FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

FOOD CUSTOMS OF RURAL AND URBAN INUPIAQ ELDERS AND THEIR RELATIONSHIPS TO SELECT NUTRITION PARAMETERS, FOOD INSECURITY, HEALTH, AND PHYSICAL AND MENTAL FUNCTIONING

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DOCTOR OF PHILOSOPHY

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DIETETICS AND NUTRITION

by

Janell Smith

2007

To: Interim Dean Michele Ciccazzo
Dr. Robert R. Stempel School of Public Health

This dissertation, written by Janell Smith, and entitled Food Customs of Rural and Urban Inupiaq Elders and their Relationships to select Nutrition Parameters, Food Insecurity, Health, and Physical and Mental Functioning, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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DEDICATION

I dedicate this dissertation to the Inupiaq communities who influenced this study and my life. They shared my concern for the nutritional well being of their Elders and graciously permitted this research within their homes. The Inupiaq families shared their wisdom, time and warm hospitality and warmly welcomed me into their hearts.

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ABSTRACT OF THE DISSERTATION

FOOD CUSTOMS OF RURAL AND URBAN INUPIAQ ELDERS AND THEIR RELATIONSHIPS TO SELECT NUTRITION PARAMETERS, FOOD INSECURITY, HEALTH, AND PHYSICAL AND MENTAL FUNCTIONING

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The Inupiaq Tribe resides north of the Arctic Circle in northwestern Alaska. The people are characterized by their continued dependence on harvested fish, game and plants, known as a subsistence lifestyle (Lee 2000:35-45). Many are suggesting that they leave their historical home and move to urban communities, places believed to be more comfortable as they age. Tribal Elders disagree and have stated, "*Elders need to be near the river where they were raised*" (Branch 2005:1).

The research questions focused on differences that location had on four groups of variables: nutrition parameters, community support, physical functioning and health. A total of 101 Inupiaq Elders $\geq$ 50 years were surveyed: 52 from two rural villages, and 49 in Anchorage. Location did not influence energy intake or intake of protein; levels of nutrition risk and food insecurity; all had similar rates between the two groups. Both rural and urban Elders reported few limitations of ADLs and IADLs. Self-reported general health scores (SF-12.v2 GH) were also similar by location. Differences were found with rural Elders reporting higher physical functioning summary scores

(SF-12.v2 PCS), higher mental health scores (SF-12.v2 MH), higher vitality and less pain even though the rural mean ages were five years older than the urban Elders.

Traditional food customs appear to support the overall health and well being of the rural Inupiaq Elders as demonstrated by higher intakes of Native foods, stronger food sharing networks and higher family activity scores than did urban Elders. The rural community appeared to foster continued physical activity. It has been said that when Elders are in the rural setting they are near "*people they know*" and it is a place "*where they can get their Native food*" (NRC 2005). These factors appear to be important as Inupiaq Elders age, as rural Inupiaq Elders fared as well or better than Inupiaq Elders in terms of diet, mental and physical health.

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LIST OF ACRONYMS

ADLs -----	Activities of Daily Living
ADF&G ----	Alaska Department of Fish and Game
AFN -----	Alaska Federation of Natives
ANCSA ----	Alaska Native Claims Settlement Act (ANCSA) ratified in 1971
AoA ------	Administration on Aging
BMI -----	Body Mass Index
DRIs -----	Dietary Reference Intakes
IADLs -----	Instrumental Activities of Daily Living
NANA -----	Northwest Alaska Native Corporation, the regional tribal organization formed in 1971 with the ratification of the Alaska Native Claims Settlement Act giving regional governance of surface and ground resources.
NPS ------	National Park Service
NRC -------	National Resource Center for American Indian, Alaska Native and Native Hawaiian Elders, an Administration on Aging (AoA) sponsored center at the University of Alaska Anchorage
NSI -----	Nutrition Screening Initiative – referring to the nutrition risk screening instrument: NSI Determine Your Nutritional Risk Checklist
NUNA -----	The local newspaper published by Maniilaq Association, Kotzebue, Alaska. The word "NUNA" means land in the Inupiaq language.
RDA -----	Recommended Dietary Allowance
STN -----	Social Transition of the North: a comparative study of the status of people and communities in Alaska and Russian Far East, NSF OPP 9496351 (Researchers: McNabb SL, Richards WW, Pika AI, 1992. Published by Saylor 2004).

LIST OF DEFINITIONS

Agutuq ----- Agutug (pronounced “Ogg-U-Tuck”) is prepared by hand by whipping caribou fat and seal oil in a large bowl until the warmth of the hand softens the fat, and turns the fat white and fluffy. Mixtures vary, but some of the most popular added ingredients are cooked chopped pieces of caribou meat, cooked fish with crowberries, or just a mixture of berries such as salmonberries and ground cranberries. Some agutug have added sugar, such as when only berries are used, but in the villages around Kotzebue, sugar is not commonly added. See Appendix C for nutrient composition.

Alaska Native ----- Communities consider an “Alaska Native” as a person of indigenous heritage related by birth, or a member of one of a cultural group who as a group can trace their association with geographical locations in Alaska prior to the arrival of European explorers. The legal definition is an individual who has recognition as a member of one of the 229 Federally Recognized Alaska Native Tribes. Most Tribal groups in the continental United States use blood quantum levels to determine Native status.

Alaskan older adults ----- Term used to refer to all older adults in Alaska over the age of 50 years old, both Native and non-Native.

Culture ----- Culture is a group that share human behaviors through a complex informational system that are transmitted through non-genetic mechanisms from one generation to the next (McElroy and Townsend, 2004:112).

Elders ----- In this paper, the term Elder refers to any older adult over the age of 50 who is of Native heritage. The word is capitalized out of respect for these individuals given by their communities as individuals and as a group.

Eskimo ----- This early definition was proposed by Mason for all peoples living in the Arctic zone, following his visit to Alaska and the northwestern United States in 1881. His report was published by the Smithsonian Institute in their Annual Report for the year 1884. Kroeber (1939) later described common traits existing among several population groups residing in the arctic area as being “use of skin boats, harpoon, bladder or inflated skin, spear thrower, three or four pronged bird spear, two-winged salmon spear, lamp, stone pot, house platform, type of clothing, ivory carving, use of kashim or social house, shamanism, type of myth or tale”.

Food Security ----- Food security has been defined by Campbell as “access to all people at all times to enough food for an active, healthy life and at a minimum includes the following: 1) the ready availability of nutritionally adequate and safe foods and 2) the assured ability to acquire personally acceptable foods in a socially acceptable way." Food insecurity exists whenever food security is limited or uncertain (Campbell 1991).

Inuit ----- (In early records were also referred to as the Polar Eskimo). Dumond (1977) proposed that the peoples of the North Pacific, Bering Sea and Arctic Coasts of Alaska (formerly all called "Eskimos") were similar in language and culture, but differed from others in the Eskimo category, in that they were speakers of the Inuit-Inupiaq language. In the Inuit-Inupiaq language, "Inuit" means 'the original people' (Damas 1984:1-7). Knud Rasmussen who led the Fifth Thule expedition in the 1920's is credited for the recognition of the cultural similarities of the *"peoples living across the top of the American world"* (Dumond 1977).

Inupiaq ----- Name self-designated by Alaska dwelling *Inuit*. The spelling "*Inupiat*" is promoted by the Alaska Native Language Center, Fairbanks (Damas 1984:1-7), and usually refers to the Native Tribes in the Barrow area. This spelling frequently appears in many governmental and scientific publications. However, when referring to the cultural group of northwestern Alaska, this paper will use the spelling, "*Inupiaq*," consistent with local customs in the communities visited.

Indigenous Foods ----- Term used to describe edible flora and fauna naturally occurring in the Arctic geographical region.

Muktuk ----- Muktuk is the outer layer of fat on the whale. Black muktuk comes from the bowhead whale. White muktuk is obtained from the beluga whale.

Subsistence -----In Section 803, Title VIII of the Federal Law, subsistence is defined as the customary and traditional use in Alaska of fish, wildlife, and other renewable resources for direct personal or family consumption, for the making and selling of handicraft articles from the non-edible by-products of fish and wildlife taken for direct personal or family consumption, and for customary trade, barter, or sharing for personal or family consumption.

Traditional Foods -----Edible items chosen by Native groups based on the indigenous foods available. Traditional foods usually have specific descriptive names in the cultural language, where introduced foods, such as fry bread, do not.

Western Contact -----Western contact refers to the time indigenous groups were exposed to substantial numbers of non-Native individuals. Although contact varied at different areas across the vast geography of the Alaska territory, contact with western explorers is generally accepted to have begun in 1778, the year Captain James Cook explored the Alaska Northern coast (Anderson 1984). However, it wasn't until the early 1800s when whaling arrived in the Bering Sea that non-Natives established a permanent presence in this region. Prior to this time, outside influences are thought to have been few, with only a few trade beads and iron tipped blades found in archeological sites.

CHAPTER I

INTRODUCTION

Older Native Alaskans

Longer life expectancy has rapidly increased the number of Alaska Native Elders (Lanier, et al, 2002). Life expectancy has increased from 64.4 years in 1980 to 69.5 years in 1997. Native Elders are the fastest growing segment of Alaska's population (US Census - Alaska 2000, Goldsmith, et al, 2004). Alaska Tribal data indicate that more than 7,300 Native Elders moved from rural to urban areas in the last decade (Branch 2005). The Native population living in urban areas increased from 19.3% in 1970 to 42.3% in 2000 (US Census, Alaska 2000). The migration from a rural to an urban setting may interfere with cultural practices that normally support the nutrition and health status of Native Elders. This research project was designed to better understand if living in an urban versus rural setting influences food customs and the possible impact of the living location may have on nutrient intake, food insecurity, health, and physical and mental functioning of Native Elders.

Thematic analyses was performed of testimony presented by members of Alaska Native communities given in a series of 17 statewide listening sessions held in 2004-2005 by the National Resource Center for American Indian, Alaska Native and Native Hawaiian Elders (Graves, NRC 2005). Consistently, three themes emerged regarding the status of Elders who had moved from rural villages to urban areas. First, the Elders, "*couldn't get their Native food*," implying a possible change in nutrient intake. Secondly, "*they didn't know anyone*," indicating possible changes in their social context. Thirdly, the community members reported that the combined impact of these changes upon the relocated Elders as "*they willed themselves to die*," implying that there may have been changes in the Elders' physical and mental status.

Information about the holistic value of subsistence resources in maintaining the food customs (i.e., the intake) of subsistence foods used by Alaska Elders has implications for policy decisions, land development, and management of natural resources, such as in land use, hunting and fishing regulations, and oil and mineral exploration. The access of Inupiaq 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. The study of Native Elders' food customs may help assure continued availability of the natural food resources that are determinants of health (both physical and mental) for older Native Alaskans.

Historical Context and Population Changes

At one point in time, all peoples that lived in the arctic were known as "Eskimos." They resided along the northern coast of Siberian Russian, Asia, Canada and Greenland spreading eastward from the Bering Sea arriving on the North American continent approximately 4,000 years ago (Fitzhugh 1988:43). More recently Tribal groups have adopted different names to assist them in establishing Tribal identity in the national and international political arenas. This study focuses on two "Inupiaq" communities that are found in western Alaska around Kotzebue. The "*Inupiat*" peoples are located in and around Barrow on the north coast of Alaska, the "*Inuit*" in Canada, and the "*Kalaadlit*" live in Greenland. All share similar languages (McCLlean 1990), similar blood types, and similar skeletal and dental morphology (Szathmary 1984:64-71). They also share a common cultural trait of adapting to the arctic climate and the development of technology to efficiently hunting arctic marine animals (Fitzhugh 1988:42-51).

One of the fundamental values of Inupiaq culture, as well as most Alaska Native cultures, is the respect for the wisdom of Elders (Kawagley 1995). It was the Elders' role to provide instruction in the societal rules and traditions and to ensure that they were passed to the next generation (Wilson 1996, Fienup-Riordan 1994). The accepted community role was for the Elder to be a strong support for the extended Native families, and traditionally, "*assumed care for*" the immediate family, the extended family, and the entire community (National Native Association of Treatment Directors, 1991).

While historically, cultural values in Native communities dictated practices that supported Native Elders (VanStone 1962:109), Alaska Native communities are changing, and the impact of these changes on the Elders is the focus of this study.

DESCRIPTION OF STUDY SETTING

Choice of Study Population: The Alaskan Inupiaq

Inupiaq Elders were chosen for this study because they have been relatively removed from Western influences. Both villages appeared on the Alaska Census records in the early 1900's. The Elders report that both villages moved from time to time prior to the settling in the current location. For the purposes of this study, village leaders were able to identify tribal members who had left rural villages and moved to urban communities. The community was involved in the study protocols whenever possible. The eagerness of the Tribal members to be part of the study encouraged the researcher to pursue this research path, and they facilitated funding to make the necessary number of visits to the communities to complete the study.

Description of the Rural Study Setting

The Inupiaq lands are above the Arctic Circle in northwest Alaska with periods of total daylight during the summer and total darkness during the winter. The average winter temperature for the region is approximately -20 degrees Fahrenheit (F), and the average high temperature in July is 63 degrees F. Yearly temperature extremes ranging from -60 degrees (F) to 85 degrees (F) are not uncommon.

The villages are not connected by roads, but are connected by short-wave radios and more recently by use of satellite phone technology and the internet. Many individuals have cell phones, television and computers. Pump-and-haul, water haul and vacuum sewer systems have been added in recent years. Technology to provide water and sewer services are evolving to protect the frozen artic tundra. Both communities are exploring the use of an incinerator with waste heat recovery to reduce the volume of refuse and to provide for an alternate heat source than use of diesel fuel. Families live in pre-fabricated homes that were transported via summer barges and were assemble in the villages. Villages have access via boats and small aircraft from Kotzebue, the region's largest community of about 4,000 people. The gravel runways in the two rural villages are approximately 3,000 feet, although the paved runway in Kotzebue accommodates daily jet transportation to Anchorage and Fairbanks. During the winter, snow machines are efficient means of travel between villages, over frozen lakes and streams.

Small tribally-owned grocery stores provide canned goods and fresh milk, as well as limited supplies of fruits and vegetables on a periodic basis. In both communities the sale or importation of alcohol is prohibited. Demographics of the two rural Inupiaq communities are presented in Table 1.1.

Table 1.1 Demographics of the Two Inupiaq Rural Communities

	Community 1	Community 2
Population	406	136
Percent Native (alone or in combination with one or more races)	96.8%	94.1%
Population by Gender		
Male	218	71
Females	188	65
Population by Age		
Age 4 and under	39	11
Age 5-9	55	15
Age 10-14	71	22
Age 15-19	59	9
Age 20-24	28	6
Age 25-34	50	20
Age 35-44	49	19
Age 45-54	22	14
Age 60-64	10	3
Age 65-74	8	7
Age 75-84	6	3
Age 85 and over	0	0
Median Age	17.8	27.0
Number of Occupied Households	84	42
Average Household Size	5.19	3.90
Per Capita Income	$9,624	$11,000
Mean Household Income	$38,333	$33,333
Percent Below Poverty	11.9%	5.8%
Unemployed and Seeking Work	33.8%	17.0%

Source: US Census - Alaska 2000. Alaska Community Database OnLine. Accessed at http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.cfm on June 3, 2005.

Health Care

New clinic buildings have been built recently in both communities, although the village clinics have been in the communities since the mid-1930's (Fortuine 1998) to fight the spread of tuberculosis using locally trained health teams. Clinic services are provided by specially trained Native individuals, many of whom grew up in the village or in villages near by. Health care training is provided by the Alaska Native Tribal Health Care System, remnants of the medical services compacted as the nationwide Indian Health Service transitioned medical care from the prevue of the Federal Government to the responsibility of the Tribal governments in 1994. Two hundred-twenty nine Alaska Tribes participate in the newly compacted Alaska medical care system. Specialty medical teams visit the clinics on a routine basis (such as dentist, ophthalmologists, diabetes management). The local clinic staff is in daily contact with physicians at the Kotzebue hospital.

Education

The community school host kindergarten through 12th grade, and is the center of activities in both villages. All school events are well attended. Sports teams are organized for all school ages and for the community as well. Both schools have a small cafeteria that offers free lunches to Elders through an agreement with the Maniilaq Regional Native Corporation with funding provided from a Title VI grant from the Administration on Aging (AoA). The majority of teachers are non-Native individuals that are contracted to teach in the village school system. Community members receive training via teleconferences for supportive jobs in the school such as for teacher aides, school clerks and librarian assistants. As more Native youth are seeking college educations, it is the hope of the villages to have an all Native teaching staff in the near future.

Having a school in each village has been a major victory for local governments. In 1976, legal action (AK 4 AAC 05.040, Tobeluk v Lund, known as the Molly Hooch Case) decreed that local secondary schools must be provided if "one or more children were available to attend secondary school". (Current regulations require that there be 10 students in a village to qualify for an Alaska State sponsored secondary school). Prior to 1976, children wanting to obtain high school training had to leave their villages and live at one of the territorial schools if the students were at least "*mixed-breed*" and "*lived a civilized life*" (Getches 1977).

The short and long term impact of routine removal of children from their families is not known. The impact of western school systems and the separation from their families upon food habits of today's parents who were raised in orphanages and/or were sent to schools away from their villages has not been studied. Current focus has been helping older adults deal with trauma from the physical and mental abuse that seemed to characterize attendance at the boarding schools (LaBelle 2006). Elders have characterized the move from rural to urban locations as a repeat of the forced relocation to attend school as a child (NRC 2005).

In a small survey on St. Paul Island located off the coast of southwest Alaska, a question was asked to define barriers that prevented individuals from using traditional foods. Many of all ages responded that they did not know how to prepare and handle seal meat (correspondence with Kari Hamrick, unpublished data from the spring of

2003). Similar patterns of educational loss about the use of traditional foods may also exist in all Alaska Native communities.

Subsistence Living

Food dependency on harvested wildlife is frequently referred to as a subsistence lifestyle (Callaway 2003). Subsistence lifestyle is the defining characteristics of rural Alaska, and when asked, community members report that this is the most important thing they do (Huntington 1992).

Although no village today can be considered to embody true subsistence living (i.e., that all raw materials come from the land), the harvest of fish, wildlife, and plants is seen as a vital connection to the land and to cultural tradition. An Inuit man from Greenland was reported in the *Los Angeles Times*,

> "*Our foods do more than nourish our bodies. They feed our souls. When many things in our lives are changing, our foods remain the same. They make us feel the same as they have for generations. When I eat Inuit foods, I know who I am.*" (January 13, 2004).

The food patterns of Alaska Natives' are tremendously varied (Ballew, et al, 2006), similar to Native populations in Canada (Kuhnlein and Reveveur, 1996). Work by Mamleeva, et al (1998) indicated seasonal fluctuations; with the highest energy intakes reported during summer and the lowest during winter. Table 1.1 shows the diversity of subsistence harvest over a period of one year for an Alaskan village similar in demographics of the two study communities.

Table 1.2. Description of Harvest by Species and Calculated Allotment per Person.

Aleknagik, Western Coastal Alaska	Subsistence Harvest Per person per year		
Native game by specific species	Harvest pounds	% of total	number 100 g edible portions
FISH			
Chum salmon (Dog salmon)	3.2	0.9%	7.3
Coho salmon (Silver salmon)	15.5	4.5%	35.5
Chinook salmon (King salmon)	22.5	6.5%	52.0
Sockeye Salmon (Red salmon)	42.2	12.2%	96.0
Spawnouts	11.7	3.4%	26.6
Herring Roe	5.7	1.6%	13.0
Rainbow smelt	4.4	1.3%	10.0
Pacific Tom Cod	0.2	0.1%	0.5
Flounder, Halibut	0.6	0.2%	1.4
Blackfish	0.8	0.2%	1.8
Burdot	0.1	0.0%	0.3
Dolly Varden	15.6	4.5%	35.0
Lake Trout	5.8	1.7%	13.2
Grayling	0.3	0.1%	0.7
Pike	19.6	5.7%	44.5
Sucker	0.3	0.1%	0.7
Rainbow trout	0.9	0.3%	2.0
Whitefish	1.1	0.3%	2.5
LAND ANIMALS			
Brown Bear	1.2	0.3%	2.7
Caribou	60.5	17.5%	137.0
Moose	90.0	26.0%	245.0
Beaver	5.6	1.6%	12.8
Arctic Hare	0.7	0.2%	1.6
Snowshoe hare	0.6	0.2%	1.4
Porcupine	4.7	1.4%	10.7
Parka Squirrel	0.2	0.1%	0.5
SEA MAMMALS			
Bearded Seal	2.2	0.6%	5.0
Harbor Seal	5.7	1.6%	12.9
Ringed Seal	0.4	0.1%	.9
Steller Sea Lion	1.6	0.5%	3.6
Beluga whale	5.4	1.6%	12.3

DUCKS, BIRDS and EGGS			
Duck (pintail + eiderduck)	2.9	0.8%	7.7
Canada Goose	0.1	0.0%	0.3
White-fronted Goose	0.2	0.1%	0.3
Swan	0.1	0.0%	0.3
Crane	0.1	0.0%	0.3
Grouse	5.6	1.6%	12.8
Ptamigan	3.9	1.1%	10.4
Gull Eggs	0.9	0.3%	2.0
Murre Eggs	0.2	0.1%	0.5
SEA INVERTEBRATES			
Butter Clams	2.2	0.6%	5.0
Razor Clams	0.5	0.1%	1.2
Cockles	0.4	0.1%	0.9
Hair Crab	0.1	0.0%	0.3
YEARLY TOTALS	346.5	100.0%	830.8
Servings theoretically available per person per day assuming that all have equal access.			2.3

Source: Unpublished raw data by Bob Wolfe, calculations of serving sizes by Janell Smith in 2001. Used with permission of Jim Magdanz, ADF&G.

Point Hope is an Inupiat community similar to the two rural communities that participated in this study. The information presented below shows the seasonal nature of the harvest of subsistence foods. Many of these data were collected during 1948-1949 by Penelope Easton, MS, RD (Easton 1950), and were included by Christine Heller, PhD, RD in her report published in 1967. The harvest seasons and the foods have remained unchanged, and are similar to food harvesting patterns that exist today (JS field notes 2004, 2005, 2006, and 2007).

Since Heller’s publication in1967 moose have returned to northwest Alaska, although their numbers are still limited.

Table 1.3 Harvest Seasons at Point Hope on the Northwest Coast of Alaska

FALL: September through October	
Wildfowl	Ducks, geese, snowy owls which pass over the village during their southward migration and to a lesser extent ptarmigan are obtained in moderate numbers at this time.
Caribou	From September through February the men, usually in parties of 2 to 5, hunt caribou in the hills east of the village. The number taken varies considerably from years to year. For several years prior to 1958 caribou were relatively scarce in the immediate area but since then their numbers have increased.
Grayling	Since aboriginal times many Point Hope families established fall camps along the Kukpuk River in the Cape Thompson area. Here they fished for grayling: first by pole and net fishing, and later by hooking through the ice. Even though the men who obtain summer wage work may not be back in time, and although many families stay in the village because of the beginning of the school year (September), sufficient grayling were still obtained during the visit in 1948-49, and the fish constitute a very important fresh food item in the fall diet.
WINTER: November through April	
Caribou	Caribou hunting continues sporadically from November through February.
Seal, Ugruk	From about late October or early November – as soon as the shore ice becomes solid enough for safe travel – and continues through winter, seal and ugruk are hunted in open leads (boats). These animals are one of the most important food animals on present day Point Hope diets. A good hunter may secure 120 or more animals during the season. They serve as food for both dogs and man.
Polar Bear	This animal is hunted sporadically during this season and has always been an important item in the Point Hope economy. The meat is used for both human and dog food; its fur as a source of cash income.
Whale – baleen	Throughout March and April priority is given to the assembling and repairing of skin boats (oomiaks)*, guns and other gear used in hunting the baleen whale. The actual hunt for this animal usually begins in April. Usually only 1-5 whales are usually caught. (* At the time of this study, whale hunters used modern boats with outboard motors, life jackets, survival suits, GPS and satellite phones)
Beluga	The beluga whale, which appearance in the area may just precede or occur simultaneously with that of the baleen whale, are hunted whenever there is an enforced curtailment in the pursuit of the larger animal. Only a few beluga are taken each year.
Grayling Tom Cod	Fishing for grayling in the Kukpuk River may continue until about mid-November. During January and February, the women and the older mem gig for tom cods through holes in the ice on the north shore.

