie intake approximated the upper range recommended by the American Heart Association Guidelines of 20–35% (American Heart Association 2000). Carbohydrate intakes were near the lower end of the range of 45–65% of total calories as recommended by the Dietary Guidelines for Americans (2005). Low intake of carbohydrates among individuals prone to glucose intolerance may be a healthy strategy to control blood glucose levels, possibly forestalling or diminishing the effects of diabetes mellitus.

Similarities and differences in nutrient intake trends were noted. All groups were consistent in reporting low mean intakes for folate, calcium, and fiber near or below DRI recommendations. Rural and urban males reported mean intakes for most of the selected nutrients above DRI values. This was in sharp contrast to urban females over seventy years of age, who reported low or marginal mean intake for calories, vitamin A, vitamin B12, and vitamin E. Due to the small sample size of the urban elders over seventy years of age, the impact of gender, location, and the small food-sharing networks found in the urban community could not be explored further. The authors could not conclude that urban elders over seventy years of age appeared to report more difficulty in meeting nutritional needs than did rural elders of the same age; however, these trends may prove accurate with additional research. When in the urban location, the Iñupiaq elders did appear to change their eating patterns: older females reported less food intake and younger males reported more. Both changes may increase their risk of malnutrition and increase chronic diseases of under-intake or over-intake.

When looking at the combined data from all rural and urban respondents (data not shown), 23 (23%) of the Iñupiaq individuals reported calorie intakes below 2,000 calories per day, and 10 (10%) individuals reported intakes of < 56 grams of protein per day. Both intakes approached minimum nutrition intake recommendations for U.S. populations.

DIFFERENCES IN INTAKE OF HARVESTED FOODS

The term "harvested foods" was used to designate foods obtained by hunting, fishing, or gathering compared to "store-bought foods" purchased at the store or ordered and shipped to the community. Rural elders from Buckland and Deering reported higher mean weekly servings of most harvested food examined: fruit and vegetables, fish, foods from the sea and the land. Rural elders also reported considerably more intake of salmon, dried fish, Native berries, greens, seal oil, and caribou. Two exceptions were halibut and *muktuk*/whale meat. Halibut is available in southeast Alaska, in the Anchorage area, and not generally available on Alaska's northwestern coast. This may explain the higher use of halibut reported by the urban elders. Intake of *muktuk* and whale meat was low in both groups, although urban elders also reported slightly higher intake of these items. This anomaly was better understood when the urban elders told of their sources of *muktuk* and whale. Many of the urban elders received the prized meat as gifts given at multitribal social events held in the Anchorage area, in contrast to rural elders in these communities who received *muktuk* and whale from family-based food-sharing networks. It appears that Anchorage is a focal point for many overlapping food-sharing networks from around the state. Native older adults living in rural areas may be somewhat more limited in their access to *muktuk* and whale if the village was unsuccessful in harvesting a whale during that particular season.

CONTRIBUTION OF HARVESTED FOODS TO NUTRIENT INTAKES

Harvested foods made significant contributions to several nutrient groups of the rural and urban Iñupiaq elders examined in this study (Table 5). Standardized nutrient content information for many harvested foods is limited or incomplete (Heller and Scott 1967; Nobmann 1992; USDA National Nutrient Database). The contribution may be greater if the nutrient content were known.

Data from rural elders indicated that harvested foods contributed 64% of the total reported intake of protein, compared to 41% for urban, almost 2 to 1. The difference perhaps indicates the deep integration of the rural elders into the local harvested food-sharing systems. For urban elders, harvested foods generally contributed less than one-third of the total nutrients consumed.

Table 5. Percent contribution of harvested foods to nutrition intake

	Rural % (n = 52)	Urban % (n = 48)
Macronutrients		
Protein, g	64.1	41.6
Energy, calories	27.5	21.2
Fat, g	25.5	25.4
Carbohydrates, g	5.6	3.0
Vitamins		
Riboflavin	60.6	35.8
Vitamin B12	45.6	19.7
Niacin	43.8	25.6
Vitamin A	39.9	19.7
Thiamin	27.4	13.9
Vitamin C	22.6	10.3
Vitamin D	13.9	28.8
Vitamin E	11.7	6.7
Vitamin B6	10.5	7.4
Folate	6.0	2.3
Minerals		
Iron	54.2	39.6
Phosphorus	50.6	30.3
Zinc	38.2	19.4
Potassium	33.2	17.5
Calcium	13.8	5.9
Sodium	11.9	7.7
Magnesium	7.2	5.6
Fiber	0.3	0.6