SPRING: May through June	
Ducks, Murres	From early May through June, ducks and murres fly over and around the area (the murres nest at nearly Capes Thompson and Lisbourne*). Usually enough are taken to satisfy day to day needs, although some families still store limited supplies for future use.
Whale (Baleen and Beluga)	Whale hunting continues into the spring season. Almost everyone in the village is occupied in some capacity in relation to it, either as an active hunter or assisting in supplying the needs of the hunter or in transporting and storing the catch. Rainey (date) states that prior to the whaling days of the 1800's the yearly whale catch at Point Hope was 15-18. Now as indicated above 1-5 is the usual number.
Seal, Ugruk	After whale hunting ceases, the hunting of seal and ugruk is resumed and carried on as long as the shore ice is safe.
Walrus	A few walrus may be taken at this time of the year but not in significant numbers nor every year. It appears that this animal no longer hauls up on the beach near Cape Thompson in the sizeable numbers that it did in the past.
SUMMER: July through August	
Wildfowl and Eggs	In July, wildfowl, especially ducks and murres, are hunted and significant amounts may be stored for future use. The village makes several trips to Cape Thompson and Cape Lisbourne to gather murre eggs. The Bureau of Indian Affairs estimated the yearly take at about 830 dozen eggs, approximately 2 ½ dozen per family. In former times, eggs were boiled and stored in seal oil. (* At the time of this study, murre eggs are collected in late June. Only one egg from a nest of two is taken. The Elders told me that if there is only one egg, and it is taken that the bird will not lay another. If there are three eggs, the eggs will be too mature, meaning that the baby bird has started to form, which did not seem to be acceptable to eat. If one of two eggs were taken, the birds will lay another).
Caribou	This animal may be hunted at this season especially if, as often the case, they come down from the hills to the lagoons at the time families happen to be camped nearby.
Whitefish, Salmon and Trout	There is sporadic fishing for whitefish, salmon and trout as the runs pass close along the south coast near the village.
* Salmonberries, blueberries, sourdock, blackberries	At the time of this study, berries were harvested in July and August. Most were frozen and stored for use later in the year. Sourdock is cooked, frozen and stored for use later.

Reprinted from: The Alaska Dietary Survey, 1956-1961, by Christine A. Heller, PhD and Edward M. Scott, PhD. US Department of Health Education, and Welfare, Public Health Service. 1967, p 247-250.

*Updated from field notes, JSmith. July 2004, 2005, 2006 and February 2007.

The harvest of fish, wildlife, and plants is seen as a vital connection to the land and to cultural tradition. The sharing of subsistence food links generations and families, creating a web of social interactions that also serves as a highly resilient adaptation to uncertain food supplies (Magdanz, et al, 2002). Cultural identity is often tied to subsistence activities (Fienup-Riordan, 2000). Economically, subsistence plays a vital role by providing food outside the limited cash economy that exists in most rural villages in Alaska (Schroeder, et al, 1987). What is less clear is the role subsistence foods play in food security among rural residents.

On one hand, the presence of locally available, highly valued, healthful food suggests that subsistence activities are likely to make rural residents secure about the availability of good food. On the other hand, the high degree of food insecurity in rural communities suggests that the picture is more complex. Subsistence production in rural communities in Alaska is typically several hundred pounds of meat or fish per person per year (Schroeder 1987). But that production is not evenly distributed. In general, some 30% of the people in a community are responsible for producing 70% of the subsistence harvest (James Magdanz, Alaska Department of Fish and Game Division of Subsistence, personal communication, 2003). Similarly, the distribution of food within a community may not lead to equal availability of food for all residents.

The political climate concerning access to traditional harvest foods has changed during the memory of the current Elders. In 1971 The Alaska Native Land Claims Settlement Act was signed awarding approximately only one-ninth of the Alaska lands to 12 regional Native corporations (Arnold 1978). Currently the US Federal government is the largest land holder in Alaska with lands held as national parks, wildlife refuges, and wildlife preserves, followed by the State of Alaska. Each entity has their own guidelines and regulations concerning the harvest of game on those lands. Those regulations are often at the mercy of the winds of political agendas that extend outside the boundaries of Alaska. One Elder told us concerning his frustration to harvest salmon and complying with the fishing regulations that specified fishing from 2:00-4:00 am on Tuesday, "*The fish don't know its Tuesday – they came yesterday*." (JS Field notes, 2001). Likewise, caribou herds migrate and their patterns of migration change from time to time, often off of tribal lands and on to or through other land holdings.

Cultural Background

Cultural values underlie higher process of human feelings and action that shape knowledge, beliefs, arts, laws, customs and other expect behaviors of those in a society (Tylor 1871). As a result, the activities of the group act to support these values.

In the late 1960's, the Northwest Alaska Native Association (NANA) gathered community leaders to define the cultural values of the Inupiaq communities in northwestern Alaska. Following years of forced changes at the hands of "outsiders", i.e. explorers (Steller 1741-1742 (1988:123-182); Shelikov 1783-1786 (1981); Alekseev 1990:3-28, Ledyard 1963; La Perouse 1799, Ellis 1969 and Sauer 1802), whaling ships, gold prospectors, famines and epidemics (Fortuine 1989:209-226,262,308-310), boarding school relocations (La Belle 2005), Elders expressed that they felt they were losing grasp of their own culture (Burch 1998). Simultaneously, under the proposed Alaska Native Claims Settlement Act (ANCSA) that was later to be ratified in 1971, tribal groups were being required to prove cultural use of their historic lands. Perceived as a universal threat to the Inupiaq way of life, the initial start was to codify the Inupiaq cultural values among the Elders. Table 1.4 presents the list of 15 cultural values agreed upon in the meetings of the Tribal Elders that were held over several years. These values present broad guidelines on how to live day-to-day in an Inupiaq community. Supporting Elders, being helpful, and meeting obligations to family are all essential values of Inupiaq communities.

Table 1.4 Inupiaq Values

Know the Inupiaq language	*Share with others and try to be helpful.*
Treat all people with respect.	*Cooperate with others.*
Respect the Elders.	*Treat children with love.*
Work hard and avoid idleness.	*Know your family tree.*
Avoid unnecessary conflict.	*Respect all animals.*
Don't lose your sense of humor.	*Meet your obligations to your family.*
Respect successful hunters.	*Learn Inupiaq domestic skills.*
Trust in a spiritual power greater than yourself.	

NUNA, November 1980.

The Inupiaq language is freely spoken in both villages. Inupiaq is part of a larger language system known as Eskimo-Aleut (Krauss 1988:146). The Inupiaq, the Inupiat, and the Inuit have a similar language thought to have resulted from the eastern migration from the Bering Straits to Greenland about A.D. 1000. Four Eskimo-Aleut language groups have been identified in arctic Alaska: North Coast (Barrow), Interior, Kotzebue and Bering Straits (Krauss 1988:145-149). Most Elders in the two Inupiaq villages included in this work are bi-lingual in Inupiaq, and use

English as a second language. Inupiaq has been taught in the schools for some time, using Elders from the village as teachers.

On Sunday mornings at 10:00 am, Sunday afternoon at 6:00 pm, and many evenings during the week, the bell rings at the Friends Church calling everyone for church services. Both Bibles and hymnals were found in Inupiaq and English in the churches of the two villages. Services are structured or unstructured, in Inupiaq or English depending upon the members and the visitors present.

The Friends Church did not just happen to be in northwest Alaska. In 1884, Congress passed the First Organic Act that delegated the responsibility of providing education for children of all races in the District of Alaska to the Secretary of the Interior (Barnhardt 1985). In Alaska, Sheldon Jackson was appointed the first Commissioner of Education for Alaska in 1885 by the Bureau of Education in the Department of the Interior, the government agency given charge of program for American Indian and Alaska Natives. He served in this position until 1908. Jackson characterized Alaska Natives as "*sunk in degradation and decay*" (49^{th} Congress, 1^{st} Session, House Executive Document 1). He organized the Alaska educational system by dividing the state into regions and contracting church organizations to organize the schools, orphanages and social programs (Barnhardt 1985). Northwest Alaska was assigned to the Friends Church (American Friends Board of Foreign Missions, 1912), and the area around Barrow was assigned to the Presbyterians (Spencer 1959).

The influence of the religious community was pervasive in all aspects of Inupiaq culture (Flanders 1991, Prucha 1975, Purcha 1984). As children achieved school age, they were frequently shipped off to boarding schools in southern Alaska or the mainland US. One Elder told us that her parents moved away from the village when they learned that “they” were going to ship her away to boarding school.

Dr. Edna MacLlean, an Inupiat individual from the Barrow area testified at the 1990 meeting of the United Nations Educational Cultural Organization that "*The second wave of white men to reach the Yup’iks and Inupiat were Christian missionaries. They were different. They were relentless in their self-righteousness, and considered it their divinely-inspired obligation to disrupt the social, educational and religious activities of the Yup’iks and the Inupiat*.” Her complete testimony can be accessed at www.alaskool.com.

MacLlean is quite vocal in her criticism of the church sponsored education system as *"the destruction of the indigenous languages of Alaska*". She says that *"the Native peoples of Alaska were taught that their languages were not important, their religion was bad and that they should become like the white man as quickly as possible*". She attributes many of the social problems found within Native communities to the methodical process to eliminate Native culture throughout the United States (MacLlean 1990). Many in the region share Dr. MacLlean's views, but many also believe that believing in a higher power and participating in church activities is beneficial to their community.

Once the waves of epidemics of flu, measles and tuberculosis ravaged many Alaska communities, the church's role was modified to establish orphanages for death-abandoned Native children. Living in orphanages away from cultural references, traditional food patterns were forcibly replaced with western food habits.

Children were fed western foods new to this population despite advice from health experts to incorporate traditional and subsistence foods in their menu planning.

By the late 1940's, many in the health field were concerned over the rapidly changing diet and possible future health problems. Field notes from a State dietitian, Penelope Easton, visiting the orphanages during the spring of 1949 support much of MacLean's view of the educational system. Easton indicated that many of the facilities were faced with *"(small) budgets, lack of equipment, and small staffs*". In one school she described the conditions "*the home is sadly overcrowded (175 children)*". Her efforts focused on using Native foods into meal patterns served to Native children living in orphanages. Easton wrote, "*There are a few rose-hips in the area and some Native greens which can be put to greater use than they have…. They are going to cut down on jams and jellies ordered* (note: The traditional lunch at many of the orphanages at the time was bread and jam served with tea).

She wrote of some success to incorporate cultural foods in their food programs. In a note from the school in Akulurak, she wrote, "*The diet of the 122 children closely follows the Native diet, and thanks to advice from Miss Heller, they have preserved thirty barrels of berries and greens and will do more next year… They catch and dry all their own fish, make their own seal oil, and of course make their own bread*". (Penelope Easton's field notes, 1948-50, unpublished).

Although most of the health professionals were "outsiders", they saw the value of helping rural communities preserve their food heritage. Many cultures are defined by the consumption of specific foods; this is not unique to Native communities. Regions in China or India are known for their culinary differences, and holidays in the United

States focus on the consumption of specific food items (ADA Cultural Foods Series, See Halderman: Alaska Native Food Practices, 1998). While the lines between food cultures are blurring, people strongly identify with the foods they grew up with.

Alan H. Goodman in the introduction on Nutritional Anthropology wrote, "*Food is richly symbolic; nutrition is essential*" (Goodman 2000, Preface, page iii). The focus on food in Inupiaq villages is one of the defining characteristics of this culture, and is perhaps one of the easiest most tangible characteristics to observe and describe, although it may require years of research to fully understand the deep symbolism represented by the food consumed in an Inupiaq community.

In preliminary visits to four possible study communities in summer of 2004, the researchers asked the President and members of the Village Senior Councils to talk to us about the Inupiaq culture in their community. In all villages, the first comments given were descriptions of food gathering activities during the year: Activities described included where they hunt, in what times of the year, and under what specific weather conditions (JS Field notes, July 2004).

It is possible that the consumption in the two Inupiaq study villages will be similar to that reported by Wein, et al (1998) relative to eating habits on the Canadian Belcher Island. She found that the consumption of indigenous meats differed by age, but not by gender or by season. A greater percentage of persons in the age group over 55 years of age consumed more local meat and fish on a daily basis, than did age groups 18-34 years or 35-54 years. Harvested indigenous foods provided 47% of daily energy and 65-92% of daily protein. Similarly, in an Inuit village in Northern Quebec, the average consumption of game, wildfowl and fish increased with age and was particularly high among men aged 50-74 years (Jette 1995).

OVERVIEW OF THE STUDY VARIABLES

A. Food Parameters

The selection of assessment methodology to examine food intake of individuals was challenging. The yearly cyclic food pattern (Table 1.1 and Table 1.2) varies according to harvest seasons and the availability of harvested game and berries. These patterns differ from the customary intake of the general US population. In urban areas, global food distribution networks and advanced transportation technology enables equal access to all food types at any one time during the year (Wiedman and Smith, 2005). In Alaska rural areas, food supplies at small local stores can vary with the ability of transportation to bring in supplies. Some communities receive food supplies on a yearly barge delivery, other villages depend upon the Alaska system of by-pass mail that provides reduced air freight cost for food goods. (The by-pass mail system was reorganized in May 2007. Individuals in the participating villages have reported that they have seen a drastic increase in the cost of purchased foods. Fieldnotes, JS 2007).

Thus, the dietary assessment tool chosen for this study had to be able to assess both harvested food as well as purchased foods. For older respondents it was helpful to use a yearly inventory, such as a food frequency questionnaire, to prompt the recall of foods consumed. Responding on the basis of a year-long timeframe made use of the participants' more reliable long-term memory, rather than the less reliable short-term memory (Smith C, 1993). The inclusion of an additional list of Alaska Inupiaq foods with the Block Food Frequency (Block, et al 1986, 1989) allowed for the quantification of the unique seasonally harvested species used in Alaska as well as purchased foods. The Alaska foods included items such as muktuk and agutuq, which are not usually included in the food frequency protocols. From these food frequency data, mean and median nutrient intakes were determined and were compared by location.

Use of a food frequency tool did not allow a formal evaluation of dietary intake at the level of adequacy of specific nutrients using the Institute of Medicine (IOM 2000) protocols; however, the mean and median data did allow for a review of the trends of the eating patterns of the Inupiaq Elders that can be examined in future studies.

Use of Harvest Foods

The Inupiaq culture has been defined by anthropologists by their food choices (Kroeber 1939, Spencer 1959). Thus, the selection of food is an important part of the cultural identity of individuals. It had been reported that as rural Elders moved to urban locations that their access to specific traditional foods was reduced. It is unknown if diminished access of harvested foods had an effect on the cultural identity that may manifest in changes in mental health.

Nutrition Risk

This was the first study to examine the food customs of the Alaskan Inupiaq Elders of northwest Alaska. The study goals were to look at broad parameters that would have minimum burden on the participants yet would provide baseline data for further studies. The nutrition risk assessment tool, Nutrition Screening Initiative

Determine Checklist examines behaviors that have been linked to inadequate intakes of essential nutrients for older adults (Posner, et al 1993). This tool has been primarily used in non-Native populations, but has been included in an assessment tool for Native Elders sponsored by the Administration on Aging, and offered the opportunity to compare the Inupiaq Elders to other Elders in American Indian communities.

Diet Quality

Two diet quality tools were evaluated in this study for use with Inupiaq Elders. The Healthy Eating Index (Kennedy, et al, 1995) and the USDA MyPyramid (USDA 2006) are assessment tools that estimate nutrition adequacy for US populations. There would be considerable utility in the evaluation of the diet of remote populations, such as the Inupiaq, if the tools were applicable in other food systems, as well.

B. Levels of Community Support

Participation in Family and Community Activities

Alaska Elders had reported that when they moved from rural to urban areas that "*they didn't know anyone*" (NRC 2005). It was unknown if changes in the Elder's social setting would impact the individual's mental health. The mental health component score (MCS) from the SF-12 Medical Outcomes Study was used to measure overall mental health.

Food Insecurity

Food supplies for all Arctic communities obtained through hunting and gathering are unpredictable due to limitations of both the weather and the physical capabilities of the hunter (Dumond 1977). Famines were common in the historic past (Fortuine 1989:35,309-311), indicated by the 15 verbs used to describe “hunger” found in the Inupiaq language. In a WIC study, high levels of food insecurity (37%) and hunger (15%) were reported among younger women (Rody, et al, 2002). These data suggest that further investigation into food insecurity and hunger among the Elders population is warranted, as this group may be even more vulnerable. It is unclear as to the role subsistence foods play in food insecurity among rural Elders. The distribution of food within a community may not lead to equal availability of food for all residents.

Food Sharing Networks

Food sharing in Alaska is a traditional cultural practice (Fienup-Riordan, 1994) which continues to occur frequently to the present day (Magdanz, et al 2002, Rody, et al, 2002). Food sharing may be one of the defining attributes of the “subsistence lifestyle.” From a cultural perspective, food sharing networks link generations and families creating a web of social interactions through which community norms and standards are transmitted. From a pragmatic view, designated individuals within the food sharing networks harvest and clean wild animals, fish and plants, and then, distribute the food supplies to members of the network. Food sharing networks also serve as a highly resilient response to uncertain food supplies (Woollett 2007, Magdanz, et al, 2002). Jorgensen (1993) proposed that the breakdown of traditional hunting lifestyles and the decreased sharing of food have contributed to the resulting social ills occurring in many Alaska communities.

One of the classic anthropological writings focuses on the benefits of reciprocal relationships evidenced by gift exchanges, feasts, and gifts of food (Mauss 1954) between the Native groups in southeast Alaska. Mauss concluded that through ritual and presentation, political rank is established among subgroups, tribes, and tribal confederations, and that resulting collective groups are defined and relationships established. He proposed that the process of exchanges was essential in the development of large communities and nations.

C. Physical Functioning:

Activities of Daily Living and Instrumental Activities of Daily Living

Daily living tasks are grouped into two categories: essential activities of daily living (ADLs) (Katz, et al, 1963), such as bathing, eating, and dressing, and the more complex instrumental activities of daily living (IADLs), such as making meals, shopping, and cleaning (Lawton 1969). The ADLs and IADLs were developed for urban-based mainstream populations. It is not known if ADL and IADLs activity lists are applicable for Native populations.

Fuller-Thomson and Minkler (2005) found that functional limitations were reported by 28% of American Indian and Alaska Natives aged 45 years or older. The individuals reporting functional limitations had less income, were older, had less exposure to education, and were less likely to be married or employed than those without functional limitations. Lee and Frongillo (2001) found that functional impairments were significantly related with food insecurity even when demographic variables were controlled.

Table 1.5 presents data on limitations of ADLs and IADLs that were collected in Alaska from nine communities. The mean number of limited ADLs was 0.55. While 0.55 is a small number, there were more than twice as many limitations in IADLs. Surprisingly, in this study of 412 Alaska Natives Elders, 63% of Alaska Natives reported little to no functional limitations.

Table 1.5. Average Limitations in ADLs and IADLs Reported by Alaska Native Elders in 9 Alaska Communities

	n	Minimum	Maximum	Mean
ADLS	412	0	6	0.55
IADLs	412	0	7	1.16

Source: North Dakota National Center for Native American Aging, Alaska Specific Data, 2003. Saylor and Doucette, *IN* Health Status of Alaska Natives, 2004.

SF-12.v2 Physical Functioning Component Score

The Medical Outcomes Study, SF-12.v2, is a validated measure to detect changes in conditions resulting in diminished physical abilities. The Physical Functioning Score (PCS) includes questions concerning activity level, the ability to perform physical activities such as climbing stairs and the measure of body pain. Pain, the reduction of the ability to accomplish work activities and depression appear to be related (Mavandadi, et al, 2007), but these relationships are not clearly understood.

Mean PCS for the General US Population by Age Group for ages 55-64 is 46.90 + 9.18 (Ware, et al, 2005).

The SF-12.v2 has published standardized norm scores for many common chronic and acute diseases that may be found in free-living older adults: musculoskeletal diseases (Carmona 2001), diabetes (Tavintharan and Lee, 1999), stroke (Bureau of Surveillance and Analysis 1997), and ischemic heart disease (Dempster, and Donnelly, 2001). Responses from twelve questions are used to assess both physical and mental abilities.

D. Health

Perceived Self-Reported General Health

Self-reported general health has been shown to be a reflection of an individual's ability to function within his or her home environment beyond the mere presence or absence of Pathak's (1996) "five D's" – death, disease, disability, discomfort and dissatisfaction. However, recent research (Agyemang, et al, 2006, Ubel, et al, 2005, and Leinonen, et al, 2001) has found inconsistencies between the self-reported general health reported by aging adults and actual clinical documentation of their levels of chronic disease.

Perceived self-reported general health (GH) is determined by one question on the SF-12.v2 survey using a five point scale. Davies and Ware (1981) found that the intervals between the responses "excellent," "very good," "good," "fair," and "poor" were not equal, and thus responses are recalibrated to reflect this important scaling assumption (Ware, et al, 2005).

Mental Functioning

The self-description of mental health function reflects levels of social involvement and the ability to participate in family and community life (Ware, et al, 2005). This study was not designed to measure mental decline, loss of memory, or early onset of disease, such as Alzheimer's. Limited data are available for Alaskan population groups in this area of health, and this study provided the first data for Inupiaq Elders.

PURPOSE AND RESEARCH QUESTIONS

The few data that have been collected in Native Alaskan populations have generally included older individuals as part of the total population, with little focus on the potentially different food patterns of this age group.

The purpose of this research was to determine whether differences in food practices between rural and urban locations affect nutrient intake and self-reported general health of Inupiaq Elders. More specifically, this study compared the food customs of Inupiaq Elders living in rural and urban Alaskan settings. For this study, food customs were defined as the intake of specific nutrients and food groups, extent of food sharing networks, presence of food insecurity, and frequency of cultural activities and patterns related to food. This study also compared the self-reported health of the rural and urban Elders and explored potential relationships between select nutrition parameters, community support and measures of mental and physical health.

Thus, the following specific research questions were addressed by this study (Table 1.6):

Table 1.6. Brief Descriptions of Research Questions, Instruments and Statistical Analysis.		
Research Questions	Instruments or Data Source	Statistical Analysis
1A. Are there differences between Inupiaq Elders in rural and urban locations in select nutrition parameters:		
a. Mean and median intake of energy, macronutrients, micronutrients and fiber?	Block 98-item Food Frequency Tool, combined with a supplemental list of Alaska harvested foods.	T-test between means
b. Intake of harvested foods?	Supplemental list of Alaska harvested foods (servings per week)	Data were retrieved as group data, no statistical analyses were possible.
c. Harvested food contributions to overall nutrient intake?	Supplemental list of Alaska harvested foods	Data were retrieved as group data, no statistical analyses were possible.
d. Nutrition Risk?	Nutrition Screening Initiative DETERMINE Checklist	Cronbach's α , X^2 and T-tests
e. Diet Quality?	(1) Healthy Eating Index (2) USDA Food Guide Pyramid	X^2 and T-tests Data were retrieved as group data, no statistical analyses were possible.
1B. Are there differences between Inupiaq Elders in rural and urban locations in community support as measured by:		
a. Participation in community activities?	North Dakota "Survey of Our Elders II"	Cronbach's α and T test
b. Participation in family activities?	NSF Study of Social Transition in the North	Cronbach's α and T test
c. Food insecurity?	ADF&G/NPS Household Harvest Survey	Cronbach's α, T-test, X^2 test, Phi Correlations
d. Food sharing networks?	ADF&G/NPS Household Harvest Survey (pounds of food shared per year, number of food sharing episodes per year)	Mann-Whitney U Test
2A. Are there differences between Inupiaq Elders in rural and urban locations in physical functioning, as measured by:		
a. Limitations in Activities of Daily Living (ADLs)?	Validated piece of ND survey	Cronbach α, X^2
b. Limitations in Instrumental Activities of Daily Living	Validated piece of ND survey	Cronbach α, X^2

(IADLs)?		
c. SF-12 Physical Functioning Component Summary score (PCS)?	SF-12v.2 questions on physical functioning	T-test
2B. Are there differences between Inupiaq Elders in rural and urban locations in health, as measured by:		
a. Self-Reported of General Health (GH)?	SF-12.v2 questions on general health	Mann-Whitney U-score
b. SF-12.v2 Mental Functioning Component Summary score (MCS)?	SF-12.v2 questions on mental functioning	T-test
3A. In Inupiaq Elders, are there relationships among select nutrition parameters, community support variables and the 3 validated measures of physical functioning:		
Nutrition Parameters a. Nutrient Intake? b. Nutrition risk? c. Healthy Eating Index? Community Support Variables d. Participation in Community Activities? e. Participation in Family Activities? f. Food Security? g. Pounds of food shared? h. Number of food sharing episodes?	Physical functioning: a. Limitations in Activities of Daily Living (ADLs)? b. Limitations in Instrumental Activities of Daily Living (IADLs)? c. SF-12 Physical Component Summary scores (PCS)?	Spearman's rho Correlation
3B. In Inupiaq Elders, are there relationships among select nutrition parameters, community support variables and 2 validated measures of self-reported health:		
Nutrition Parameters a. Nutrient intake? b. Nutrition risk? c. Healthy Eating Index? Community Support Variables d. Participation in community activities e. Participation in family activities f. Food insecurity? g. Pounds of food shared? h. Number of food sharing episodes?	Health: a. SF-12.v2 Mental. Component summary score (MCS)? b. SF-12.v2 Self-Reported Health Score?	Spearman's rho Correlations

3C. In Inupiaq Elders, are there relationships among select nutrition parameters, community support variables and demographic characteristics:		
Nutrition Parameters a. Nutrient intake? b. Nutrition risk of malnutrition? c. Healthy Eating Index? Community Support Variables d. Participation in community activities? e. Participation in family activities? f. Food insecurity? g. Pounds of food shared? h. Number of food sharing episodes? Demographic Characteristics i. Age? j. BMI? k. Gram protein per Kg of body weight?	Nutrition Parameters a. Nutrient intake? b. Nutrition risk of malnutrition? c. Healthy Eating Index? Community SupportVariables d. Participation in community activities? e. Participation in family activities? f. Food insecurity? g. Pounds of food shared? h. Number of food sharing episodes? Demographic Characteristics i. Age? j. BMI? k. Gram protein per Kg of body weight?	Spearman's rho Correlations

CHAPTER II

LITERATURE REVIEW

Historically, cultural values in rural Native communities dictated practices that supported Native Elders (Van Stone 1962). However, Native communities are changing, and the impact of these changes is unknown. Native Elders living in urban areas may have increasing access to "institutionalized" government-based food programs, while in rural communities kinship food sharing networks appear to continue to provide food for elderly members (Magdanz, et al, 2002). The effects of these changes on either food support system or on mental and physical health are unknown.

FOOD CUSTOMS AND EATING PATTERNS OF THE ALASKAN INUPIAQ

Early anthropological and ethnological writers identified cultural groups by their ecological base and how geographical resources were used (Kroeber 1939). In Northwest Alaska, Spencer (1959) categorized the regions into two resource-use groups; People of the land, "*The Nuunamiut,*" and People of the Sea, *"The Tareumiut*. *The Nuunamiut* were cultures that centered around animals of the land, predominately caribou. People of the Sea, *The Tareumiut*, focused on sea mammal hunting, such as the hunting of seals, sea lions and whales (Spencer 1959). Archeological evidence indicates that Native tribes have customarily improved quality of life by moving away from places of disease and to places with increased resources needed for daily life, such as seasonal foods. Limited data from the last 120 years supports that the Inupiaq populations moved in response to changes in the migration of the inland caribou herds

(Murdoch 1892:19-41). Even as late as the spring of 1953, when few caribou migrated along the interior Brooks Range, Spencer's visits during the 1940-1950's documented many small abandoned villages that appeared to have moved to increase access to greater food supplies (Spencer 1959). Today, with increased technology (snow machines, four wheelers, powerful outboard motor boats), hunters travel further to secure food but return to the more stationary village.

Mark Cohen (1989) proposed that culture establishes norms for daily behaviors, including behaviors that deal with the selection and preparation of food. Culture also defines what foods are acceptable and the foods that are not-acceptable, and how foods are eaten and prepared.

The Inupiaq diet pattern is not well defined. The diet focuses on protein sources that are harvested in a seasonal rotation. Protein sources are very diversified by the number of species used, as well as the many parts of the animals that are consumed. Greens and berries supplement harvested game. The seasonal basis for harvest, and the unpredictability of the success of the harvest, has the potential of increasing uncertainty about access to a sufficient food supply.

Two views exist concerning the harvested game that forms the core of the Inupiaq diet, that of outside groups and that of the Inupiaq community (Burch 1998, Ballew, et al, 2006). To professional game biologists and land management programs the process of collecting extensive data as to the count and types of animals harvested appears to be more important than the use of these resources to provide nourishment for Native people in this region. For most of the United States, the acts of game harvest are merely recreational, in contrast to the Inupiaq that depend upon these resources for food. For example, outside groups and media have focused on the preservation of the Porcupine Caribou Herd, which migrates from northern Canada to western Alaska through the oil producing regions of northern Alaska (Bourne 2006). Yet the status of the larger herd, The Northwest Alaska Herd, which is the major source of food for the Inupiaq region, goes unstudied (conversations with Jim Magdanz, ADF&G on February 28, 2007). The migration and expansion of the growing Porcupine caribou into western Alaska is relatively new, and thus, it competes for food with the Alaska herd. Members from the Inupiaq communities have expressed that those outside of Inupiaq culture fail to understand the importance of the Northwestern Alaska herd as food sources as well as key components of the holistic constructs of health for the Inupiaq people (Fieldnotes JS March 2007).

To the Inupiaq community, harvesting animals follows patterns set forth by their parents, their grandparents, and generations that came before and those that will come after. Participation in the activities of harvest and food preparation serves to unite families and provides a structure for interdependence found in Inupiaq communities (Burch and Burch, Jr, 2005). Within this process, the role of Elders is supported and defined (Smith and Wiedman, 2006).

Archeological evidence tends to support that the traditional Inupiaq diet may have contained as much as 95% of total calories from harvested protein and fat (Dumond 1977). Dumond summed up the importance of the use of harvested food resources when he wrote, "*Eskimos required at least the oil of sea mammals to burn, to eat, and so <u>to make life worth living.</u>*" Dumond thus linked the importance of specific foods to the psychological well being of Alaska Native individuals.

Perceived Health Benefits of Harvested Foods

Harvested foods are perceived to have greater value than similar non-Native foods, e.g. fresh salmon versus canned salmon. Literature supports the perceived importance of Native foods in the attainment of health. Public testimony held following the Valdez oil spill incident in 1989, transcribed by Jack Crews, PhD, (draft report, unpublished) reported,

> "*Native foods keep me warmer than western foods,*" and "*Elders crave certain foods.*" Jack Crews summarized their comments as, "*Well-being of Alaska Native people is deeply tied to access to subsistence foods.*"

Similar comments were recorded by McNabb (1991) from Northwest Alaska as to the importance of the use of Native foods. He reported criticism of the increasing Western diet from the Native community, "*Sandwich eaters are weak.*" McNabb's research showed that there was perception in a decline in health, strength, agility, and endurance when nourishment was obtained using store-bought foods (McNabb 1991).

The value of medicinal properties of Native food (Ptarmigan, a small bird) were recorded by Mishler (2001:163) in an interview with Walt Erickson, Sr. conducted in 1997,

> "*…My belief is that ptarmigan is a good medicine. We had no doctors. My Mom was the doctor. Dr. Mom, they called her. But that's what we use if you had a fever or anything, we'd always have ptarmigan, boil it and just drink the water, and this ptarmigan has all the herbs, and all the good stuff that comes out of meat, in the ptarmigan. Every time you have ptarmigan juice like that, boil the daylights out of it, and drink that and you'll get well, believe me.*"

A number of health research projects have reported the biological importance of eating Native foods, in support of the traditional wisdom given by the Elders. Adler, et al (1996) studied traditional diet and harvest activities among 15 Yup'ik and Athabasca villages and found significant trends in the relationship of eating a traditional diet high in protein to improved glucose intolerance, when combined with adequate levels of exercise. Yup'ik individuals (as a group) participated in moderate to high levels of activity. Athabascans (as a group) reported lower physical activity. Overweight and obesity occurred at similar rates between the Yup'ik and Athabasca respondents despite differences in levels of activity. Individuals who reported eating more traditional food were less likely to have diabetes and hypertension (Murphy, et al, 1995, Murphy, et al, 1992, and Murphy, et al, 1997).

Similar findings have been found among northern Canadian Inuit Tribal groups who share family and cultural history with the Alaska Inupiaq. Use of traditional foods also differed by age. On Belcher Island, individuals over the age of 50 reported higher consumption of traditional Inuit foods than younger community members aged 19-49 (Wein, et al, 1998) similar to findings reported for Baffin Island Inuit adult males (Kuhnlein 1995).

The cultural rationale for eating certain foods has also been viewed as endorsement for foods with healing properties. Borre' (1994) reported narrative data from Inuit communities that seal meat is a "*rejuvenator of human blood*" and "*seal blood gives us our blood…seal is life-giving.*" Among Baffin Island (Canada) Inuit, seal meat is frequently given to the infirmed.

Similarly, among Alaska participants from Northwest Alaska in the National Science Foundation Social Transitions in the North Study, Callaway (2004) reported in his examination of self-reported general health data that the less harvested fish and game (subsistence foods) in the diet, the higher the probability that they were to self-report poorer health.

In spite of the belief that harvested foods are associated with health and well-being, there appears to be a shift in the use of harvested foods across all Alaska Native communities (Rody, et al, 2002, Nobmann 1992, Heller and Scott, 1967). Total calorie intake over forty years has remained constant (approximately 2000 calories), although protein intake has decreased and carbohydrate intake has increased.

Food Sharing Networks

Traditionally, participation in food sharing networks was essential for survival of individuals of all ages in rural remote Alaskan communities and other communities with limited ability to access purchased food. Exclusion from a food sharing network threatened the survival of the individual because it separated the individual from the group needed to harvest large game animals such as moose, caribou and whale (Burch 2003). Similarly, large social networks in rural South Africa have been shown to buffer food insecurity (Lemke, et al, 2003).

Elders and Food Customs

Observers have asserted that the contribution of Alaska Elders maintains the strength of Alaska communities (Wilson 1996, Fienup-Riordan 1994). The Elders of the tribe are the guardians of food customs, and therefore, keepers of the culture.

For this reason, respect for Elders, extended kin support, and the continued sharing of wildlife resources with Elders are core tenets of indigenous Alaskan cultures (Caulfield 2002, Fienup-Riordan 2000, Lantis 1946, Callaway 2003). The National Resource Center for American Indians, Alaska Natives and Native Hawaiian Elders' listening sessions indicated these core tenets are potentially determinants of nutritional intake in the lives of Inupiaq Elders, whether in a rural or urban settings. Mitchell (1974) and Manson (1995) found that the support afforded by extended family and kin based food sharing networks provides both food and social interaction for elderly Natives.

From 1995-2004, the Alaska Department of Fish and Game and the National Park Service (ADF&G/ NPS) (Magdanz, et al, 2002) surveyed two Inupiaq villages, Deering and Wales. The ADF&G/ NPS surveys confirmed what ethnographers, oral historians and local indigenous voices had been saying for decades, namely that rural Native Elders are embedded in extensive, kin-based food sharing networks and that Elders are both producers and recipients of wildlife subsistence resources (Boas 1888, Spencer 1959, Lantis 1946).

Schieman and Meersman (2004) reported that the older adults' ability to withstand adverse life conditions improved when they perceive high levels of social support. Callaway and North Slope Borough (2003) concluded that while Elders perceived that food support networks were strong, is was unknown if kin-based food sharing networks actually provided sufficient calories, protein and nutrients to maintain their health in this Alaska setting.

Based on her work in southwest Alaska, Lantis (1946) also reported that some Elders fared better than others, depending upon the support from their extended families and the families' food sharing networks.

Due to the variety of nutrition programs in urban locations and increased choices offered at grocery stores, sources of nutrients would seem to be more available for urban Alaska Native elderly. It is less clear whether urban Native Elders have the transportation and the income necessary to purchase food items, similar to other older adults in Alaska and elsewhere in the US (Wolfe 2000). Urban dwelling Native Elders may receive small packages of traditional harvested food from relatives and extended kin in rural communities, but the frequency and the amount of food received is unknown (NRC 2005). It is unclear as to the extent (if any) of food and other support (financial or emotional) that may be provided by extended rural families to urban Native elderly.

SELECT NUTRITION PARAMETERS

Use of Nutrient Intake Standards

Dietary Reference Intakes (DRIs) are the current standards issued by the Food and Nutrition Board of the United States Institute of Medicine (IOM 2000) for estimating nutrition needs for individuals and population groups. The DRIs are summative values to replace the Recommended Dietary Allowances (RDAs) for the

United States (National Research Council, 1989), and the Recommended Nutrient Intakes (RNIs) for Canada (Canadian Council on Nutrition, 1990).

Estimate Average Requirements (EARs) have been determined for most nutrients by age groups by examination of the distribution of the requirements for individuals within a given population. Assessment as to the adequacy of intake of a population, i.e., risk of nutrient inadequacy, is dependent on the shape and variation of the usual intake distribution of the population, and is not based on mean intake. When there is insufficient data to determine the EAR for a nutrient, the IOM has established an Adequate Intake or AI. However, IOM protocols indicate that one cannot infer risk of nutrient inadequacy from comparison of the usual intake distribution to the AI.

The methodology in the application of DRIs represents a major shift from the widely-used methodology (food frequency and one day 24-hour recall data) applied to the dietary assessment of populations and population subgroups. The incorporation of the statistical techniques into practical tools that can accommodate epidemiological studies is on-going. The evaluation of commonly used tools (such as food frequency) to provide data applicable for the DRI protocols is forthcoming.

The premise underlying the statistical assumption in the DRI protocols is that the diet of US populations is sufficiently consistent throughout the year to allow use of the variance within a handful of 24-hour food intakes to calculate "usual intake." The statistical methodology proposed by IOM normalizes the asymmetrically right-distributed data of reported food intake (since zero intake is not "usual" for healthy individuals) and compares the large within-person variance to the between-person variance (IOM, 2000). Data from The Third Nutrition and Health Examination (NHANES III) indicated that 24-

hour measures for two non-consecutive days or three consecutive days was adequate to estimate “usual” intake for the US population (Guenther, et al, 1997).

IOM developed protocols to allow for the comparison of the intake against a standard in order to determine if the overall intake was indeed adequate to control for high within-person variation, while at the same time minimizing the burden on respondents. Recently, four statistical modeling protocols have been proposed to control for inter-person variation of food intake that use a minimum days of 24-hour recalls. These are: 1) The Institute of Medicine Method developed by Freedman (2004); 2) The Iowa State University Method by Nusser, “C-Side Software” (1996), and Guenther, et al (1997); 3) The Best Power Method by Nusser, et al (1996); and 4) The Iowa State University Food Method to include episodically consumed foods developed by Nusser, et al (1997). Two studies were recently published (Tooze, et al, 2006, Subar, et al, 2006) that used these techniques in evaluating usual intakes in a large random US population sample from the Eating at America’s Table Study.

At the time of this study, the Iowa State Method, “C-Side” appears to be emerging as the most favored. From two 24-hour recalls from each individual in a group, the C-Side software (Iowa State University, Ames IO, Version 1.2, 1997) is able to calculate usual intake of the population group by comparing the within-person variance to the variance within the total group (Arab, et al, 2003). C-Side is able to determine the proportion of the population consuming amounts of nutrients equal to or more than the EARs. Using this technique, calculation of the distribution of usual intake for a population group or sub-population, and the percentage of the population that may have inadequate intake may be estimated.

Overview of Survey Methods to Access Diet Intake

The following is a brief review of commonly used tools to collect food intake data, such as food frequency questionnaires (FFQ), 24-hour food recalls (Dobbs, et al, 2006), and direct observation (Barnard 2002). During their use over the last sixty years, research has shown that each method has strengths and weaknesses.

Food Frequency Questionnaires (FFQs) are often used in large epidemiological studies because of the apparent belief that they can capture long-term behaviors (Jain, et al, 1996, Block, et al, 1992, Ammerman, et al, 1991, Kristal, et al, 1990). The protocol of using a list of foods to estimate intake over a period of time began with Burke's article, "The Dietary History as a Tool in Research," in 1947. Building upon Burke's work, Heady (1961) found that using a checklist of foods was nearly as predictive of data obtained by using a more time intensive 24 hour recall or the participant-exhausting three-day food diary based on total weights of the foods consumed.

The food frequency questionnaire generally has two parts. The first part asks respondents to estimate how often and how much they regularly eat of a given list of foods; the second part is the list of foods. The food list for estimation of food intake are usually based on foods reported as consumed in large epidemiological studies such as National Food Consumption Survey (NFCS) in 1977-78, and 1987-88; the Continuing Survey of Food Intakes of Individuals (CSFII) in 1985-86, 1989-91; and 1994-96, and the National Health and Nutrition Examination Surveys (NHANES) in 1971-74, 1976-80, 1988-94, and 1999-2000. Sometimes food frequency questionnaires target nutrients of special interest. For example, a food frequency examining fat intake would be sure to include questions about butter consumption and the eating of chicken skin, where as a food frequency examining vitamin intake would query the consumption of specific fruits and vegetables.

Most food frequency recalls can be coded on scannable forms allowing for standardization of data entry and computerization of the intake calculations, thus reducing coding errors. Willet, et al (1981) proposed the use of regression analysis in the selection of food items, statistically and strategically eliminating items that are not used frequently or contributed little in the stepwise regression analysis. However, he noted a caveat to watch for covariant foods such as butter on corn, in that including one usually predicted the other.

The FFQ is based on the extrapolated ability of the eating frequency of a relatively short list of key foods to project food intake over a given period of time. Gladys Block indicated that in the development of the Block Food Frequency, that the process is, “as much as an art as a science.” She was instrumental in the development of the first food frequency used by the National Cancer Institute to look at correlations between diet and cancer.

Once frequency of intake, as well as the size of portion and prepared food items have been estimated by the respondent, those data are converted into a number from which the total intake of a specific nutrient can be calculated. For example, if information obtained from the respondent indicated that they ate 2 slices of bread on usual basis of 4-5 times per week. From the reported eating frequency, calories could be calculated as: 2 slices x 4.5 times/week x 80 calories per slice = 720 calories contributed by bread during one week, or approximately 103 calories per day. Of course the matrix for a mixed item such as "hamburger, cheeseburger and meatloaf" would be considerably more complex.

Both the 24-hour and FFQ share the same limitation in that they both rely on the participant's memory of what they ate during the survey time frame. Responding to a given inventory of foods as provided by the FFQ may, for older adults, have improved responses in comparison to foods given on a 24-hour recall (Smith 1993). Being prompted by a list appears to take advantage of long-term memory and avoid dependency on the perhaps failing short-term memory.

Generally, the cost of administering FFQs is less than the more labor-intensive 24-hour recalls (Brown 2006) due to the standardization of data entry and computer calculations on a computer-scannable form. The initial costs to develop a food frequency are high, often precluding the development for small populations or small studies. Larger research institutions are able to include specific foods in a standardized list of generally accepted foods and add specific nutrient content to their database, such as the fat screening FFQ developed by the Hutchinson Cancer Research Group in Seattle (Kristal, et al, 1990).

Another commonly used diet assessment tool is the 24-hour recall. The 24-hour recall solicits information about only one day, and most researchers agree that use of a single day is a poor reflection of long-term intake (Beaton, et al, 1983), thus, the collection of multiple day 24-hour recalls has been the recommendation. The 24-hour recall is difficult to administer except by highly trained professionals (Willet 1998). The use of para-professionals or local community members may create bias in the data collected due to possible inconsistencies in the training and background. Researchers who solicit information about food intake also need to have a good working knowledge of how food is prepared (especially cultural foods), and other items likely to also be served with the item. For example, if the respondent had said that they had eaten a hamburger for lunch, the researcher would need to explore the size, type of meat, type of bread, the condiments, and other foods such as french fries, coleslaw, and beverages that may have been eaten on this occasion. Differences in food knowledge of the researcher has been controlled somewhat by the use of computerized 24-hour assessments, such as the University of Minnesota Nutrition Coordinating Center Food and Nutrient Database that provides automatic prompts in describing each food. For example, if the respondent reported eating cereal and milk for breakfast, the computerized data entry process asks for clarification on the type and amount of milk, the type and name-brand of the cereal. Other questions are asked such as if sugar was added, if all the milk was consumed, or if other foods were also eaten. The process is often lengthy, and many feel that the extended time required capturing the minutest details of the intake may increase the interviewer bias (Kristal, et al, 2005).

The process is somewhat more complicated for subgroups with a large amount of seasonal variation in their diet. Willet (1998) has estimated that, for long-term intake, a collection of 3 to 4 days during multiple seasons during the year would be required, or an estimated 12-16 days per individual. Willet's summary of this research is quite extensive (Willet 1998), and he summarized that 3 to 10 days of data were required to determine usual intake of macronutrients (carbohydrates, fats and protein), and as many as 20 to 50 days for components such as vitamin A, vitamin C and cholesterol which had more variation in the contribution of these nutrients in food items, as well as more variation in the eating frequency of these foods.

Researchers also found differences in food intake on different days of the week (Beaton 1983, Thompson 1986, Tarasuk and Beaton 1992). Other studies examined dietary data collected on consecutive and non-consecutive days (Morgan 1987, Hartman 1990). Different methodologies were used to improve the estimation of usual intakes, such as averaging multiple days (Willet 1998), but later research in the development of the DRIs found that multiple days simply averaged together did little to improve estimation of "usual" intakes (Dobbs, et al 2006).

Other disciplines have used direct client observations and propose that this methodology would be the optimum methodology to determine subsistence food intake patterns, however, this technique is extremely labor intensive. Observations are made by a researcher embedded within a community for months, or even years (Pelto, et al 1989, Quandt and Ritenbaugh,1986). While the resulting data are extremely rich, the cost is too prohibitive for group sizes required to give statistical significance if this methodology was used.

Selection of Food Frequency Assessment Tools for a Baseline Study of Eating Patterns of Inupiaq Elders

Food frequency techniques were used in this study to collect dietary information due to the perceived minimized burden on the Native Elders during the data collection process. A food frequency tool had been used by other researchers with Native populations (Wolfe 1985, Smith CJ 1996, Slattery 1994, Harnack 1999).

The dietary patterns of Inupiaq Elders is reflective of the seasonal harvest of foods that are eaten in surplus for short time frames. We believed that a food frequency tool would be able to evaluate the intakes of a wide assortment of store-bought foods; and by adding a page of Alaska foods, the food frequency would also able to assess the level of intake of a list of Alaska specific foods (such as muktuk and Agutuq). Alaska foods are eaten in large quantities on an infrequent basis that may have been missed using other assessment tools such as a 24-hour recall.

Application of the statistical techniques discussed above and proposed by the IOM to determine the percent of population meeting or below Estimate Average Requirements (EARs), and the percent of population above Upper Tolerable Limits (ULs) was therefore not possible in this broad baseline study.

While the IOM recommendations were issued in 2000, it would appear that current publications by field researchers have embraced IOMs updated data on nutrient needs by age groups, but have not fully embraced the IOM position for the need of statistical underpinning to determine “usual” intake as demonstrated by recent publications in the Journal of The American Dietetic Association (JADA) that compared DRIs using food frequency data for rural older women in the Midwestern U.S. (Boeckner, et al, 2007), and a limited recall checklist based on parental report for Mexican-American preschoolers (Mier, et al, 2007). The JADA April 2007 published a validation study of a web-based food frequency using a three day estimated food record (Matthys, et al, 2007).