RELATIONSHIPS BETWEEN VARIABLES

Table 6 examines relationships between nutrition and food customs reported by the Iñupiaq elders as a total group, using Spearman rho correlations due to the unequal sample sizes and distribution of data. Negative correlations indicate inverse relationships (i.e., as one variable increases, the other decreases), whereas positive correlations indicate corresponding increases (i.e., as one variable increases, so does the other). Increased age did not appear to influence the intake of energy and protein, although this has been reported for other population groups (Blaum et al. 2005). Longevity in the rural location appeared to have a strong relationship to decreased intake of energy ($p = 0.045$) when compared to increased energy intake reported by urban respondents. Likewise, participation in community activities also showed a strong positive relationship to increased intake of protein ($p = 0.040$). A harvest of large arctic animals requires an array of distinct social roles for procurement, food processing, storage and preservation. Negative relationships were found between intake of protein and the number in the household ($p = 0.002$). This relationship may reflect the challenges faced to feed all within a network during the year of the study or possibly that the elders may give preference to feeding others in the household before feeding themselves. Higher education levels may give opportunities for employment and increased cash income but may also restrict time for harvesting food. Characteristics of food-sharing networks were quite different in the rural and urban locations, but the differences did not seem to be reflected in re-

Table 6. Spearman's rho correlations among select nutrition intake, community support variables, and demographic characteristics as reported by all Alaska Iñupiaq elders (n = 75)

	Nutrient Intake			
	Energy		Protein	
Community support variables	**rho**	**p**	**rho**	**p**
Participation in family activities	–0.004	0.967	0.139	0.183
Participation in community activities	0.181	0.099	0.224	0.040
Food-sharing networks				
Number of edible pounds of harvested food	–0.011	0.920	0.110	0.309
Number food-sharing episodes	–0.024	0.839	0.045	0.699
Demographic characteristics				
Age	–0.173	0.086	–0.096	0.341
Years of education	–0.160	0.118	–0.213	0.036
Time at rural/urban location	–0.201	0.045	–0.095	0.346
Number in household	0.041	0.689	–0.305	0.002

duced intake of total energy or protein. As the number of Native older adults continues to increase, these issues should be revisited.

CONCLUSION

These data provide insights based on quantifiable data for the benefits of traditional food customs based on the self reports of the participating Iñupiaq elders. Participation in rural community activities provided greater nutritional health to the elders. Harvested foods provided over 60% of total protein and 40% of energy intake for elders living in Buckland and Deering. Within the Iñupiaq culture, the harvest and preparation of traditional food provides bridges from past to present, thus bridges generations. Traditional Iñupiaq foods are a defining aspect of the Iñupiaq culture. Further studies should examine healthy components of the Iñupiaq diet that encourage the use of harvested local plants, berries, meats, and fish (such as high intake of fish containing omega-3 fatty acids, low intake of salt, and high intake of low-cholesterol meat from caribou). Teachings of the elders could provide appropriate balance within Iñupiaq communities for younger individuals to continue a deep appreciation of the rich food heritage if incorporated into nutrition education programs (Smith and Wiedman 2000). These programs could be used to help guide food choice decisions by young families as they combat the bombardment of advertising messages that promote foods purchased from global markets known to be associated with poor health outcomes. These findings concerning participation in community activities and retention of food heritage may apply to other Native groups, as well.

The constraints of culture and remote geography indicated that a self-selected population should be used. The small number of frail individuals, those over the age of seventy, in the urban group may have limited the strength of comparisons. Differences in many of the variables may have been higher if rural and urban groups could have been matched by age and gender. Data collection occurred during a short period of time during the summer and fall of 2005, and limited observations made through brief encounters may inadvertently be imprecise if the observations could have been measured over multiple seasons. However, despite possible limitations, this new information substantially adds to the total body of knowledge that could be useful in future studies.

Even with these limitations, these findings are consistent with elders' testimony given at the National Resource Center for American Indian, Alaska Native and Native Hawaiian Elders' meetings in seventeen Alaska communities (Graves and Shavings 2005), when they said that older Native individuals were not happy when they moved from Alaska rural villages to urban locations because they "couldn't get their Native food" and "they didn't know anyone."

The harvest of subsistence foods links generations through the sharing of indigenous knowledge needed to harvest and distribute food. Traditionally, links in these food-sharing networks extend from the hunters to Native older adults, thus fulfilling traditional expectations for food support anticipated by individuals as they age and their physical abilities to hunt and gather food decline. The participation in village activities by older individuals as part of traditional food customs acknowledges the respectful role of elders as keepers of historical memory, ensuring their significant place within the community. When older Native community leaders move away from the rural community, the distance prevents involvement in these traditional activities and appears to change food intake. Providing support services within the cultural framework of rural communities may be advantageous, rather than moving aging Native individuals to urban health and social services.

This information about the positive value of food customs used by Alaska Native older adults has implications for policy decisions, land development, and management of natural resources. Limits placed on land use, more restrictive hunting and fishing regulations, and oil and mineral exploration have decreased traditional food harvesting activities in these communities. Access of Iñupiaq elders to the natural resources that contribute a significant portion of their nutrient intake has come under challenge in both domestic and international political arenas. Policies that enhance Native older adults' food customs and assure continued availability of the natural food resources would promote nutritional health for all older Alaska Natives.

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