Past validation studies of the FFQ methodology focused on the ability of the tool to duplicate 24-hour recall data (Block, et al, 1992; Jain, et al, 1996), rather than the estimation of "usual" intake over an expanded period of time. The IOM has not published guidelines regarding use of FFQs to determine the risk of nutrient inadequacy in either an individual or a population. "Usual intake" has become the focus of IOM (2000) with the issuing of the DRIs, and it is unknown at this time, if using calculated "usual" intakes or projected intakes calculated from FFQs is the most effective in the improvement of dietary intake to maintain and improve health.

One advantage of the food frequency was that the survey could be administered within an hour during one visit. Many studies have used 24-hour recalls collected over the phone following one in-person visit (Bailey, et al, 2007; Sharkey, et al, 2002) however, phone service is not universal in the rural communities. Had the IOM methodology been implemented, the cost of multiple 24 hour food recalls during multiple harvest seasons were prohibitive in terms of logistics and funding, as well as the potential burden on the study participants and on the community, especially for a baseline assessment in a dissertation level study (conversations with Dr. Kathy Graves, IRB member, Native Representative, University of Alaska Anchorage, April 2005).

In a review of possible dietary assessment tools in the spring of 2004 by Native leaders living in Anchorage, the group felt that the food frequency was potentially the least taxing on Native Elders.

Importance of Nutrient Intake for Older Adults

An adequate diet is deemed essential to prevent and manage chronic disease and to maximize individual opportunities for healthy aging (ADA 2005). Rowe and Kahn (1998) and McKevith (2005) suggested that the benefits of an adequate diet are to maintain low risk of disease, to maintain high mental and physical functioning, and to obtain an active engagement of life.

Both biological and community factors challenge everyone to achieve an adequate diet. Morley (2001) reported that reduction in taste and flavor sensations occurs as individuals age. Altered hormonal responses, such as increases of hormone leptin, may lead to early satiety and reduced food intake.

The older eater has been characterized as one who consumes less calories than when younger (Wakimoto and Block, 2001). Wakimoto proposed that reduced daily volume of food appears to place the older eater at increased nutritional risk. Physiological changes associated with age, such as slower gastric emptying and decreased basal metabolic rate, have been related to low intake of calcium, iron, zinc and vitamins for this older cohort (Drenowski 1997). Low intakes of important nutrients make older adults prone to increased infections, higher rates of chronic diseases and cognitive dysfunction (Chandra 1997). In addition, physiological changes and age driven metabolic declines may increase the risk of chronic disease (Goulding, et al, 2003). Use of more than four medications per day has been correlated with eating fewer food items per day and poorer appetite (Shahar, et al, 2005). Bernstein, et al (2002) concluded that greater diet variety was associated with a better body composition and acted to preserve body mass in the frail elderly population. This group is potentially at higher risk for protein-energy malnutrition and sarcopenia.

Nutrient Intake of American Indians and Alaska Natives

Among the ten leading causes of death nationwide for American Indian and Alaska Natives, four are associated with nutrition – heart disease, stroke, some types of cancer, and diabetes (Jackson and Beard, 2005). Appropriate nutrient intake also influences body weight, often a modifiable precursor for the onset of chronic diseases such as diabetes, hypertension, arthritis, and osteoporosis (US Department of Health, National Heart, Lung and Blood Institute, 1998).

The underlying purpose of the Older Americans Act (1965) is to keep older adults in their homes and their home communities for as long as possible. This is a goal shared by the Alaska Commission on Aging, the Native communities and the Elders themselves (NRC 2005). Living in rural communities permits Elders to have continued access to traditional food and food customs.

Title VI programs are the food and nutrition programs provided in the Older Americans Act in 1965 that provides congregate and home delivered meals to American Indian and Alaska Native Elders. An evaluation of the Elderly Nutrition Program was conducted between 1993 and 1995 and was funded by the Administration on Aging, US Department of Health and Human Services by Ponza, et al (1996). She compared BMI of 336 Native individuals over the age 50 participating in Title VI Tribal Elderly Nutrition Programs to 1,848 non-Native individuals participating in Title III Congregate Meal programs. Of the Native participants, 40% had BMIs over 30, which is considered to be obese, compared to 29.2% of the non-Native sample. Ponza also compared mean daily intake of 425 Native individuals based on 24-hour food recalls. She found that intakes of the majority of nutrients met or exceeded the Recommended Dietary

Allowances (RDA); however kilocalories, calcium and vitamin B_6 intakes were lower than RDAs. The average fat intake of 34% of kilocalories and cholesterol intake of 260 milligrams met USDA Recommendations of 2005 for a daily intake of fat between 20-35% of total calories and less than 300 milligrams cholesterol. Intake of saturated fatty acids comprised 12% of total calories, which was slightly more than the 10% recommended. Sodium intake was 2,812 milligrams, nearly twice the recommended 1,500 milligrams (Ponza, et al, 1996). In light of the kilocalorie intakes below recommendations, she did not provide insight as to the cause of the higher BMIs found among the Native Title VI participants.

Potential of Nutrient Deficiencies in Alaska

Due to the generally low consumption of fruits, vegetables, milk products and grains in the Inupiaq diet, one would expect that intakes of vitamin C, vitamin A and vitamin E, B-vitamins, vitamin D, folic acid and calcium would be inadequate. These food groups are the recognized sources for these nutrients in governmental health resources, such as those published by United States Department of Agriculture and the Centers for Disease Control and Health Prevention.

Using recommendations from the Food Guide Pyramid, Nobmann and Lanier (2001) confirmed food intake patterns low in fruits, vegetables and milk food groups among Alaska Native women living in Anchorage, Alaska’s largest community. However, when blood samples were analyzed, the women’s plasma levels of iron, vitamin A, vitamin C, and vitamin E were within acceptable ranges. One out of three (31.5%) participants was found to have low levels of red blood cell folate.

Vitamin D is also of concern due to the Alaska geographical location that results in prolonged darkness over 160 days per year and limited darkness for 60 more. Mean cooler temperatures that rarely exceed 70 degrees Fahrenheit during summer months increases layers of clothing thus limits skin exposure to sunlight. A recent study suggested that institutionalized older adults may need as much as 800 IU of vitamin D per day to reduce falls (Broe, et al, 2007). Current DRI recommendations are 10 mcq for individuals aged 51-69, and 15 mcq for individuals over 70 years of age.

A significant problem for determining whether or not the Inupiaq diet is adequate is the lack of current and complete nutrient composition data for many foods consumed in Inupiaq communities. For example, nutrient data on seal oil and salmon oil, or meat cut from walrus, caribou and whale skin, are lacking in commonly used nutrient databases such as the United States Department of Agriculture (USDA) National Nutrient Database for Standard Reference (Release 16), the University of Minnesota Data Base, and the Block Food Frequency Data Base (McElroy and Townsend, 2004). Kassam (2001) also reported incomplete data for plants commonly used by Alaska populations, such as Labrador Tea *Ledum palustre* and *Artimesia arctica* (also called "stinkweed"), which are both used frequently as a "tea," or Lovage *Ligusticum scoticum*, an herb used to season meat and fish that resembles flat-leaf parsley. Foods thought to be rich in calcium, such as boiled bone soups and fermented fish bones, also have not been analyzed for nutrient content (Jennifer Johnson, Dietitian, Alaska Native Tribal Health Consortium, Anchorage, Alaska, personal correspondence). Fermented foods are also commonly eaten in Alaska communities. Nobmann (1992) reported that 23% of 351 Alaska Natives surveyed in 13 representative communities reported eating fermented foods. The Canadian nutrient database lists halibut as a source for calcium, but this has not been confirmed by USDA.

Once intake data are collected, when specific data for a food item are not available, the accepted protocol is to use data from a similar food item. Risica, et al (2005) used “like-data” for 26 foods that were missing from the NDS analysis software (University of Minnesota, version 5, 2004) in the Alaskan GOCADAN study. Rody, et al (2002) reported adding “like-data” for 41 foods to the Block Food Frequency Data base for the Alaska WIC Healthy Moms Study. The USDA is currently testing many of the more commonly eaten Alaskan foods. As more complete food composition data becomes available for unique Alaska foods, more reliable diet intake assessment of diet intake can be made (Pehrsson 2005). Further, the USDA is also updating food composition data for commonly eaten foods in the US diet (Ahuja, et al, 2006).

The practice of measuring intakes of groups of food in order to approximate the overall intake of nutrients has been the foundation of food consumption guidelines for the last 60 years (Willet 1998). Indeed, Drewnowski’s work (1997) found that nutrient deficiencies for calcium, iron, zinc, vitamins and folic acid in older adults, identified through lab values, correlated with reported low intakes of fruits, vegetables, and grains.

Data from the Alaska WIC Healthy Moms Study (Rody, et al, 2002) were used during the planning phase of this study to examine eating patterns that may suggest deficiencies in older adults living in similar communities as the younger women in the WIC study (Table 2.1). WIC participants reported a mean intake of two servings each of fruit and vegetables per day. The mean intake of fortified grain products was less than two servings per day. These values are below the recommended number of servings from MyPyramid which is four servings of fruit, five servings of vegetables, and six servings of enriched breads per day (MyPyramid, accessed at http://www.myprymid.gov on Feb 4, 2007).

Nutritional Risk of American Indians and Alaska Natives

The ten-question Nutrition Screening Initiative Determine Checklist (NSI Determine Checklist) is a tool that requests brief information concerning ten behaviors commonly associated with decreased food intake that may result in malnutrition among older adults (Posner, et al, 1993). Of the ten questions, some items are weighted more than others, reflecting the relative importance the score has on nutritional risk. Scores can range from 0 to 21. The scoring allows for the estimation of “nutritional risk.” A score of 0-2 indicates “no risk,” a score of 3-5 indicates “moderate risk.” A score of 6 or more indicates “high nutritional risk.”

The sensitivity of this instrument has been established at 36.6%, indicating that those who were classified by their responses to the ten questions did have true nutritional risks a little over a third of the time. In contrast, the specificity was relatively high at 84.9%, indicating that the tool was stronger at confirming the absence of nutritional risks (Posner, et al, 1993).

The NSI Determine Checklist was included in the Assessing Our Native Elders survey compiled by the University of North Dakota National Resource Center on Native American Aging (McDonald, et al, 2005), a project funded by the Administration on Aging. Of the 9,416 American Indian and Alaska Natives who completed the survey, 22.3% were categorized as high nutritional risk and 31.8% were categorized as moderate risk. Native individuals living alone had the highest risk. Married American Indian and Alaska Natives had the lowest nutritional risk.

B. COMMUNITY SUPPORT

The Importance of Participation in Community and Family Activities

Notes from the 1978 Puiguithaat *("meaning Wise Council")* Elders Conference, sponsored by the North Slope Borough (NUNA 1980), defined the importance of participation in the community to mental health. Elders reported that they wanted "*to be close to family,*" and to have *"community support.*"

In studies among southern black families, Dressler (1991) used an operational concept of "*family*" as a "*linkage of households into networks of mutual support.*" Individuals of the linked households provided support and "*looked out for one another, including neighbors and in-laws.*" This definition is appropriate for defining networks within Native communities, as well.

In Alaska, working as a family group in the harvesting of game reinforces cultural identity of the group, as well as enabling the procuring and sharing of essential food (Borre' 1994). McElroy and Townsend (2004) proposed that without collaboration between hunters, the group (i.e., families, communities and tribes) may fail to survive.

Table 2.1. Servings per Week for Fruit, Vegetables and Fortified Grain from the Block Food Frequency. Data from the Alaska WIC Healthy Moms Study of Rural Alaska Native Women aged 35.1 $\pm$ 10.8 years with a range of 18-61 years.

n = 62	Rural	Urban
Total Fruit Servings per Week	14.22	10.31
Drinks with some juice or Vit C added/ Tang	5.21	1.72
Orange or grapefruit juice	2.08	1.38
Berries	1.72	0.48
Other fresh fruit	1.42	1.66
Apples or pears	1.16	1.34
Oranges, tangerines	1.03	1.21
Bananas	1.02	1.36
Canned fruit, applesauce, etc.	0.58	1.16
Vegetable Items Servings per Week	16.63	16.65
Green beans or peas	2.13	1.50
Other vegetables	1.98	1.83
Vegetable soup	1.89	0.86
Salsa, ketchup, taco sauce	1.87	1.23
Carrots	1.84	1.02
Raw tomatoes	1.29	1.39
Green salad	1.21	1.73
Broccoli	0.89	1.06
French fries, fried potatoes	0.86	0.99
White potatoes, baked or mashed	0.84	1.12
Coleslaw, cabbage	0.47	0.47
Baked beans, beans, refried beans, bean burritos	0.56	0.80
Spinach, greens, wild greens	0.44	2.13
Seaweed	0.17	0.06
Sweet potatoes	0.11	0.29
Soy Milk	0.08	0.17
Fortified Grain Products Servings per Week	9.95	6.31
Rice or dishes with rice.	3.67	1.29
White bread, French bread	2.39	1.73
Dark bread, whole wheat, rye	1.65	1.55
Spaghetti pasta	1.21	0.72
Bagels, English muffins, buns	1.03	1.02

Source: Rody et al, 2002

Lowe (2001) wrote that a "*health cultures exist that… define the phenomena associated with health, wellness, illness and death.*" To understand the health culture within Native communities, focus groups were held at the National Native American Indian Nurses Association in 2000. Seven themes were identified that were important in the achievement of health. These were: 1. Caring (health, knowledge, holism, relationships); 2. Traditions (relationships, respect, wisdom, values); 3. Respect (relationships, honor, identity, strength); 4. Connection (relationships, foundation); 5. Holism (balance, relationships, culture); 6. Trust (relationships, respect, presence); and 7. Spirituality (relationships, unity, honor, balance, healing) (Lowe 2001). Underlying all of the themes identified by Lowe was the importance of "relationships," suggesting that for Native communities having successful relationships positively influences physical and mental domains of health.

A recent study of self-perceived quality of life in two villages in Northwest Alaska addressed many of aspects of good health delineated by Lowe. Two Inupiaq North Slope Borough Communities (Anaktuvuk Pass and Kaktovik) were surveyed (Table 2.2). These communities are similar in size and cultural characteristic to the two communities that participated in this dissertation project. In the North Slope communities, heads of household older than 60 years of age had less income than the average household in the same community. Over half of the Elders self-reported that they depended on subsistence resources for more than half of their diet. Ninety-four percent expressed concern about increased use of alcohol, violence, and illegal drugs that was occurring in their village. Yet, they reported positive changes in their quality of life and they perceived high levels of support from others.

In theory, all communities provide for basic needs. For Native Elders, Inupiaq communities provide for social expression (mental health) through the Elder's status. Community members also provide for physical care through the acts of respect, which includes such activities as running errands, performance of housework, and the provision of food. Communities (villages) are the places where these acts of physical care can (and do) occur.

Table 2.2. Perceptions of the Quality of Life in Two Inupiaq North Slope Borough Communities

	Anaktuvuk Pass		Kaktovik	
	Community	$\geq$60	Community	$\geq$60
Total Household Income	$40,549	$33,575	$59,342	$38,937
% Diet from subsistence $\geq$50%	71%	88%	68%	64%
Perception: increase in fish/ game	70%	52%	60%	82%
Perception: increase in good jobs	31%	56%	70%	80%
Perception: increase in use of alcohol, violence & drugs	92%	94%	73%	70%
Perception: positive change in quality of life	74%	65%	94%	100%
Perception: positive change in support from others.	77%	82%	89%	100%

Source: Callaway D and North Slope Borough, "2003 Economic Profile and Census Report", Vol. IX, Barrow AK: North Slope Borough Department of Planning and Community Services. 2003.

Some may question the Elder's positive attitude, despite dependency on others for subsistence foods and the low monetary standard of living. However, these data suggest that social relationships continue to support Elders' care in the manner that

Elders had anticipated as they aged. Callaway (2003) concluded that sociological shifts that were reported within rural Alaska communities (i.e., the Elders' report in the increase in the use of alcohol, violence, and drugs), may be future threats to the ability of Elders to obtain food through traditional food sharing patterns.

The 2000 US Census provided brief descriptive parameters of the Alaska elderly, such as 6.8% of all elderly have incomes below poverty level and the high percentage of elderly (56%) who have responsibility for grandchildren. No survey research information was found where bivariate or multivariate analysis could be conducted on Alaska Native Elders as a group. Unfortunately, few Native populations have been included in large epidemiological studies such as the National Health and Nutrition Examination Studies (NHANES series), but the NHANES offered a basis of comparison for older adults in general.

Food Insecurity

Food insecurity exists whenever access to food is limited or uncertain. Campbell defines food security as, "*access by all people at all times to enough food for an active, healthy life and, at a minimum, includes the following: 1) the ready availability of nutritionally adequate and safe foods and 2) the assured ability to acquire personally acceptable foods in a socially acceptable way*" (Campbell CC 1991). The lack of any of these components would imply food insecurity.

USDA's Economic Research Service reports on household food security in the United States provide the following information for the years 2001 through 2005 (Nord, et al, 2002, 2003, 2004, 2005, 2006) (Table 2.3).

Table 2.3. Food Security Rates for the General US Population.					
	2001	2002	2003	2004	2005
US Households Food-Secure	89.3%	89.0%	88.8%	88.1%	89.0%
US Households Food-Insecure	10.7%	11.1%	11.2%	11.9%	11.0%
US Households--Member(s) hungry	3.3%	3.5%	3.5%	3.9%	3.9%

Source: Nord et al, 2002, 2003, 2004, 2005, 2006

Food insecurity is known to affect general health (Olsen 1999). Analysis of NHANES data (1999-2000) indicated that children of food insecure households were at greater risk of obesity (Causey, et al, 2006). Food insecure older adults in the general US population had poor diets and were 2.3 times more likely to report their general health as "fair" or "poor" (Lee and Frongillo, 2001).

Food insecurity for United States households with older adults was reported at 6.5% (Hall and Brown, 2005), with the rate being 7.3% among older adults living alone (Frongillo 2004). Nutrient deficiencies were found in an examination of a sub-sample of 477 older adults participating in the NHANES III study (1988-1994). Food insecure older adults in the sub-sample had significantly lower intakes of energy, protein, carbohydrates, saturated fat, niacin, riboflavin, vitamin B_6, vitamin B_{12}, magnesium, iron, and zinc (Lee 2001). Rose (1997) had earlier reported low intakes of calcium, vitamin A, and phosphorous, and Dixon, et al (2001) reported food insecure older adults were found to have lower serum levels of carotenoids and vitamin E.

Among Native households, 22% of Native American households were food-insecure from 1995 through 1997, and 9% of Native American households reported hunger (The Food Resource and Action Center, 2001). High rates of food insecurity were also reported in rural Alaskan Native communities by young women (mean age: 38.7 years) who participated in the Alaska WIC Healthy Moms Study (Rody et al, 2002). A total of 37% of the WIC respondents reported food insecurity, and 15% reported hunger. The Alaska WIC rates were similar to the WIC data reported in the 2006 Position Paper from the American Dietetic Association titled, "Food Insecurity and Hunger in the United States," which states that 42.3% of WIC families reported food insecurity, with 10.5% reporting hunger. However, the Alaska WIC results are difficult to interpret given other measures of nutritional status that showed that those reporting food insecurity and hunger actually had higher protein and caloric intakes compared with respondents asserting no food insecurity or hunger (Table 2.4).

Table 2.4. Comparison of Calorie and Protein Intake Reported by WIC Respondents by Food Security Status in the Alaska WIC Healthy Moms Study

Mean	Not Reporting Food Insecurity	Reporting Food Insecurity	Not reporting Hunger	Reporting Hunger
Protein, g	51 n = 70	59.6 n =23	50 n = 83	77.6 n = 10
Calorie intake	1,420 n = 82	1,493 n = 24	1,404 n = 96	1,753 n = 10
BMI	28.0 n = 87	30.7 n = 22	28.3 n = 98	30.9 n = 11

Source: Rody, et al, 2002.

Within Alaska Native communities, the strong kin-based family structures share many day-to-day experiences (Magdanz, et al, 2002). Most Elders interviewed had personal memories of times of starvation within their family during their lifetime (JS Fieldnotes, 2001). Large-scale starvation, usually associated with regional epidemics, has been documented in northwestern Alaska over the last 150 years: 1838 (Village of

Nulato: smallpox); 1878 (Villages on St Lawrence Island: early ice break-up, measles and “black-tongue), 1887; 1894 (Yukon River villages: influenza and measles, Village of Wales: respiratory disease, Village of Point Hope: “capillary bronchitis” (outdated term for bronchopneumonia); 1897 (Village of Kuchin: scarlet fever); 1898 (Village of Barrow: whales didn’t arrive, Village of St. Michaels: scurvy); 1899 (Village of Barrow: influenza); 1900 (Village of Nome: measles, smallpox); and 1927 (Village of Nome: typhoid, Asiatic cholera) (Fortuine 1989: 209-226, 230, 262-263). Ganley (1998) recently reconstructed the dispersal of the 1918 Influenza Virus though out northwest Alaska.

The high rates of food insecurity reported by younger women in the Alaska WIC Healthy Moms Study (Rody, et al, 2002) may in fact be a reflection of anxiety held by the parents and grandparents concerning the potential of having nothing to eat. Other researchers have reported similar inter-generational anxiety or concern about sufficient food by younger members in response to periods of starvation experienced by their parents in years earlier (Yehuda, et al, 1998, and Sindler, et al, 2004).

Food Sharing Networks

Food sharing networks represent complex processes of social action that results in the harvest and sharing of food (Hanneman 1988). It is easier to describe products of the networks, than the structures themselves. In the abstract, Alaska food sharing networks consist of the aggregates of actions by many individuals precipitated by the relationships among them. Food sharing networks in Alaska appear to differ from those reported in Africa and the Islands of the Pacific (Gilberthorpe 2007), where the exchange of cash is an essential good that is also traded between the network members. In Alaska, little cash is exchanged, although information, tools (such as boats, ammunition, etc.) and actual wildlife resources are shared (Magdanz, et al, 2002).

In urban areas, Wenger's (1997) research showed that larger social networks had a "protective effect" upon mortality among elderly, a finding consistent with research among Native elderly on Prince Edward Island, Canada (MacLellan 1998), and J McDonald's (2000) research among urban Midwestern older adults. Coreil and Mayard's (2006) work in Haiti showed that networks centered around a specific illness also contributed to their spiritual well being of their members through the emphasis on religious and spiritual dimensions and the focus on "mutual aid in daily life."

In rural Alaska communities, Magdanz's et al (2002) research in Northwestern Alaska villages documented that there were successful and unsuccessful networks within the community based on their ability to pool available human talents and resources for efficiency and maximum food security among their members. Successful networks reduced the impact of misfortunes affecting a household such as age, illness or loss of income or employment (Trosper 2003).

Lantis (1984:218) wrote of the food sharing networks on Nunivak Island that she observed in 1938 and 1946,

> "*Prosperous hunters who were kin-group or community leaders were expected to feed orphans and elderly people who needed help, but they did not always perform according to the code. Evidently no one starved while others had food; nevertheless, wide differences between family conditions persisted."…..Food was shared within the household… Older people who could no longer produce much were fed, although not always well.*"

C. PHYSICAL FUNCTIONING

Limitations in Activities of Daily Living and Instrumental Activities of Daily Living

Daily living tasks are grouped into two categories: essential activities of daily living (ADLs) (Katz, et al, 1963), such as bathing, eating, and dressing; and the more complex activities where multiple decisions are incorporated into a single action, known as instrumental activities of daily living (IADLs), such as making meals, shopping, and cleaning (Lawton 1969). The ADLs and IADLs were developed for US general populations. It is not known if ADLs and IADLs activity lists are applicable the Native Elders. For example the ADLs and IADLs activity lists include telephone skills, money management, and cooking/ meal preparation. Native Elders participate in activities such as walking to the post office and store, gathering firewood, lifting firewood into the wood-burning stove, hauling buckets of water, dragging in fish nets, and cleaning game. It is often customary that food is prepared for older members of the household by younger women of the family (daughters, nieces, granddaughters and daughters-in-laws).

Examination of the US Census 2000 Supplementary Survey provides a demographic profile of American Indian and Alaska Natives with functional limitations. Fuller-Thomson (2005) found that functional limitations were reported by 28% of American Indian and Alaska Natives aged 45 years or older. Individuals with functional limitations had less income, were older, had less exposure to education, and were less likely to be married or employed ($p < .001$ for all comparisons) than those without functional limitations.

The North Dakota Native Resource Center developed an assessment tool, Identifying Our Needs: A Survey of Native Elders II, to help American Indian and Alaska Native tribal groups assess the needs for Native older adults. This project was funded by the Administration on Aging, Department of Health and Human Services (AoA Grant #90-AM-2751). Nine Alaska Native Tribal community groups have used this tool to assist in the planning of services for their Elders. The tables below present data on the limitations in ADLs and IADLs that were collected in Alaska. Table 2.5 shows that the mean number of limitations in ADLs was 0.55, with more than twice as many limitations in IADLs.

Table 2.5. Average Limitations in ADLs and IADLs Reported by Alaska Native Elders in 9 Alaska Communities

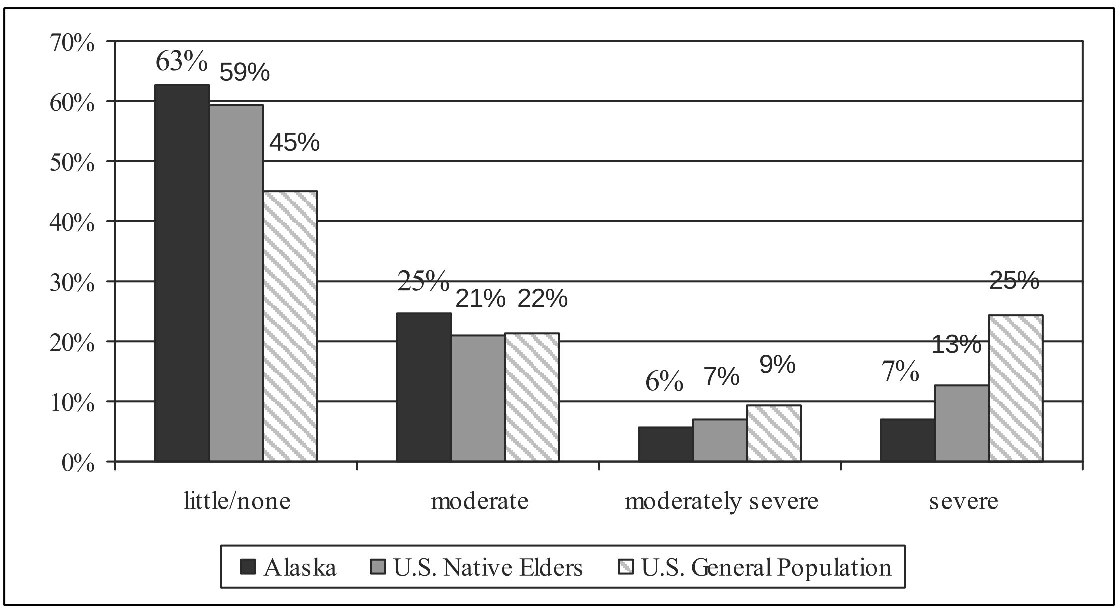
	n	Minimum	Maximum	Mean
ADLs	412	0	6	0.55
IADLs	412	0	7	1.16

Source: North Dakota National Center for Native American Aging, Alaska Specific Data, 2003. Saylor and Doucette, *IN* Health Status of Alaska Natives, 2004.

Figure 2.1 shows the comparative level of functioning among Alaska Natives, US Natives and the general US populations of a similar age distribution. Sixty-three percent of Alaska Natives reported little to no functional limitations, which was slightly more than other groups of older adults. Reports of severe and moderately severe limitations were less common in Alaskan Natives than the other groups. Somewhat more Alaskans reported moderate functional limitations.

Table 2.6 shows that one out of every five Alaska Native Elders has difficulty walking. In rural parts of the State of Alaska, this limitation may present a serious impediment to independent functioning due to the lack of public transportation. Limitations in walking and physical ability may also affect the ability to obtain food, because and may also limit the individual's ability to participate in cultural activities.

Figure 2.1. National Comparisons of Functional Limitations



Source: North Dakota National Center for Native American Aging, Alaska Specific Data, 2003. Saylor and Doucette, *IN* Health Status of Alaska Natives, 2004

Table 2.6. Limitations in Activities of Daily Living (ADLs) in a Sample of Alaska Native Elders (n = 412)	
Task	Percent Reporting Difficulty
Walking	21.1%
Bathing/showering	10.0%
Getting in and out of bed	7.5%
Dressing	5.6%
Using/getting to the toilet	5.3%
Eating	5.1%

Source: North Dakota National Center for Native American Aging, Alaska Specific Data, 2003. Prepared by: Saylor and Doucette, *IN* Health Status of Alaska Natives, 2004:

Bathing and showering was the second most commonly reported functional limitation. The 2000 Census indicated that in one of the survey communities, 51 (60.7%) of the homes lacked complete plumbing (meaning without a sink, or bath/shower, or flush toilet). A total of 45 homes (53.5%) lacked a complete kitchen (meaning without a stove, or a refrigerator or running water). And 2 homes (2.3%) reported that they obtained water from the river or from cisterns. If basic services are not available, it follows that adapted bathing equipment is unlikely to also be available. Lack of facilities and/or running water may tax caretakers who provide assistance when the individual has functional limitations in bathing and bathroom skills.

Limitations in Instrumental Activities of Daily Living

For individuals in the general US population, the ability to perform the instrumental activities of daily living (IADLs) enables an individual to remain self-sufficient. Table 2.7 provides data on the extent of difficulties that Alaska Native Elders reported with instrumental activities of daily living. Help with housework appears to be the most common need among Alaska Native Elders, followed by shopping and meal preparation.

Table 2.7. Limitations in Instrumental Activities of Daily Living (IADLs) in a Sample of Alaska Native Elders (n= 412)

Task	Percent Reporting Difficulty
Doing heavy housework	42.2%
Shopping	18.0%
Preparing meals	15.0%
Doing light housework	13.3%
Managing money	8.5%
Using the telephone	5.1%

Source: North Dakota National Center for Native American Aging, Alaska Specific Data, 2003. Saylor and Doucette, *IN* Health Status of Alaska Natives, 2004

D. HEALTH

State of "health" has been defined and understood differently over time and by different cultures. The World Health Organization (WHO 1946) defined health in their Constitution as, "*a state of complete physical, mental, or social well being, and not merely the absence of disease or infirmity*." Sallis and Owens (1997) wrote that health behaviors within communities are influenced by social, cultural, and physical environmental variables that are uniquely interpreted within each culture. McElroy and Townsend (2004) proposed that within Western society, obtainment of health has become a "*high priority*". McElroy further elaborated that a major belief of Western society is that "*disease can ultimately be prevented or controlled*" through the use of technology, medications, and therapies that are administered by a system of impersonal professionals.

In contrast, within Native communities, health is often viewed as a holistic concept obtained through the establishment of spiritual harmony with one's surroundings.

Nelson (1899:427-434) wrote of the healing shamans who had the ability to communicate with the spiritual world to correct imbalances within the individual, or the community, whichever was viewed to lack equilibrium. The power of shamans declined as waves of epidemics plagued northwest Alaska from smallpox in 1835-1840 through the influenza epidemic of the early 1900's, which the shamans could neither control nor offer substantial relief to those infirmed (Fortuine 1989:234-235).

Good nutrition, in the broadest sense, is thought to influence health. As an extension of the Western medical model, selection of the "right" food fortified the body that allowed for the achievement of health. In Western communities, diets with endorsements to include or exclude specific foods are commonly found in the popular press. Similarly, Native communities also propose the feelings of improved health when eating specific foods. One such food is frybread. Frybread is a commonly eaten food in Native communities, although the food is not Native in origin. Adoption of frybread occurred during the years on reservations when available food was limited to flour, lard and a small amount of meat. Eating frybread symbolizes the strong spirit and the ability to survive despite hardships (Smith and Wiedman 2001).

Use of Native plants for healing teas served as a connection between the human and "*the world below*" (words of Beulah Ballot, JS field note, July 2004). Plants were gathered according to their properties of inducing harmony in competing influences of health and illness. Due to the short summer climate, plant remedies on the northern coast have been reported to be more limited than in other more temperate climates in some parts of the state (Spencer 1959, DeLapp and Ward 1981). Cantwell (1889:49-74), Anderson (1939), Gubser (1965:239-242), and Lucier, et al (1971), reported continued use of stinkweed (*Artemisia arctica*), willow (*Salix spp*) and yarrow (*Achillea borealis*), although the most universal remedy continues to be seal oil and whale blubber (Stoney 1900, Spencer 1959, Lucier et al 1971). (Notes: (1) stinkweed tea continues to be valued. I was offered stinkweed tea several times during my visit in March 2007, (2) Source of botanical names was Schofield (1995).

Perhaps the broadest view of health is the absence of death. By examining causes of death, the presence of health can be defined. Jackson and Beard (2005) analyzed death certificates recorded by all Native reservations in the United States Native Health Care System in order to summarize ten leading causes of death for indigenous populations in the United States, including Alaskan Natives (Table 2.8). She examined death rates by age and found that the top three leading causes of death were similarly ranked between individuals 55-64 and those over 65 years of age. These were cardiovascular or heart disease, malignant neoplasms and diabetes mellitus.

Table 2.8. Ten Leading Causes of Death for American Indians and Alaska Natives	
Age 55-64	Age 65+
Heart Disease	Heart Disease
Malignant Neoplasms	Malignant Neoplasms
Diabetes Mellitus	Diabetes Mellitus
Liver Diseases	Stroke
Accidents	Pneumonia and Influenza
Stroke	Chronic Obstructive Pulmonary Disease
Chronic Obstructive Pulmonary Disease	Accidents
Pneumonia and Influenza	Nephritis
Nephritis	Liver Diseases
Septicemia	Septicemia

Source: Jackson and Beard, 2005.

A number of observations and studies have examined the health of Native individuals over time, including relationships between diet and health. Villages in northwestern Alaska received increased western contact in the 1840's at the beginning of intensive whaling in the Bering Sea (Fortuine 1989:248-250). One of the first records of the people living in Norton Sound was made by Ellis (1782) who reported on the voyages of Captain Cook, and Captain Clerke's voyage in Alaska waters. Ellis described the men to be "*stout and well made, but in general below middle size, although three or four were nearly six feet tall.*" Later Height and weight data were recorded in Barrow by Dr. GS Oldmixon (1885:Appendix) and published by Murdoch in 1892. Oldmixon wrote, "*their height varied between five feet, one inch, and five feet, nine and half inches, with their weights ranging from 125 to 195.*" Simpson (1855) considered them to be "*robust, muscular and inclined to spareness rather than* *corpulence*." Analysis of height and weight over time for this region shows a declining body mass index over the last 100 years (Smith, et al, 2004).

The Strong Heart Longitudinal Study examined cardiovascular risks among tribal communities in Arizona, North Dakota, South Dakota and Oklahoma (Stang, et al, 2005). Research found that the reported diet of Native participants was similar in calories and percent fat to the diet of the general American population, yet the Native group had significantly higher occurrences of cardiovascular and other chronic disease. Wiedman (2005) in his response to their findings raised awareness of the importance of culturally sensitive assessment of minority populations. He encouraged that culturally appropriate interventions be sought and implemented that would deal with underlying problems of long-term poverty, extensive poor access to health care, and disproportionately high rates of communicable disease that have faced Native communities for the last one hundred years. He proposed that the Native voice be included in systemic therapies that focus on communities, rather blaming individuals in keeping with tribal traditions. Similar sentiments have been expressed by other health professionals working with Native and other minority populations (Gallaway 2005, Garroutte 2005, Airhihenbuwa 1996).

Another epidemiological study underway is the study of 8,000 Native individuals in the "Changes in Diet and Lifestyle and Rise in Chronic Diseases of Alaska Native People – the EARTH Study – Education and Research Towards Health." This study is examining the relationships of diet and cancer among American Indian and Alaska Natives (Slattery 2005). Dietary patterns and energy balance are being proposed as contributors to health in populations of American Indian and Alaska

Natives. Alaska is one of the three major survey sites. Alaska data will be compared to Native groups in Montana and the Southwest United States. Data collection is on-going, and the release of the findings is scheduled to be in 2008.

The Alaska Siberia Project (Ebbesson, et al, 2005) used Strong Heart Study protocols and compared Alaska Inupiaq and Siberian Yupik individuals in Russia living on the east and west sides of the Bering Straits. From these data it was concluded that cardiovascular disease (CVD) was present in the Inupiaq population at an incidence rate of 26% for individuals over the age of 55 years (Ebbesson, et al, 2005). This is similar to the 25% rate reported in 2000-2003 for the general US population over the age of 55 (Schoenborn, et al, 2006).

Findings concerning the benefits of high intake of omega-3 fatty acids were inconclusive in Ebbesson's and colleagues' study of Inupiaqs (1996). One day 24-hour recalls estimated omega-3 fatty acid consumption was 3.05 grams for individuals with no CVD, and 3.77 grams for individuals with diagnosed CVD. Both groups reported intakes above the therapeutic dose of omega-3 fatty acids of 1-2 grams per day that is usually used in intervention studies for CVD (Conner 2000), and dementia syndromes (Panza 2007).

Autopsy examination of coronary arteries in a sample of Alaska Native subjects and non-Native subjects living in Alaska found less advanced atherosclerosis in coronary arteries, along with higher proportion of omega-3 polyunsaturated fatty acids, among Alaska Native subjects compared to white populations living in Alaska (McLaughlin, et al 2005 and Middaugh 1990). McLaughlin and Middaugh respectively proposed that high dietary intake of omega-3 may relate to lower coronary artery atherosclerosis reported among Alaska Native individuals, consistent with conclusions made by Holub (1988), Kromhout (1995) and Barr (2000) for other populations.

Beyond the studies that document and diagnose disease, few measures examine the non-tangible aspects of health among Native individuals. Such a measure is perceived self-reported general health.

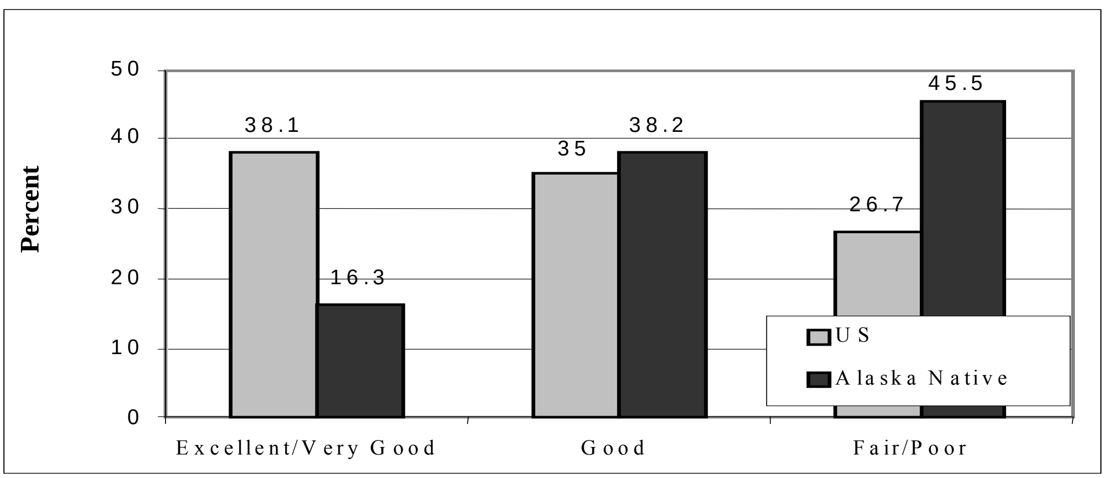
Self-Reported General Health

Self-reported general health has been shown to be a reflection of an individual's perception of their ability to function within his or her environment beyond the mere presence or absence of Pathak's (1996) "five D's" – death, disease, disability, discomfort and dissatisfaction. Researchers have long recognized the lack of total agreement between the presence of disease or illness in an individual and his or her view of their general health. Recent research (Agyemang, et al, 2006, Ubel, et al, 2005, and Leinonen, et al, 2001) reported higher self-perception of their general health reported by aging adults than supported by clinical documentation of increased chronic disease and deterioration of function performance. Mechanic (1968) proposed that access to adaptive systems may help older individuals cope with changes in mental and functional status, and consequently, they see their general health as favorable.

A question concerning self-reported general health was included in the study of Native Elders conducted by the University of North Dakota National Resource Center for Native American Aging. Data from a sample of 412 individuals from Alaska tribes were compared with data from The National Health and Nutrition Examination Survey, a survey that is conducted by the National Center for Health Statistics to assess the general health of the general US population.

Figure 2.2 compares self-reported health status data from Alaska Native Elders with National data from the National Health Interview Survey. The data show marked disparities between national measures of self-reported health status and similar data from Alaska Natives. A greater proportion of Alaska Native Elders perceive their health status as fair or poor than their mainland US counterparts. Data were not available as to gender and/or marital status to measure these effects on the responses.

Figure 2.2. Self-Reported General Health Status in a Sample of Alaska Native Elders Compared to US Counterparts



Source: North Dakota National Center for Native American Aging, Alaska Specific Data, 2003. Saylor and Doucette, *IN* Health Status of Alaska Natives, 2004

Table 2.9 indicates that very old Alaska Native Elders (those age 85 and over) perceived their general health as fair or poor more often than their younger counterparts. This is consistent with increases in functional limitations as people age.

Table 2.9. Perceived General Health and Age Cross-Tabulation in a Sample of Alaska Native Elders (n = 401).

	55-64 years		65-74 years		75-84 years		85 and over	
	#	%	#	%	#	%	#	%
excellent	10	8%	7	4%	3	4%	0	0%
very good	13	10%	27	16%	5	6%	1	5%
good	55	42%	60	35%	30	38%	8	40%
fair	40	31%	54	31%	29	37%	6	30%
poor	12	9%	24	14%	12	15%	5	25%
Total	130	100%	172	100%	79	100%	20	100%

Source: North Dakota National Center for Native American Aging, Alaska Specific Data, 2003. Saylor and Doucette, *IN* Health Status of Alaska Natives, 2004.

Relationship of Education and Self-Reported General Health

Educational level also appeared to have influence on self-reported general health in Native Alaskan Elders (Table 2.10). These data indicate that the highest percentage reporting “excellent” health was in the group also reporting college training. Similarly, the highest percentage reporting “poor” health was in the group reporting minimal schooling. Education level has also been related to a reduced number of nutritional risks among respondents that received congregate and home delivered meal services (Kretser 2003). Higher education levels have been related to healthier food consumption and nutrient intake among older women living alone (Holcomb 1995).

Table 2.10. Self-Reported General Health by Educational Level in a Sample of Alaska Native Elders (n = 397)								
	never attended or < elementary		elementary		high school		college	
	n	%	n	%	n	%	n	%
excellent	1	4%	6	3%	6	6%	6	10%
very good	2	9%	26	12%	9	9%	8	13%
good	6	26%	77	37%	41	39%	26	44%
fair	8	35%	70	34%	38	36%	14	23%
poor	6	26%	30	14%	11	10%	6	10%
Total	23	100%	209	100%	105	100%	60	100%

Source: North Dakota National Center for Native American Aging, Alaska Specific Data, 2003.
Prepared by: Saylor and Doucette, *IN* Health Status of Alaska Natives, 2004.

Mental Functioning

Definitions of mental functioning emerge from the social context within which they occur (Mechanic 1968), and thus are unique to the individuals and communities in which they are found. Rene' Dubos (1959) wrote,

> *"[Man's] self-imposed striving for every-new distant goals makes his fate even more unpredictable than that of other living things. For this reason health and happiness cannot be absolute and permanent values, however careful the social and medical planning. Biological success in all its manifestations is a measure of fitness, and fitness requires never-ending efforts of adaptation to the total environment, which is every changing."*

There are multiple levels of mental functioning that must be considered in an assessment. One category of function includes cognitive ability to remember facts and individuals and the ability to process information to make decisions (reference). The second is the ability to maintain the intangible personality, described as continual striving for distant goals (Dubos 1959). This construct has been referred to by Rowe and Kahn (1998) as a sense of self-efficacy and by Sen (1993) as valuable functioning.

Taber's Medical Dictionary (Thomas 1985) provides a subjective definition that mental functioning is "*the lack of clinically significant behavior, syndrome or pattern, typically associated with either a distressing symptom or impairment of function.*" McElroy and Townsend (2004) reported differences in cultural explanations of mental ailments and the community-accepted practices in dealing with them.

Limited data are available for Alaskan population groups as to the mental functioning status of older Native adults. Ferraro (2005) wrote on the lack of neuropsycological and dementia assessment tools for Native elderly populations and suggested the possibility of over or under-diagnosis of mental disorders in this group.

SOCIOLOGICAL AND CULTURAL THEORIES

Two social theory frameworks were used in understanding the cultural origins of Inupiaq food customs and behaviors. Theories help to understand relationships, and guide questions to give frameworks for addressing research questions.

Themes from the cultural materialism (Harris 1987:57-92, Ross 1987:7-56) and the theory of social ecology (Stokols 1996) provided a holistic foundation to understand food customs and community supports that are found in Alaska Inupiaq communities. The food customs studied in this research embody both theories. The social ecology theory can be applied to food and nutrition behavior by linking it to a community context. The theory of cultural materialism broadly recognizes that social patterns develop based on the natural resources available. For this application, the cultural materialism theory is used to examine social patterns that deal with the harvest, distribution, and consumption of harvested resources. Both the social ecology theory and the theory of cultural materialism take a holistic view of an individual's environment and the impact of the environment on total health.

Achterberg and Miller (2004) advanced theories of food and nutrition behavior that previously focused on actions of individuals to give recognition to the influences of community environment in improving health. Likewise, The American Dietetic Association's position paper on nutritional needs of older adults, "Nutrition Across the Spectrum of Aging" (ADA 2005), also focused on the impact of the individual's social and community context.

Theory of Cultural Materialism

The theory of cultural materialism defines "*culture as the learned repertory of thoughts and actions collectively exhibited by members of social groups*" (Harris 1979). The underlying focus of this theory is the efficiency of a culture to make adaptations to maximize the physical environment around them. While this theory is very broad and encompasses societies as a whole, constructs of this theory are useful in an examination of the selection of food and the food distribution to age cohorts (Harris 1987:73). Harris (1987:57-90) outlined the autonomy of Native communities to self-determine foodways and food practices that influenced nutrient intake among all segments of the community, such as the classification of Inupiaq communities by the foods they harvested mentioned earlier.

Harris proposed that optimization of resources drove cultural systems and patterns. With systems and patterns in place, Native communities balanced the physical cost of the harvest against the success rate and yield. In Alaska, the risk of death or injury associated with harvesting sea mammals is relatively high, yet the yield is also high providing protein and fat for many households within a community. Speth (1983) reported similar benefits of the bison kills among the Plains Indians. Groups of individuals would be required to minimize the immediate risk of harvest and the long-term risk should one or some of the hunters be injured.

Other researchers have built upon Harris's theoretical platform. Cohen (1989) examined the variety of diet and proposed an index of "*hard times*." He proposed that as food stress increased in a community, the more diverse the food supply became. In temperate climates, Binford (1983) proposed that the large diversification of food goods occurred as hunter and gatherers increasingly exploited a wider variety of species and made use of smaller animals when larger animals were unobtainable. He wrote that the depletion of game preceded the shift to agricultural pursuits, a reactionary adaptation to ensure stability in the food supply.

Important in this examination of food support for Inupiaq Elders is the reciprocal relationship established by the sharing of knowledge held by Elders as to seasons of harvest, harvesting tools and techniques in exchange for the game that they could no longer physically harvest themselves. Harris's theory of cultural materialism provides a theoretical platform consistent with these observations made by this researcher and others. Harris proposed that cultures would develop rituals and symbols to preserve the cultural wisdom to protect the food supply, such as the community care provided to Elders. Elders could share the most efficient ways foods were selected, obtained, distributed, processed, and consumed (Harris 1987). In Harris's underlying foundation, he proposed that cultural constructs determine population segments that benefit from the nourishment and those in the group who will pay the costs of the food customs, be it financial or in physical labor.

Social Ecology Theory

The social ecology theory proposes that there are relationships between individuals and their communities. It recognizes influences that environment may have upon behaviors and customs of the individual. The social ecology model evolved from the conceptual traditions from public health where the community influences on disease are well recognized (Stokols 1992). One of the tenets of the social ecology model is the broad interdisciplinary view of social responses to community problems. Use of this theoretical framework appeared appropriate in the examination of food behaviors in Native communities, and it was consistent with Sallis and Owens (1997) who wrote that health behaviors within communities are influenced by social, cultural, and physical environment variables that emerged from the community.

Identifying and categorizing community factors are very important within the social ecology model (Sallis and Owens 1997). Moos (1979) listed types of community factors: physical settings, organizational, human aggregate, and the social climate, which he states, "are intricately woven." Mauss wrote that these community factors contain the threads from which the "*social fabric is composed*" (Mauss 1954). He views all parts essential to the whole; without which parts, the whole would not exist.

Many of the themes from the social ecology theory are consistent with the world-view held by Alaska Native Elders. Elders believe that preservation of the village often outweighs the importance of the individual (Graves 2005). At the Conferences of Elders, when Native Elders were asked to respond to questions about barriers that prevented achievement of their happiness, Native Elders consistently wanted to discuss the problems of the village and not themselves. In their minds, if one group has a problem, the entire village shares the problem, regardless of age (NRC 2005). Thus, in the Elder's view, solutions for problems among the Elders or among the youth would involve the entire village.

Cultural values are mirrored in the practices and behaviors that shape community interaction with older adults, and, thus, the identity of the Elder is defined. Native Elders associate the manifestation of cultural values as "respect." For example, the act of giving food to an Elder is viewed as an indicator of respect for which the Elder reciprocates by sharing knowledge and experience with the community, such as mental keepers of the history of events that occurred in the village. Elders were taught that the ability to share wisdom is the primary role of the Elder in the Inupiaq community (Graves 2005, NRC Conferences of Elders 2005). Graves reported that if Elders were able to satisfy these community requirements, then they had achieved their life's work.

SUMMARY

This review of literature provides information as to the cultural context of food customs within the Inupiaq community, and the underlying cultural values that have transcended centuries of change and technology. In essence, understanding the functional intricacies of food customs and examining of the contributing variables can provide the next step towards gaining knowledge about the deeper social and ideological meanings of the foods and food systems (Pelto, et al 2000:1-10) within the Inupiaq culture. While these variables are universal, each acquires nuances unique to community culture, such as in this Alaskan location and in this Native group.

As Native Elders migrate from rural to urban areas (deMarban 2006), there is the potential for changes that may affect access to their native food culture. It is not known if living in the village affect nutrient intake or the cognitive domains of self reported general health, mental functioning, and physical functioning; that therefore was the focus of this research study.

CHAPTER III

METHODOLOGY

PRELIMINARY STUDIES

Several preliminary studies were invaluable in refining research protocols, developing community relationships and immersing the student in the diverse Native cultures of Alaska. These included: understanding the role of Elders to support families in Native communities (Smith and Wiedman, 2000); limitations of the nutrient content of many Native foods (Smith and Wiedman, 2001); overcoming the challenges of implementing a community level nutrition intervention using traditional Native communication of oral transmission (Smith, George, Easton, 2001); gaining community approvals for health research in Alaska rural communities (unpublished); the development of an assessment tool for food intakes from a yearly subsistence pattern (unpublished); collection of food cost data (unpublished); narrative data describing food insecurity (Rody, et al, 2002); potential use of data collected during the National Science Foundation Social Transition in the North Study for nutritional assessment studies within Inupiaq communities in Alaska and Siberia (Hamrick and Smith, 2004); and evaluation of a standard tool to access body fat among Alaska Native women (Smith, et al, 2004).

RESEARCH DESIGN

This study is a cross sectional field study to compare the food and nutrition customs of Inupiaq Elders living in rural versus urban Alaskan settings and to explore potential relationships between select nutrition parameters and self-reported mental and physical health. The data collection process used quantitative survey methodology. Standard survey instruments and research protocols, which had been previously used by other researchers with Native populations, were used to study the Inupiaq Elders' food customs and self-perceptions of health.

These instruments and the study protocol were approved by Institutional Review Boards (IRBs) at Florida International University and at the University of Alaska Anchorage. Additional approvals were obtained from each of the participating Inupiaq rural communities. Native leaders in Anchorage were contacts concerning the study, and presentations were made at church meetings, Native events and to Native organizations that described the study. They also were allowed to review the survey to identify questions that they felt may be inappropriate or potentially disrespectful to the Elders. Figure 3.1 provides a brief overview of the key activities accomplished to complete this project.

Figure 3.1. Chronology of key research, analysis and dissertation activities

2004		
Jan-Mar	Developed research questions and project design with Graduate Committee	
Jan-Mar	Sought introductions and visited with local Native associations, churches and leaders to discuss study, determined research tools appropriate for Native Elder participants	
April	Obtained preliminary IRB approvals FIU, UAA	
	Rural	Urban
Feb	Solicited potential Inupiaq communities at state-wide Tribal meeting in Anchorage	
July-Aug	Visited four communities to explain project scope and objectives (Traditional Tribal Councils, Elders' Councils, Local Governments)	
July-Aug	Reviewed survey materials with communities. Listened to their suggestions, concerns and desired	

	changes to research protocols	
Oct	Two communities accepted invitation, data set for researcher to return	
Oct	Sought funding for data collection and participant honorariums	
Nov	Filed Proposal	
2005		
Feb	Contracts signed with local villages to disperse honorariums to the Elders	Private funds secured to give the same honorariums to urban participants
Mar	Proposal revised	
April	Arranged for transportation and lodging in two villages for survey team	Visited with local leaders to discuss recruitment of participants in Anchorage
May	Recruited surveyors for rural and urban data collection	
June	Arranged for 2 day IRB training for all surveyors by Alaska Native Health Board's "IRB on the Road"	
June	Assembled survey materials in folders.	
June	All surveyors attended Native gathering and collected data. Surveyors' work individually evaluated and retrained if necessary to ensure quality control	
June	Purchased and mailed food for survey teams to rural villages	Data collection begins
June	Traveled to villages, made introductions to Traditional Tribal Councils, Elders' Councils and Local Governments, church services	
July	Recruited local assistance: transportation of Elders to the survey site, preparation of frybread and agutuk for the Elders	
July	Coordinated with Tribal Council on how to disperse honorariums	
July	Collected data	
August	Rural data collection completed	Data collection continues
Nov		Urban data collection completed
Dec	Data copied, and mailed to data processors (Block, U of North Dakota). Data scanned (SF-12, Cultural Strengths). Fish and Game Data examined for quality and consistency. Data returned to Fish & Game to identify households.	
2006		
Feb	Fish & Game data sets merged by participant names and/or household numbers with other data sets	
Mar	Preliminary findings reviewed with Graduate Committee	
June-July	Analysis of FFQ data by contribution of harvested foods to key nutrients	
July	Returned to rural villages to discuss preliminary findings with Elders and community leaders	
Aug- Nov	Preparation of Chapters III, IV with Committee Statistician	
2007		
Jan – Apr	Preparation of Chapters I, II, V, VI with Major Professor	
May	Committee Review and Preliminary Defense with Committee	
June	Copies sent to participating villages for review	
June	Formal Defense	
July	Manuscript filed with the University Graduate School	

STUDY SETTING

This study focused on Alaskan Inupiaq Elders living in rural and urban communities. Both the Alaska Inupiaq population that live in the area around Barrow and the Inupiaq Elders who reside on the northwest Alaska coast near Kotzebue were previously misidentified as Arctic Eskimos. Both groups are part of the larger Inuit population that has a deep history, having resided along the northern coast of Siberian Russian, Asia, Canada and Greenland for over 4,000 years (Fitzhugh 1988).

The northwest region of Alaska was selected because this region had experienced the least historical outside contact, perhaps due to the remoteness of the location and challenges presented by the harsh Arctic climate. If the perceptions of adverse influences of urban migration were accurate, comparison groups in a rural setting were needed in order to gain insight and understanding of this phenomenon. The study had to be conducted where the contrast between urban and rural locations had the potential to be the greatest and could be described.

The participating communities were two of four communities in northwest Alaska that responded to a sign reading "*community needed for Elder nutrition research*" posted at a statewide meeting in the spring of 2004. Villages requested that researchers come in person to make contact with the community before permission was granted, after which the researcher could return to collect the data. Arrangements were made to visit each of the four responding communities during the summer of 2004. Length of the visits ranged from five to eleven days, depending on the wishes of the community and available travel and lodging for the team members.

Relationship with Study Communities for the Purposes of Subject Recruitment

The recruitment team consisted of a Professor Emerita in dietetics and nutrition, the researcher, and two graduate students: one in the Master's program in Public Health at the University of Alaska Anchorage and the second a doctoral candidate in anthropology from the University of Alaska Fairbanks. During the community visits, formal presentations were made to the Tribal Councils and to the Elders Committees by the researcher and professor. Informal presentations were made to the mayor and other local leading residents in order to explain the purpose of the study and to respond to all questions and concerns.

The two study communities that chose to participate met the criteria of having a long, unbroken history in the region and continue to maintain a lifestyle of hunting and gathering wild food resources, often referred to as a subsistence lifestyle (Callaway 2003). In addition, both communities had strong interest in documenting the strength of cultural customs of their Elders.

During the fall of 2004, the researcher was notified of the villages' decisions about whether or not to participate in the study; arrangements were made to return during the summer of 2005 for the data collection phase.

Description of Village 1

"Village 1" is one of the very old communities in northwest Alaska. The population in this village is just over 400 individuals in 84 households. The village lacks any substantial industry. Many of its residents continue to participate in subsistence activities of hunting and fishing and travel to hunting and fishing camps during the year. A review of the 2000 census records indicated that there were approximately 50 Elders residing in the community.

In response to the posted notice, the Tribal Council President invited the researcher to talk to the community about the project. Materials about the study were emailed, faxed, and mailed to the Tribal Council President prior to arrival. In the initial visit at the council meeting (July 2004), the principal concern expressed regarded the village's control of the findings that may result from the study. Their question was "*What will happen if your study is in conflict with other studies?*" The Council was assured that they would have full editorial control over the findings, and they were full partners in the research about their community. An understanding was established that the research team would be sending back data and preliminary reports, and the Council would be asked to assist with the interpretation of the data and verify conclusions.

While the topic was not initiated by the village, the spirit of the research relationship developed between this researcher and the community was in keeping with the definition of participatory research (American Anthropology Association 1983, American Academy of Pediatrics 2004, Kaufert and Kaufert, 1998, Boyer 2007), which includes community involvement at all stages of the research project.

Payment to Elders for participating in the project was a key element for obtaining Council approval. At the time of the visit, applications for funding were in progress, and the researcher assured the Council that funding payments for the Elders would be pursued. Follow a meeting with the Elders Council five days later, the Tribal Council voted in favor of the research project.

As the relationship developed over the next three years, members of both communities appeared to grasp the importance of the study and seized all opportunities to teach the research team, in order that the value of their food customs and the resulting care of their Elders was documented. Several Elders called and visited the Anchorage office to “catch up on news” and hear about the team’s progress.

During the 2004 visit, the itinerant medical quarters at the clinic were vacant, and with the permission of the Maniilaq Regional Health Corporation, the team was able to stay there. During the 2005 visit, clinic space was not available, and the Mayor gave permission for the team to stay in the school. Two beds were offered, and the remainder of the team spent ten nights in sleeping bags spread on the floor in the library. Showers were available next door in teacher housing. Lodging costs were paid by the ANSRPH grant.

Description of Village 2

“Village 2” is also one of the very old communities in northwest Alaska. It is smaller than Village 1 with a population of less than 250; there were approximately 25 eligible Elders. Village 2 was not visited in 2004 because of foggy weather and the discovery of significant archeological findings during the installation of a new water line that resulted in prolonged plumbing problems in the village. Materials were sent and frequent phone calls were made with the council Elders during the year. The formal meeting of the Elders’ Council was held after the arrival of the research team in summer of 2005.

Because Village 2 is located approximately 100 miles from Village 1, there are many family ties between the two villages. Elders in Village 2 had some knowledge of the study and had invited the team to their village. The morning after the team's arrival, the Senior Dietitian (age 82) was invited to participate in the Elders' Council Meeting to discuss the implementation of the study. The rest of the team was allowed to observe with the understanding that comments would be made through the senior representative. After a lengthy discussion, the Council requested that the team sponsor a potluck for the Elders. Once the team agreed to the potluck, they gave us permission to collect data.

Preparation for the potluck took some creative menu planning with the foods mailed ahead for the team. Supply barges arrive only in the summer, and actual arrival dates were unknown. If the team arrived before the barge, supplies at the small store would be minimal. Younger staff at the clinic and Village Tribal Council asked if they could contribute. Of course, all offers were welcomed. Over 100 people of all ages came the night of the potluck. The tables in the gym were filled with the team's diverse offerings and dishes of locally harvested delicacies brought by the community. Most of the Elders took plates of food home.

Finding lodging in Village 2 was problematic. We arrived at the village Tribal Office knowing that the new clinic was under construction, and the old clinic did not have space. After enjoying a cup of coffee or two, a member of the community called and gave permission for the women to sleep in her house while she was out of town, and the men were invited to sleep across the street at the residence of the Elders' Council president. Funds from the ANSRPH grant paid for the lodging.

Description of Villages That Decided Not be Part of the Study

Four of the seven Inupiaq villages in Northwest Alaska extended invitations to researchers to visit and to discuss the study with the Village Council and Elders' Council. Visits to the four villages were completed during the summer of 2004. Only the two villages described above eventually decided to participate in this study.

Village 3 had recently completed a very comprehensive environmental impact study since oil had been discovered nearby. In addition, the village had experienced three deaths the week before our arrival. The community was very gracious, but declined to participate. The mayor told us, "*Our Elders are tired*" (JS fieldnotes, 2004).

Village 4 also chose not to participate. They had been recently included in a ten-year international whaling study. In addition, the Elders' Council was being reorganized. Although they declined to participate, they liked the researchers and wanted to be informed of the findings.

Willingness to participate by participants and communities is a basic tenet of Alaska research. All of the four communities had many similar cultural characteristics and demographics. Had all of the villages decided to participate, all would have been included.

Confidentiality of Information about Communities

Both communities were assured that any community information that could allow identification of the name and location of the community would be shielded during the research and data collection process. This effort was made to prevent any possible unintentional impacts resulting from the publication of the findings.

Communities' Approval of Findings

Both participating villages asked to review the data, and preliminary drafts were forwarded to community leaders as requested. These protocols are mandated by the University of Alaska Anchorage and Indian Health Service Alaska Regional Institutional Review Board, as well as the National Science Foundation Principles of Conduct of Research in the Arctic (1982). The researcher returned during the summer of 2006, to give community leaders time to review preliminary working drafts and to discuss their views of the findings. Their comments are incorporated into this document.

Application of Principles of Participatory Research

All efforts have been made by this researcher to adhere to the principles of "participatory research." One of the survey communities requested control of the research relationships, including oversight of data collection, authority rights concerning the storage and disposition of survey materials, and monitoring of conclusions and release of publications. The request is consistent with current research relationships among Indigenous and First Nation Tribes in Canada (Ethical Principles for the Conduct of Research in the North, 2003; Code of Ethical Conduct for Research Involving Humans, 1997) and indigenous groups in Australia (Australian National Statement on Ethical Conduct in Research Involving Humans, Guidelines for Ethical Conduct in Aboriginal and Torres Strait Islander Health Research, 2003).

ESTIMATION AND FEASIBILITY OF SURVEY GROUP SIZE

Jacob Cohen's techniques (1988) were used to determine the required size of the two survey groups. Effect size measures the magnitude of the treatment effect, which in this study was the location where the Elders lived. Effect indices are independent of sample size, since they are based on the distribution of the data for the two groups, as measured by standard deviations (Lipsey and Wilson, 1993). Cohen (1988) described the effect sizes greater than 0.5 as "large," greater than 0.3 but less than 0.49 as "moderate" and greater than 0.2 but less than 0.29 as "small."

Using Cohen's methods, it was determined that 50 Inupiaq Elders from rural Alaska villages and 50 Inupiaq Elders living in the urban site would achieve 84% power to detect a medium effect size of 0.6, using a significance level of 0.05 in a two-sided or "two sample" t-test. Table 3.1 presents the effect size calculations for comparisons of nutrient intake between rural and urban Inupiaq Elders. The number in the survey group appears adequate to have detected differences between the Inupiaq Elders living in two locations.

Feasibility of Projected Survey Groups

Demographic information regarding Village 1 and Village 2 (accessed at www.alaska.gov) indicated that the proposed survey group size would require participation of 83% of the Inupiaq Elders (50 out of 60) living in the two villages.

The urban survey group size also appeared to be feasible based on population numbers. One of the Anchorage community programs for Native Elders estimated that over 300 Inupiaq Elders (16% of all Native individuals > 50 years of age) lived in

Anchorage, Alaska's largest urban community. The rural Village Tribal Councils provided a list of over 100 Inupiaq individuals they knew to be living in Anchorage.

Table 3.1. Effect Size Calculations for Comparisons of Nutrient Intake between Inupiaq Elders Living in Rural and Urban Locations

	t-test	p	Effect Results	Size of Effect (1)
Energy	1.26		0.25	small
Protein, g	0.44		0.09	
Fat, g	1.48		0.30	medium
Carbohydrates, g	1.62		0.32	medium
Carbohydrates, % of energy	1.20		0.24	small
Fat, % of energy	0.71		0.14	
Vitamin A	0.27		0.06	
Thiamin, B_1	1.81		0.36	medium
Riboflavin, B_2	1.52		0.30	medium
Niacin	0.63		0.13	
Vitamin B_6	3.73	<.0001***	0.75	large
Vitamin C	0.13		0.03	
Vitamin B_{12}	2.27	.026*	0.45	medium
Vitamin D	3.21	.002**	0.64	large
Vitamin E	0.03		0.06	
Folate	2.24	.028*	0.45	medium
Calcium	1.00		0.20	small
Iron	0.32		0.06	
Magnesium	2.96	.004**	0.59	large
Potassium, g	2.19	.036**	0.44	medium
Phosphorus,	0.41		0.08	
Sodium, g	1.95		0.39	medium
Zinc, animal sources	3.16	.002**	0.63	large
Fiber	3.26	.002**	0.65	large

(1) Cohen 1998

Given the considerable time and number of visits required to recruit each village, and the high costs of air travel and lodging to the two rural communities, a total survey group of 100 was decided upon for this study: 50 Elders living in rural villages, and 50 living in Anchorage.

RECRUITMENT OF PARTICIPANTS

Inclusion Criteria: All survey participants were community-dwelling, non-institutionalized individuals. All rural Inupiaq individuals who lived in the two survey villages, who were over 50 years of age, or who had a 50th birthday in 2005, were eligible to participate. This resulted in a purposeful census group with 94% of all eligible Elders participating. Family members assisted the researcher when interviewing individuals with limited physical and mental abilities.

The urban group was an availability group recruited using a modified snowball technique. The survey group was not randomized, and no age stratification was attempted. Urban recruitment began with a list of Inupiaq individuals known to be living in Anchorage who were identified by one of the two villages. The survey team discreetly called leaders within the Anchorage Native community seeking contact information of the persons identified by the Inupiaq villages. Names on the list were called by the urban survey team, and an appointment was scheduled to complete the survey forms. Through this process, other Inupiaq individuals were also identified that came from villages in close proximity to the two rural communities. Recruitment was closed once 50 Inupiaq individuals over the age of 50 had been surveyed. Thus, the urban survey group represented the first 50 completed interviews, as opposed to the rural group, which consisted of all Elders in the villages that were willing to participate.

Recruitment Honorarium

The Tribal authorities in the two survey villages requested that each Elder be given $50, regardless of the participation of the Elders. While the contribution was modest, the transaction indicated the value of the Elder's wisdom. A contract was negotiated with the village and funds were given to each village Tribal Council for distribution. In the urban community, the $50 honorarium was given to the Elder at the beginning of the interview to reduce any pressure they might feel to complete the interview. In the rural villages, funds from ANSRPH were used to cover the cost of the honorariums. In the urban community, private funds were used.

PROTECTION OF PARTICIPANT RIGHTS

Approvals and Permissions

Institutional Review Board (IRB) approvals were obtained from Florida International University and from the University of Alaska Anchorage in 2004, prior to visiting village locations to solicit their permission to collect data for this study.

Research in Alaska requires additional approvals. The National Science Foundation's (NSF) Principles for Conduct of Research in the Arctic (1982) has received support from the circumpolar governments of the United States, Canada, Greenland, and Russia, and provides guidance for researchers working in rural Native communities. These tenets require that no research may proceed in a Native community without the community's Tribal council's permission to do so. In addition, The Alaska Federation of Natives has passed resolutions that scientific investigations in Alaska

Native communities must adhere to the NSF guidelines when dealing with human subjects in small isolated communities. The American Academy of Pediatrics also has issued a similar policy (2004) concerning protection of individual rights in small populations.

Consent Forms

Consent forms informed participants of their rights, risks, and benefits of participating in the study. For this study, the informed consent forms were developed in consultation with a committee of Alaska Native individuals at the University of Alaska Anchorage. This is consistent with guidelines recommended by the American Public Health Association (Strauss, et al, 2001). Individual signatures on the study consent forms were required from each person participating in this study, even with general community approvals to conduct research in place. An additional form was signed to release individual data collected on the household harvest by the Alaska Department of Fish and Game (ADF&G).

Security of Data

Survey forms for each individual were grouped and placed in a pocketed folder. A different color folder was used for each location. Each folder was assigned a tracking number, and the number was written on all survey forms. A log was kept matching names and tracking numbers. The coding system allowed for the collection of missing data by other team members.

In the field, the completed survey forms were maintained and kept in a secure location until they could be stored in a locked central document file at the offices at the University of Alaska Anchorage, Institute for Circumpolar Health Studies in Anchorage Alaska.

Data from the Block Food Frequency Questionnaire, the University of North Dakota “Survey of Our Elders”, the SF-12v.2, and the Social Transitions in the North Study were matched by tracking number. Names were used to match survey data with harvest and food sharing network data from ADF&G.

DATA COLLECTION PROTOCOLS AND TOOLS

Survey Team

Survey team members had previous work experience with older adults, Alaska Native populations and Alaska communities. During the Summer of 2004, the research team consisted of the researcher, Janell Smith, RD, LD, a PhD student at Florida International University; Penelope Easton, PhD, MPH, RD, Professor Emerita from Florida International University, and graduate students taking a field methodology course as part of the curriculum of the University of Alaska Anchorage’s Masters of Public Health Program (see Keebler 2005, for students’ description of this experience).

In the summer of 2005, seven students sponsored by the NIH grant at University of Alaska Anchorage (Center for Minority Health- Alaska Native Science and Research Partnerships for Health (ANSRPH)), accompanied Smith and Easton to the villages after two days of intense training with the survey tools and IRB training on the protection of individual rights during the survey. Students included two postbaccalaureate, pre-internship dietetic students, a student with a BA in anthropology, a third-year medical student, and a second-year sociology student.

In the urban area, members of the Alaska Native Brotherhood assisted Smith with locating Inupiaq Elders to participate in the study. A member of their Executive Board received both IRB training and individual training with the team leaders.

Diversity in ages of the team members had numerous advantages, especially with the research focus on the nutritional status of Elders. Having a senior researcher on the team in the Alaska WIC Healthy Moms Study (Rody, et al, 2002) provided an entree for all team members to attend community functions where the team could talk with local Elders to verify information and to gain greater understanding of the community heritage (Smith J, unpublished). The inclusion of older individuals on the team is in keeping with community traditions of the value and respect due community Elders (Smith and Wiedman, 2000). In addition, the researcher is a female, and many Native communities prefer that women do not travel alone. Penelope Easton was 82 years old at the time of this study and had worked in the arctic during 1948-1950. She had assisted Ms. Smith with two prior research projects in Alaska.

Involvement of the Graduate Committee

Dian Weddle, PhD, RD, provided insight for the organization of the urban data collection during her visit to Alaska in August 2004. Brian Saylor, PhD, MPH, Director at the University of Alaska Institute for Circumpolar Health, facilitated funding, coding and scanning of data forms, as well as travel arrangements to the villages. Dennis Wiedman, PhD, was instrumental in helping to locate background literature that prepared the researcher for this project. He also encouraged presentations at appropriate national meetings (Society for Applied Anthropology presentations in 2005, 2006, 2007; Indian Health Service Research Meeting 2005, and American Anthropology Association in 1999, 2000).

Selection and Description of the Assessment Tools

Careful consideration was given to the tools used in this study. Tools were chosen that had been previously used with Native populations by either the survey team members or other researchers. Figure 3.2 presents the tools selected and the variables each was used to assess.

Administration of the survey tools did not occupy all of the time that team members spent with each Elder. After visiting the villages the year before, participants took time to share acquaintances with the team leaders, update us on family news of births and deaths, and discuss other changes in the village. The recent deaths of two youths in Village 2 prompted many participants to share their concerns for the future of their village and the role of Elders to help the community through these tragedies, as they saw it.

Data Collection via Survey and Interview

Training of the survey team members included a two-day course that covered: protection of rights during research with Native populations provided by the Alaska Native Health Board; Institutional Review protocols; training in the techniques to administer the survey tools; and instruction from Elders from the Anchorage community on how to work respectfully with Elders.

Figure 3.2. Brief description of data collection tools

Variable	Tool	Estimated Time to Administer
Nutrition parameters:	Block 98 item Food Frequency, and a supplemental sheet of Alaska foods.	45 minutes
Nutrition risk	The Nutritional Screening Initiative Determin Checklist	Less than 5 minutes
Community support	Participation in family activities - Questions from the Comparative Study of Social Transition of the North: Alaska and Russian Far East, NSF OPP 9496351.	10 minutes
	Participation in community activities Identifying Needs of Our Elders: version II developed by the National Resource Center on Native American Aging at the University of North Dakota, 2003.	10 minutes
	Food security status - Modified USDA Food Insecurity Measure	Less than 5 minutes
	Food sharing network - Community Socio-Economic Survey developed by the ADF&G Division of Subsistence and the National Park Service, AKRegional Office (ADF&G/ NPS).	15 minutes to 30 minutes
Physical functioning	Physical Functioning Composite Score (PCS) The SF-12v2 Health Survey	5 minutes
	Limitations in Activities of Daily Living (ADLs) Identifying Needs of Our Elders (described above)	10 minutes
	Limitations in Instrumental Activities of Daily Living (IADLs)) Identifying Needs of Our Elders (described above)	10 minutes
Self-reported general health	Self-Reported General Health (GH) The SF-12v2 Health Survey	5 minutes
	Mental Functioning Composite Score (MCS) The SF-12v2 Health Survey	5 minutes
Demographic characteristics	The Community Socio-Economic Survey - tl Alaska Department of Fish &Game, Division Subsistence (ADF&G)	Less than 30 minutes
TOTAL TIME		Minimum of 155 minutes

Questions were asked orally and recorded on forms by the survey team. Many Elders have problems with visual acuity and finger dexterity. A few of the Elders were only functionally literate in English and in these cases, an interpreter was used. An orally administered survey eliminated possible bias from participant limitations. Further, oral communication is consistent with historical communication patterns in Native communities.

All written responses were made in plain view of the subject. If notes were taken by the surveyor, such as to record a recipe or an interesting comment or story offered by the Elders, the researchers carefully reviewed all written comments with the Elder to verify that the information was recorded correctly.

In rural communities, interviews were conducted at the school, waiting for a plane at the airport, and in participants' homes. Interviews in the urban community were conducted at public functions, small cafes, in the conference room at the Institute for Circumpolar Health at the University of Alaska Anchorage, as well as in participants' homes.

SELECTION AND DESCRIPTION OF ASSESSMENT TOOLS

A. Nutrition Parameters

Food frequency techniques were used to collect dietary information in this study. The Food Frequency was chosen in order to minimize the burden on the Native Elders during the data collection process and because the population's heavy reliance on seasonal and harvested foods.

Analysis of food intake data was limited to comparisons of the mean nutrient intakes of the rural and urban Elders as stated in the research question. Since a food frequency questionnaire is not a valid measure of “usual intake”, it was not possible to apply the statistical techniques recommended by the IOM as discussed earlier. Thus, in this baseline study of Inupiaq Elders, we were unable to determine the percent of population meeting Estimate Average Requirements (EARs) and the percent of population above Upper Tolerable Limits (ULs).

Nutrient Intake

Two issues were considered in examining the difference in mean intake. The first was the selection of an assessment tool that minimizes participant burden, yet was effective in obtaining information with some degree of certainly that the information is reflective of overall eating patterns. The Inupiaq diet is based on the seasonal harvest of game, with heavy consumption during periods surrounding game availability and harvest as discussed earlier. The inability to predict times and amounts of the harvest precludes the use of two non-sequential 24-hour intakes as a method to determine the “usual nutrient intake” of this population (IOM 2000).

Nutrient intake of Inupiaq Elders was assessed using The Block Food Frequency Tool (BFFQ) (Block Dietary Data Systems, NutritionQuest, Berkeley CA, Block 1989). We used this tool to estimate yearly intake because it had been used previously in Alaska, and the list of unique Alaska food had been tested in a previous study (Rody, et al, 2002). The BFFQ has been shown to be reliable when used with older rural non-

Native women aged 50 to 69 years with a reliability coefficient (≥ 0.70), significant at $p < 0 .05$, when compared to 24-hour recalls (Boeckner,et al, 2002).

Literature review indicated the diversity of the Alaska diet (Heller and Scott, 1967, and Nobmann, et al, 1992) and a pattern of food intake in Arctic regions that reflects the contribution of seasonal foods (Khulein, et al, 2004). A food frequency tool was considered advantageous due to the ability of the tool to gather dietary intake and information on eating patterns over a long period of time (Willet 1998). In addition, The BFFQ was being used by the Strong Heart Study, Phase V (personal correspondence with ML Slattery, PhD, RD in February 2004, also see Strong Heart Study Coordinating Center, 2006), and offered the potential for future comparisons between geographically different Native Tribes.

Elders were asked about a series of 98 food items and then asked to indicate the frequency of use and the amount eaten each time. To assist with identifying portion sizes, the sheet of visual cues provided by Block Associates was used to estimate portion sizes and to improve recall. Many of Inupiaq residences house multiple generations, and when family was available, they frequently assisted in the survey process. Often the family showed the researcher the actual plates, bowls, and cups used by the Elder.

Gladys Block and Block Associates assisted in the development of an additional page of Alaska foods that was added to the BFFQ and used in this study. The evaluation of the list of Alaska foods was part of a previous study in 2001 that used USDA WIC Discretionary funding (Rody, et al, 2002). Dr. Valerie George, PhD, LD, at Florida International University assisted with the initial planning of the WIC study. The list included harvested fish, meats, berries, and wild greens. It also included commonly eaten purchased or prepared foods that had been identified by earlier researchers (Nobmann, et al, 1992) as having intake patterns unique to Alaska, such as the powdered breakfast drink, “Tang”, pilot bread, frybread, and the use of evaporated milk in coffee.

The second issue was the lack of complete food composition for most of the harvested foods eaten in the Inupiaq diet. The researcher provided Block Associates with nutrient data for the 41 Alaska specific foods included on the supplemental page. There is incomplete nutrient information on many of the foods harvested in Alaska. Appendix B provides an overview of the limited and missing data for many commonly eaten foods in Inupiaq villages. If specific nutrient data were not available, the existing information was supplemented with data of like species, such as using data from Colorado elk for Alaska reindeer and caribou. Details of this process have been published elsewhere (Rody, et al, 2002). Block Associates entered the nutrient data as furnished by this researcher, and thus was able to return data files collected from the BFFQ and the Supplemental Page of Alaska foods for further analysis.

The approximate time required for Elders to complete this portion of the survey was 45 minutes.

Nutrition Risk

The risk of malnutrition was assessed using The Nutrition Screening Initiative’s Determine Your Nutrition Risk Checklist (NSI Determine Checklist) (Posner, et al, 1993). Results of the NSI Determine Checklist have been published by Valias, et al

(1998), Garofalo and Hunak-Hankinson (1995), Herdon (1995), MacLellan and Van Til (1998), although these studies surveyed primarily non-Native populations. The NSI Determine Checklist was included in the University of North Dakota's Survey of Our Native Elders (McDonald, et al, 2005).

The survey consisted of ten questions, with some items weighted more than others, reflecting the relative importance the score has on nutritional risk (Posner 1993). Scores can range from 0 to 21. The scoring allows for the estimation of "nutritional risk." A score of 0-2 indicates "no risk," a score of 3-5 indicates "moderate risk." A score of 6 or more indicates "high nutritional risk."

The approximate time required for Elders to complete this portion of the survey was 5 minutes.

B. Community Support

Participation in Community Activities

Participation in community activities was assessed using The University of North Dakota Identifying Our Needs: Survey of Elders II (McDonald, et al, 2005). The tool can be accessed at http://www.med.und.nodak.edu/depts/rural//nrcnaa/pdf/booklet. This instrument was developed by Native Americans, for use among American Indian and Alaska Native Tribes, to assess health needs of Native Elders. Although no validity or reliability studies are available for this tool, over 9,000 Native individuals > 55 years of age have participated in the surveys. The form is in a scannable format to reduce coding errors.

Nine Tribal groups in Alaska (n = 412) have participated in the survey, although none in northwestern Alaska have participated. Permission was obtained from the University of North Dakota National Resource Center for Native Elders' to provide Alaska Tribal data to the National Resource Center for American Indian, Alaska Native and Native Hawaiian Elders (AK NRC) at the University of Alaska Anchorage. At the time these data were shared, this researcher was an employee of the AK NRC. Saylor and Doucette published the data in 2005 (Saylor and Doucette, 2004).

The time required for Elders to complete this portion of the survey was approximately 10 minutes.

Participation in Family Activities

Participation in family activities was assessed with questions from the Comparative Study of Social Transition of the North: Alaska and Russian Far East, NSF OPP 9496351 (McNabb et al, 1994, and Saylor and Cochran, 2004).

The purpose of the Social Transitions of the North (STN) study was to examine changes in demographic, epidemiological and social changes of health and family relationships in Alaskan and Russian Far East communities (Saylor and Cochran, 2004). A total of 820 interviews were completed (Mason 2004) during 1993-1995. Interviews were conducted in 16 rural villages, eight in Alaska and eight in Russia. Only limited analysis of data from this study have been completed due to the tragic untimely death of the research team in 1996 off the coast of Kamchatka, Russia. To the knowledge of this researcher, and to others familiar with this study, no validity or reliability studies are available for the research questions (correspondence Ms Anna M. Kurttula, PhD, NSF, Office of Polar

Programs, February 3, 2007). One of the study communities that participated in this study also participated in the STN study, along with seven other Alaskan communities. It may be feasible in the future to compare the data obtained in this study to data collected earlier during the 1993-1995 STN study.

The approximate time required for Elders to complete this portion of the survey was less than 10 minutes.

Food Insecurity

Until this project, there were no questions to assess food insecurity in communities based on subsistence foods rather than purchased foods.

Burt's questions (1993) adapted by USDA asked if the individuals were "worried about having enough food," and "if they ever were hungry and didn't have enough food to eat." Responses were dichotomous, i.e., yes or no.

The USDA's food insecurity questions were modified for use in the Inupiaq communities that depend on harvested rather than purchased foods. The process of question modification was coordinated in concert with Mark Nord, PhD, USDA Economic Research Service, Jim Magdanz from the Alaska Department of Fish & Game and Don Callaway, PhD from the National Park Service. Information on the development process of the food security questions was presented in a poster at the 2005 meeting of the American Public Health Association (Smith 2005). These questions have not been validated, although responses from the food insecurity questions were correlated with questions from the NSI Determine Checklist that dealt with food insecurity issues, such as "not having enough money to buy food," and "eating less than two meals per day."

During the community review of the survey in 2004, members from the Native communities suggested that initial wording of the questions was confusing, especially as to the word "*worried.*" In the Inupiaq language, "worried" translates as "thinking about." Traditional culture has the hunter and his family "thinking about" the hunting process prior and during the hunting event (Fienup-Riordan 1994). Thus, the family would naturally be "thinking about" or "worried" about the success of the hunt. Therefore, the word "worried" was removed from the question. After several revisions, and with the help of village community members, the resulting questions were proposed as possible scenarios. The participant was asked if this scenario was true for their household during the past year. Respondents answered "yes" or "no" to four theoretical statements. The four statements were:

Food didn't last, and we couldn't get more.

We couldn't get the food we needed to eat healthy meals.

Adults cut the size of meals or skipped meals.

Times when household did not have enough to eat.

Special concern was used when asking food insecurity questions in ensure privacy of responses. In some instances, the researchers gave the survey forms to the participant to read. The approximate time required for Elders to complete this portion of the survey was less than five minutes.

Food Sharing Networks

Food sharing information was included as part of household data collected by the ADF&G and NPS in the two study communities in the spring of 2005. The latest version of questionnaire can be found in ADF&G Technical Paper #279 at http://www.subsistence.adfg.state.ak.us/geninfo/publctns/subabs.cfm?region=arctic

Data were collected from urban participants using the ADF&G and NPS tools and protocols to allow comparisons between the rural and urban groups. Information was analyzed to determine the characteristics of food sharing networks in which the Elders participated. Analysis indicated the strength of each network by measuring the number of trades between households of Elder participants and the amount of food resources obtained or shared. Data were collected from all households in both villages in an approach reflecting what Hanneman (2001) calls a "full" network method. Network analysis is a new field of data examination, and the examination of food sharing networks is unique to food sharing cultures.

Data were collected by household and the amounts of harvested foods coming into the household were determined from this survey. Determination of the networks, and linking networks to the nutritional intake of Native Elders, will be explored further and are part of a National Science Foundation Dissertation Grant obtained by Saylor and Smith (NSF# ARC-0611971, September 2006). To our knowledge, the validity and reliability of these tools in this setting has not been determined.

The approximate time required for rural Elders to complete the survey by ADF&G and NPS varied from several hours to less than thirty minutes. For the urban Elders, survey time was considerably less due to the decreased harvest of wildlife resources and the smaller quantities of shared food items due to the distance from the harvesting locations. Average time to complete this portion of the survey for urban Elders was 15 to 30 minutes.

C. Physical Functioning

Physical functioning was evaluated using three validated measures: Limitations in Activities of Daily Living (ADLs) and Limitations in Instrumental Activities of Daily Living (IADLs), and the Physical Functioning Score from the Self-Reported Medical Outcomes Study Short Form, the SF-12.v2 Health Survey.

Limitations in ADLs and IADLs

Questions concerning self-reported limitations in ADL and IADL were included as part of The University of North Dakota Identifying Our Needs: Survey of Our Elders II (McDonald, et al, 2005) described previously. The tool can be accessed at http://www.med.und.nodak.edu/depts/rural//nrcnaa/pdf/booklet. Average time to complete this portion of the survey for urban Elders was less than 20 minutes.

Physical Functioning Component Score (PCS)

Three scores from the Self-Reported Medical Outcomes Study Short Form: SF-12.v2 Health Survey (Ware, et al, 1996) were used in this study: the physical functioning component summary score (PCS), self-reported general health score (GH), and the mental functioning component summary score (MCS).

The SF-12.v2 is a multidimensional generic measure of self-reported quality of life (Brazier and Roberts, 2004). Ware's original survey consisted of 36 questions (SF-36), and later versions have been reduced to only six questions (SF-6). All versions of the Medical Outcome Study Short Form Surveys provide two scores based on eight subscores: (1) a physical component score (PCS) that is a composite score based on levels of physical function that include the role of physical, bodily pain, and general health; and (2) a mental component score (MCS) based on mental health, role of emotional, social function and vitality. In addition, there is a self-reported general health score (GH).

The SF-12 has been used with low income, vulnerable and hard-to-reach populations. Studies have included health status changes related to illness such as sinusitis (Atlas, et al, 2005), osteoporosis (Porthouse, et al, 2005), and HIV (Mannheimer, et al, 2005), as well as to evaluate the impact of medical treatment plans to those affirmed (Bruce, et al, 2005, Garry, et al, 2004, Lechtzin, et al, 2004).

The SF-12 has been used with a variety of populations, including low-income minorities (Franks, et al, 2003), Asians (Lam, et al, 2005), Australians (Savage, et al, 2003), Spaniards (Vilagut, et al, 2005), Vietnamese (Steel, et al, 2005), and Mexicans (Franzini and Fernandez-Esquer, 2004). The SF-12 has also been used to examine the relationship of health status and food insecurity (Stuff, et al, 2004, and Pheley, et al, 2002).

Earlier versions have been used with Native populations. The SF-36 has been used with Pima Indians to measure health related quality of life of individuals with diabetes (Johnson, et al, 1996), and the SF-6 has been used to evaluate factors contributing to alcohol abuse among urban Native American young males (Shore, et al, 2002).

The approximate time required for Elders to complete this portion of the survey was less than 15 minutes.

D. Health

Two measures of self-reported health were used in this study: the SF-12.v2 self-reported general health score (GH), and the SF-12.v2 mental functioning component score (MCS), describe previously.

E. Demographic Data

Demographic information was collected using the Community Socio-Economic Survey developed by the Alaska Department of Fish and Game (ADF&G), Division of Subsistence, and the National Park Service (NPS) (Callaway 2003). This survey received review and approval from the U.S. Office of Management and Budget, and from the U.S. Department of the Interior. The tool has been used since 1994 in the Kotzebue area to survey villages dependent on harvested wild resources. The tool includes a lengthy assessment of household income, as well as the harvest of game, fowl, fish, greens, and berries. The assessment also asks the household to identify who in the household harvested each food item, how much food was harvested, and how the food items were distributed to others in the community. Most households took several hours to a full day to share the harvest information from the previous year. Food sharing networks have been identified from this information.

Data for the rural survey communities was collected by staff from ADF&G / NPS with village assistance. A separate release form was signed giving this researcher access to the rural Elder's household data.

Harvest and food sharing data from the urban participants were collected by this researcher. The time required for urban Elders to complete this portion of the survey was usually less than 30 minutes, due to the reduced dependence on harvested food in urban communities.

DATA ANALYSIS

Multiple statistical methods were used to analyze the differences between and the relationships among the variables. Variable groups were (1) nutrient intake, (2) community support, (3) physical functioning, and (4) health.

Descriptive and other summary statistics were calculated using Statistical Package for the Social Sciences, for Windows (version 14, SPSS Inc, Chicago, IL, 2006) on variables of interest in this study.

For Likert data, the scores were summed, then means and standard deviations were calculated. Reliability of measures was assessed using Cronbach's α to estimate consistency and reliability among items for each of the multi-item scales. If the α coefficient was 0.70 or higher (de Vaus 2002), it can be assumed that there is some degree of certainty that scores obtained from different individuals resulted from real differences between the individuals, and not to chance variations resulting from inadequacies in the survey tool or process (Cronbach 1951).

T-tests were used to compare mean data between rural and urban Inupiaq Elders. Differences in proportions were tested using X^2 tests. The Mann-Whitney U test is a non parametric test and it was used to examine ordinal data when it cannot be assumed that the data are normally distributed. Phi Correlations were used to measure the degree of relation when two variables are binary (also referred to as dichotomous variables). Spearman's correlation (rho) was used to show the degree of linear relationships between rank-ordered data that are measured on an ordinal scale.

Statistical significant was defined for all tests at the $p<0.05$ level.

Merging Datasets

There were five sets of data that were merged into one database for analysis. The resulting database contained over 700 variables per participant. 1). Food intake survey forms from the 98-item BFFQ and the supplemental page of Alaska foods were mailed to Block Associates to code and convert to electronic media. Data were returned in two data files. The researcher combined the two files before the data were merged. 2). Jim Magdanz, Alaska Department of Fish and Game reviewed release forms and provided household harvest data and socio-economic data files for participants living in Village 1 and Village 2 with signed release forms. 3). Data from the North Dakota Assessing Our Elders, II were manually entered from the survey forms and independently verified before merging. 4). Survey forms containing questions from the National Science Foundation's Social Transition of the North Study were scanned into an excel file before merging. 5). Data from the Medical Outcomes Study Short Form, SF-12v2, were also scanned before merging. Scanning was performed by information technology staff at the University of Alaska Anchorage.

Both the individual names and tracking numbers were used during the data merging process. Once data had been examined for accuracy, names were removed.

Merging of the data used during this study was performed under the supervision of Don Callaway, PhD, Senior Cultural Anthropologist at the National Park Regional Office in Anchorage. Further data quality methods were employed by dissertation committee member, Dr. Paulette Johnson, during the summer and fall of 2006.

SPECIFIC METHODOLOGY TO RESPOND TO RESEARCH QUESTIONS

RESEARCH QUESTION 1A:	Are there differences between Inupiaq Elders in rural and urban locations in select nutrition parameters: a. Mean and median intake of energy, macronutrients, micronutrients and fiber? b. Intake of harvested foods? c. Harvested food contributions to overall nutrient intake? d. Nutrition risk? e. Diet quality?

Mean intake of energy, macronutrients, micronutrients and fiber (1A.a)

Daily mean intake data for 31 nutrients from the Block Food Frequency Questionnaire (FBBQ) was returned in two ASCII data files by participant ID: one for the BFFQ, and the second from the Supplemental List of Alaska Foods. After data files were examined to ensure that the nutrient data were presented in the same order, and that no participants were missing, data were imported into SPSS as two groups of data columns.

To determine the total intake of protein, for example, a new variable was created that was the sum of the daily mean intake of protein from the BFFQ and the daily mean intake of protein from the Supplemental Page of Alaska Foods. Total mean intakes of nutrients were compared between rural and urban groups using t-tests.

Intakes of Harvested Foods and the Contribution of Harvested Foods to Nutrient Intake (A1.b, A1.c.)

One of the data reports provided by Block Associates is a listing of the percent contribution of each food to each of the 31 nutrients examined by location. For this study, the findings were presented in two reports; one report is from the BFFQ and the second from the Supplemental Page of Alaska Foods. Data were provided for the total group of rural and urban Elders, and not by individuals. Standard deviations were not provided, and thus limiting the ability to compare groups other than total amounts and percent contribution.

To organize the data, foods from the BFFQ and the supplemental page of Alaska foods were grouped into subgroup categories by similar nutrient content or ingredients (Appendix C), such as separate subgroups for breads (such as sliced bread, rolls, bagels) and breads made with sugar (such as doughnuts, frybread). Subgroups of protein sources were grouped by methods of procurement (e.g. harvested or purchased) and where they were harvested (e.g. land or sea).

The grouping of harvested food was based on a narrative description provided by Ms. Beulah Ballot, a respected 83 year old Inupiaq Elder, who described the Inupiaq diet as containing, "*foods from the land, foods from the sea; foods from above the earth, foods from below*" (JS field notes July 2004).

Table 3.2. Categories of Harvested Food as Listed by Inupiaq Elders	
Food from Above the Earth	Foods from the Land
Native berries Native greens Seaweed Agutuq with berries (see Appendix E for analyses of Agutuk recipes)	Caribou, reindeer Duck Other game birds, ptarmigan Moose Deer, venison Hare, rabbit Beaver
Foods from Below the Earth	Foods from the Sea
Salmon Dried fish, fried fish, fish not fried Other fish like Char, Cisco Agutuq with fish only Herring eggs Agutuq with fish and berries Halibut	Seal oil Bird eggs Seal Muktuk Whale Walrus Sea Lion

Total intake of nutrients of interest was tabulated in the appropriate units of measure, and the proportions of purchased and harvested to the total reported intake were calculated.

Nutrition Risk (1A.d)

The Nutrition Risk Score of each subject was determined using the Nutritional Risk Score from the National Screening Initiative Determine Checklist (Posner, et al, 1993).

Each respondent received a total score based on responses to nine of ten questions dealing with behaviors commonly associated with nutritional risk. The question concerning intake of alcohol was eliminated at the request of the villages. Both villages had self-declarations of no-alcohol in the community. From the score of the remaining nine questions, the level of nutritional risk was also categorized: a score of 0-2 indicates “no risk,” a score of 3-5 indicates “moderate risk.” A score of 6 or more indicates “high nutritional risk.”

Cronbach α were calculated, and if greater than 0.70, then mean scores were then compared by t-tests to evaluate differences in overall scores between rural and urban Inupiaq Elders. X^2 tests were used to compare nutrition risk categories between the two groups.

Diet Quality (1A.e)

The modified Block Food Frequency Questionnaire (BFFQ) provided data on both food servings and intakes of specific nutrients. With these data, two methods could be used for assessing diet quality: (1) Scores from the Healthy Eating Index (Kennedy, et al, 1995), and (2) Servings from the USDA Food Guide Pyramid (USDA 1992).

Healthy Eating Index (HEI) scores were calculated and provided by Block Associates as part of the analysis of the FFQs. The HEI standards ranked the reported diet as “poor”, “needs improvement”, “good” based on nine components, each having a score of 1-10. A score of equal to or less than 50 implies a “poor” diet; a score of 51 to 79 implies that the diet “needs improvement”; a score between 80 to 100 as a “good” diet. Mean HEI values reported by the Inupiaq Elders were compared using t-test by rural and urban locations. X^2 tests were used to compare index categories between the two groups.

The assumption was made that the macro and micronutrient requirements reflected in the DRIs (IOM 2000) for North American populations, are probably similar for Native Alaskans, and thus could be used for baseline comparisons. However, standardized food pattern recommendations for the US population, such as the Dietary Guidelines for Americans (USDA 2005), the Food Guide Pyramid: A guide to Daily Food Choices (USDA 1992), and the more recent MyPyramid (USDA 2006) may not be compatible with traditional cultural food practices of individuals living in an Inupiaq community.

These pattern recommendations for food groups may not be valid for Native Alaskans because the diets of Native Alaskans contain large amounts of many foods not often consumed in significant amounts by other US populations (e.g., caribou and moose, sea mammals, halibut and other fish). For example, although Native Alaskans drink very little milk, they appear to obtain significant amounts of calcium by eating large quantities of halibut (Ballew, et al, 2006) and fermented fish with bones (Nobmann 1992). Studies that have examined diet quality of Alaska Natives based on Food Guide Pyramid servings have suggested that intakes of some food groups are below recommendations. However, blood serum levels of selected nutrients normally provided by those food groups were adequate (Nobmann and Lanier, 2001).

In spite of these possible limitations, the number of servings from each of the food groups in the USDA MyPyramid were compared. Block Associates provided the mean number of servings contributed by the regular FFQ items, by rural and urban location, as part of their analysis of the FFQs. Although group means were provided, they were not accompanied by a measure of variance, e.g., standard deviations. Data were not provided at the level of the individual, precluding more detailed analysis by age and gender. With neither individual data nor a measure of variance on the group data, it was not possible to test for statistical differences between groups.

The number of servings of Alaska Harvested foods, the indigenous foods of Elders, was calculated by this research to allow comparison to food groups in the MyPyramid. The volume of intake was calculated by dividing the subgroup total by the serving size measures from the USDA PNW 357, Nutritive Value of the Edible Part of Food. For example, one cup of fresh blueberries weighs 145 grams. Total gram intake of berries was divided by 145 grams to give the number of cup servings. Similar calculations were made to determine servings of meats, vegetables, milk and dairy, breads/cereals, and fats. Then, the volume was divided by the portion sizes used in MyPyramid.

RESEARCH QUESTION 1B: Are there differences between Inupiaq Elders in rural and urban locations in community supports, as measured by:

a. Participation in community activities?
b. Participation in family activities?
c. Food insecurity?
d. Food sharing networks?

Participation in Community and Family Activities (1B.a and 1B.b)

Participation in community and family activities was described based on data obtained from two surveys. Questions for measuring participation in family activities came from the Social Transitions in the North Study (McNabb, et al, 1992, Saylor and Cochran, 2004). Questions for identifying extent of participation in community activities came from the North Dakota "Assessing Our Elders" survey. Both used Likert scales that asked respondents to rank their responses according to the frequency of participation in a specific event as "never," "rarely," "sometimes," "most of the time – regularly," or "all the time." These values were numerically scored between 1 and 5 with "never" equal to 1 and "all the time" equal to 5. By summing up the total responses, mean and standard deviation were determined by location for each activity. Cronbach α were calculated, and if greater than 0.70, then score means were compared by t-tests. Secondly, patterns of item responses to each question were examined for distribution. If the distribution of responses for each item was greater than five, differences in the distribution of each response by location was analyzed using X^2.

Food Insecurity (1B.c)

Four questions were used to assess food insecurity. All questions required yes or no responses. Two questions were part of the Alaska Department Fish & Game Community Harvest Survey, "Sometimes the food doesn't last and we can't get more," and "Adults cut the size of meals or skipped meals," and two questions came from the NSI Determine Checklist: "Do you have enough money to buy food," and "Eats less than two meals per day." Respondents responses to the four questions were coded as to the frequency of food insecurity as dichotomous variables, “no,” and “yes.” These values were numerically scored with “no” equal to 1 and “yes” equal to 2. Cronbach α were calculated for the responses to test for reliability, and if greater than 0.70, mean scores (total of the four questions) were compared by t-tests.

The proportion of item responses was examined for distribution. If the expected counts of “yes” responses for each item was greater than five, differences in the distribution of each response by location were analyzed using X^2.

Phi correlation was used to measure the correlations of the dichotomous responses to the four food insecurity questions to the dichotomous responses to the two questions on the NSI Determine Checklist.

Correlations were performed on the total group.

Food Sharing Networks (1B.d)

Food sharing networks were defined as the number of sharing/trading episodes or links where food moved from one household to another reported during the previous year. Rural Elders data were reported in harvested weights, and urban Elders reported shared meats in edible portions. Data were converted to edible portions to allow comparisons for this variable using ADF&G conversion tables (Wolfe and Utermohle, 2000, Georgette and Loon 1990, Georgette 1999, Georgette 2000, Georgette, et al, 2003).

The total number of pounds shared/traded was determined by summing the amounts reported by species for each sharing/trading episode, and then compared by

Mann-Whitney U test. The Mann-Whitney U test is a non-parametric test used to examine ordinal data when it cannot be assumed that the data are normally distributed.

RESEARCH QUESTION 2A: Are there differences between Inupiaq Elders in rural and urban locations in physical functioning, as measured by:

a. Limitations in Activities of Daily Living (ADLs)?
b. Limitations in Instrumental Activities of Daily Living (IADLs)?
c. Physical Functioning Component Summary score (PCS)?

Limitations in Activities of Daily Living (ADLs) (2A.a)

Cronbach α were calculated for the responses to test for reliability, and if greater than 0.70, mean scores were compared by t-tests.

The proportion of item responses was examined for distribution. If the total of "yes" responses to each of the limitations of ADLs was greater than five, then differences in the distribution of each response by location was analyzed using X^2.

The percent of individuals reporting at least one ADL was calculated and compared by X^2 tests.

Limitations in Instrumental Activities of Daily Living (IADLs) (2A.b)

Cronbach α were calculated for the responses to test for reliability, and if greater than 0.70, mean scores were compared by t-tests.

The proportion of item responses was examined for distribution. If the total of "yes" responses to each of the limitations of IADLs was greater than five, then differences in the distribution of each response by location was analyzed using X^2.

SF-12.v2 Physical Functioning Component Summary Score (PCS) (2A.c)

Mean PCS scores were compared at three levels. First, t-tests were used to compare mean PCS scores by location. Secondly, PCS scores were compared by age subgroups: age 45-54, age 55-64, and age 65+. Lastly, age subgroups were compared to PCS published population norms (Ware, et al, 2005) using t-tests.

RESEARCH QUESTION 2B:	Are there differences between Inupiaq Elders in rural and urban locations in health, as measured by: a. Self-Reported General Health (GH)? b. SF-12 v2 Mental Component Summary score (MCS)?

Self-Reported General Health (GH) (2B.a)

Mann-Whitney U test was used to compare the response pattern of self-reported general health (GH).

SF-12.v2 Mental Component Summary Score (MCS) (2B.b)

Mean Mental Component Summary Scores (MCS) were compared by location using t-test. MCS scores were also compared by age subgroups: age 45-54, age 55-64, and age 65+. In addition, age subgroups were compared to MCS published population norms (Ware, et al, 2005) using t-tests.

RESEARCH QUESTION 3A: In Inupiaq Elders, are there relationships among the following select nutrition parameters, community support variables and 3 validated measures of physical functioning:

Select Nutrition Parameters

a. Nutrient intake?
b. Nutrition risk?
c. Healthy Eating Index?

Community Support Variables

d. Participation in community activities?
e. Participation in family Activities?
f. Food insecurity?

Food Sharing Networks

e. Pounds of food shared?
g. Number of food sharing episodes?

Measures of Physical Functioning

h. Limitations in Activities of Daily Living (ADLs)?
i. Limitations in Instrumental Activities of Daily Living (IADLs)?
j. SF-12.v2 scores for Physical Functioning (PCS)?

Relationships Between Select Nutrition Parameters and Physical Functioning

Correlations between select nutrition parameters, community support variables, and physical functioning were examined using Spearman's rho correlation tests.

Description of Select Nutrition Parameters

The nutrition parameters included nutrient intake per day (energy, proteins, gram protein/kg weight). The total nutrition risk (the total risk score 1-9, and the risk category score of 1-3 was assigned, where 1 = “no risk,” 2= “moderate risk” and 3 = “high risk”); a measure of diet quality. The Healthy Eating Index Score (HEI) standards rank the diet “poor,” “needs improvement” or “good” using a numerical score. Diets were categorized using the HEI scale. A “poor” designation was assigned if the score was equal to or less than 50; a “diet needs improvement” designation was assigned if the score was 51 to 79; and designation of “good” if the score was 80 or higher.

Description of Community Support Variables

Community support variables included the scores for participation in community and family activities, a food insecurity score and measures of food sharing networks. Participation in community activities was measured using nine questions of five points each for a range of 0 to 45 points. Participation in family activities was measured using four questions of five points each for a range of 0 to 20 points. The food insecurity score ranged from 0 to 4 with 0 implying no reported food insecurity and 4 implying positive responses to all four food insecurity questions. The food sharing network variable was measured by number of pounds of edible food shared and the number of food sharing episodes.

Physical functioning was measured by three validated measures: the number of limitations of activities of daily living (ADLs) from 0 to 6; the number of limitations of instrumental activities of daily living (IADLs) from 0 to 7; and the physical functioning score (PCS) on the Health Outcomes Survey, SF-12.v2. Norm scores for US population ages 55-64, males and females, ranged from 4.92 to 64.49 points (Ware, et al, 2005).

RESEARCH QUESTION 3B: In Inupiaq Elders are there relationships among select nutrition parameters, community support variables and 2 validated measures of health (self-reported general health (GH) and SF-12.v2 Mental Component Scores(MCS) and:

Select Nutrition Parameters

a. Nutrient Intake
b. Nutrition risk?
c. Healthy Eating Index?

Community Support Variables

d. Participation in Community Activities
e. Participation in Family Activities
f. Food Insecurity

Food Sharing Networks

g. Pounds of food shared?
h. Number of food sharing episodes?

Measures of Health

i. Self-reported General Health (GH)
j. SF-12.v2 Mental Components Scores (MCS)

Relationships Among Nutrition Parameters and Measures of Health

Correlations between nutrition parameters and community support variables, and measures of health were examined using Spearman's rho correlation tests.

Description of Select Nutrition Parameters

The nutrition parameters included nutrient intake per day (energy, proteins, gram protein/kg weight); nutrition risk (the total risk score 1-9, and the risk category score of 1-3, where 1 = “no risk,” 2 = “moderate risk” and 3 = “high risk”); the Healthy Eating Index Score (HEI) standards rank the diet as “poor,” “needs improvement” or “good” using a numerical score. A “poor” designation was assigned if the score was equal to or less than 50; a “diet needs improvement” designation was assigned if the score was 51 to 79; and designation of “good” if the score was 80 or higher (Ware, et al, 2005).

Description of Community Support Variables

Community Support variables included the scores for participation in community and family activities, a food insecurity score and measures of food sharing networks: number of pounds of food shared, and the number of food sharing episodes. Participation in community activities was measured using nine questions of five points each for a range of 0 to 45 points. Participation in family activities was measured using four questions of five points each for a range of 0 to 20 points. The food insecurity score ranged from 0 to 4 with 0 implying no reported food insecurity, and 4 implying positive responses to all four food insecurity questions. The food sharing network variable was measured by number of pounds of edible food shared; and the number of food sharing episodes.

Description of Measures of Health Variables

Mental functioning was measured by two validated measures: Self-reported General Health (GH) on the Health Outcomes Survey SF-12.v2, and the Mental Functioning component score (MCS) from the same survey. Norm scores the GH for

US population ages 55-64, males and females, ranged from 18.87 to 61.99 points (Ware, et al, 2005). Norm scores the MCS for US population ages 55-64, males and females, ranged from 16.98 to 69.87 points (Ware, et al, 2005).

RESEARCH QUESTION 3C: In Inupiaq Elders are there relationships among select nutrition parameters, community support variables, and demographic characteristics:

Select Nutrition Parameters

a. Nutrition intake?
b. Nutrition risk?
c. Healthy Eating Index (HEI)?

Community Support Variables

d. Participation in family activities?
e. Participation in community activities?
f. Food insecurity?
g. Food sharing networks: Pounds food exchanged?
h. Food sharing networks: Number of food sharing episodes?

Demographic Characteristics

i. Age?
j. Body Mass Index (BMI)?

Relationships Between Select Nutrition Parameters, Community Support Variables and Demographic Variables

Correlations between and among select nutrition parameters, community support variables, and demographic characteristics were examined using Spearman's rho correlation tests.

Description of Select Nutritional Parameters

The select nutrition parameters included nutrient intake per day (energy, proteins, gram protein/kg weight); nutrition risk (the total risk score 1-9, and the risk category score of 1-3, where 1 = "no risk," 2= "moderate risk" and 3 = "high risk"); the Healthy Eating Index raw score (HEI) with a possible 0 to 100.

Description of Community Support Variables

Community Support variables included the scores for participation in community and family activities, a food insecurity score and measures of food sharing networks.

Participation in community activities was measured using nine questions of five points each for a range of 0 to 45 points. Participation in family activities was measured using four questions of five points each for a range of 0 to 20 points. The food insecurity score ranged from 0 to 4 with 0 implying no reported food insecurity, and 4 implying positive responses to all four food insecurity questions. The food sharing network variable was measured by number of pounds of edible food shared; and the number of food sharing episodes.

Description of Demographic Characteristics

Two demographic variables were included in the analysis of correlations of the total group: age and body mass index (BMI).

Age was measured in years. Body mass index is a ratio calculated using Quetelet's Index by dividing the weight of the subject in kilograms by the height in meters squared (Keys, et al, 1972). BMI categories for adults are independent on gender or age (CDC 2006). The standard weight status categories are: Underweight: BMI below or equal to 18.49; Normal weight: BMI equal to or above18.5 and less than or equal to 24.9; Overweight: BMI equal to or above 25.0 and less than or equal to 29.9; Obese: BMI equal to or above 30.0 (CDC 2006).

Power analysis did not support looking at both gender and location simultaneously. Future studies are needed to examine differences by gender.

CHAPTER IV

RESULTS

A total of 101 Inupiaq individuals meet with the survey team. One record was incomplete and thus, the analysis used the 100 complete surveys. This cross-sectional study was carried out with a total of 100 Inupiaq individuals who were currently 50 years old or older, or who were anticipating a 50th birthday during the year of 2005.

The rural communities were recruited during the summer of 2004. Data from two rural communities were collected over a period of four weeks during July and August of 2005. Data from the urban cohort were collected during June to November 2005.

DESCRIPTION AND DEMOGRAPHY OF THE SURVEY GROUPS

The number of Elders by age from each location is reported in Table 4.1. Mean age ± SD for the rural Elders survey group was 62.9 ± 9.2 years, significantly older than the 57.0 ± 6.9 years in the group of urban Elders ($p < 0.001$). In both locations and for both genders, more individuals were surveyed who were under 70 years of age ($n = 82$) than were over 70 ($n = 18$). The largest group in the survey group was urban males under 70 years of age ($n = 27$), followed by rural males under 70 ($n = 20$). The smallest groups were urban males over 70 years of age ($n = 1$), and urban females over 70 ($n = 3$). In the rural group, 10 individuals were over 70 years of age, and only four in the urban group. All survey participants were community-dwelling, non-institutionalized individuals.

Table 4.1. Distribution by Age of Alaskan Inupiaq Elders Living in Rural and Urban Locations

	Rural n = 52				Urban n = 48			
	Male		Female		Male		Female	
	<70	≥70	<70	≥70	<70	≥70	<70	≥70
Village 1	13	5	11	5	-	-	-	-
Village 2	7	1	7	3	-	-	-	-
Individuals Living in Anchorage	-	-	-	-	27	1	17	3
Subtotal	20	6	18	8	27	1	17	3
mean age ± sd ($p < 0.001$)	62.9 ± 9.2				57.0 ± 6.9			

Demography of the Survey Groups

Table 4.2 provides basic demographic descriptions of the study survey groups of Inupiaq Elders living in rural and urban locations. Rural and urban Elders were similar in years of education, living status, the number of individuals living in the household, current employment, and income. Rural Elders had lived longer at their current residence ($p < 0.001$). Seventy-six percent of rural Elders had lived over 21 years in the village while 57% of urban Elders had lived in Anchorage for less than five years. More rural Elders cared for grandchildren (61%) than did their urban cohorts (37%) ($p = 0.01$). Patterns of marital status also differed between rural and urban Elders ($p = 0.03$). More rural Elders were widowed (33%), and more urban Elders reported being divorced or separated (27%).

Table 4.2 Descriptive Characteristics of Alaskan Inupiaq 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%)		
Cares for Grandchildren			6.21	0.013
No	20 (39%)	30 (63%)		
Yes	32 (61%)	18 (37%)		
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%)		
Marital Status			8.65	0.034
Married/living with partner	17 (33%)	15 (31%)		
Single, never married	13 (25%)	12 (25%)		
Divorced / separated	5 (10%)	13 (27%)		
Widowed	17 (33%)	6 (12%)		
No response	0 (0%)	2 (6%)		
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%)		
Body Mass Index			2.85	0.241
≤ 24.99	19 (37%)	20 (41%)		
≥ 25.00 ≤ 29.99	14 (31%)	20 (41%)		
≥ 30.00	17 (33%)	9 (18%)		
BMI Mean + SD (t-test)	27.3 ± 4.9	26.6 ± 5.3	0.636	0.526

RESEARCH QUESTION 1A:

Are there differences between Inupiaq Elders in rural and urban locations in select nutrition parameters:

a. Mean and median intake of energy, macronutrients, micronutrients and fiber?
b. Intake of harvested foods?
c. Harvested food contributions to overall nutrient intake?
d. Nutrition risk?
e. Diet quality?

MEAN INTAKE BY LOCATION

Mean and Median Intake – Energy, Macronutrients

Table 4.3 presents mean and median intake data for macronutrients as reported by rural and urban Elders. Both groups were similar in mean reported macronutrient intake. No significant differences were found for energy, grams protein, grams fat, fat as percent of calories, grams carbohydrates, or carbohydrates as percent of calories.

Mean protein intake as a percent of total calorie intake was 19.0 ± 6.6% reported by rural Elders, and 16.9 ± 4.9% reported by urban Elders. This difference approached significance ($t = 1.79$, $p = 0.077$), with a trend for rural Elders receiving greater percentage of energy from protein than urban Elders.

Mean BMIs reported earlier was 27.3 ± 4.9 for rural Elders and was 26.6 ± 5.3 for urban Elders.

Table 4.3 Means, Standard Deviations, Medians and Differences in Macronutrient Intakes as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations using the Block Food Frequency Tool						
	Rural n = 52		Urban n = 48		t-test	
	m ± sd	median	m ± sd	median	t-test	p
Energy, kilocalories	3,594 ± 2,122	3,144	4,319 ± 3,129	3,508	-1.35	0.182
Protein, g	170 ± 112	144	185 ± 156	121	-0.56	0.577
Fat, g	146 ± 91	121	182 ± 146	155	-1.48	0.143
Carbohydrate, g	379 ± 234	343	469 ± 316	428	-1.62	0.110
Contribution of Macronutrients as Percent of Total Calories						
Protein, %	19.0% ± 6.6%	18.5	16.9% ± 4.9%	16.0	1.79	0.077
Fat, %	36.0% ± 6.4%	36.9	36.8% ± 5.9%	36.4	-0.71	0.481
Carbohydrate, %	43.2% ± 9.4%	42.2	45.3% ± 8.4%	46.5	-1.19	0.236

Mean and Median Intake - Vitamins

Table 4.4 presents differences in mean and median reported vitamin intake between rural and urban Inupiaq Elders collected with the Block Food Frequency tool. Both groups had similar mean reported intakes of vitamin A, thiamin, riboflavin, niacin, vitamin C, and vitamin E.

Urban Elders reported statistically significantly higher mean intake of vitamin B_6, vitamin B_{12}, vitamin D, and folate than rural Elders, $p < 0.05$.

Table 4.4. Means, Standard Deviations, Medians and Differences in Vitamin Intakes as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations using the Block Food Frequency Tool

	Rural n = 52		Urban n = 48		t-test	
	m ± sd	median	m ± sd	median	t-test	p
Vitamin A, mcg, RAEs	1,638 ± 1,244	1260	1,779 ± 1,715	1228	-0.47	0.638
Thiamin, mg	2.3 ± 1.3	2.1	3.0 ± 2.4	2.3	-1.83	0.071
Riboflavin, mg	5.2 ± 4.2	3.6	4.2 ± 3.4	3.2	1.32	0.189
Niacin, mg, NE	45 ± 26	42	49 ± 39	35	-0.71	0.483
Vitamin B_6, mg	1.6 ± 0.9	1.4	3.1 ± 2.6	2.4	-3.66	0.001
Vitamin B_{12}, ug	5.6 ± 4.6	4.3	8.6 ± 8.1	6.5	-2.27	0.026
Vitamin C, mg	266 ± 235	225	264 ± 242	193	0.05	0.962
Vitamin D, mcg	3.8 ± 2.5	3.4	6.2 ± 5.3	4.5	-2.84	0.006
Vitamin E, mg, α-TE	17 ± 12	13	19 ± 15	15	-0.30	0.762
Folate, mcg, DFE	464 ± 271	409	652 ± 523	461	-2.24	0.028

Mean and Median Intake – Minerals and Fiber

Table 4.5 presents differences in mean and median mineral and fiber intake between rural and urban Inupiaq Elders collected with the Block Food Frequency tool. Both groups were similar in mean reported intake of calcium, iron, and phosphorus.

Urban Elders reported significantly higher intake of magnesium, potassium, sodium, zinc, and fiber than rural Elders, $p < 0.05$.

Table 4.5. Means, Standard Deviations, Medians, and Differences in Mineral and Fiber Intakes as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations using the Block Food Frequency Tool						
	Rural n = 52		Urban n = 48		t-test	
	m ± sd	median	m ± sd	median	t-test	p
Calcium, mg	993 ± 509	884	1,138 ± 883	883	-1.00	0.321
Iron, mg	34 ± 26	29	36 ± 37	23	-0.32	0.752
Magnesium, mg	309 ± 145	289	459 ± 324	263	-2.96	0.004
Phosphorus, mg	2,452 ± 1,503	2,170	2,593 ± 1,954	1,874	-0.41	0.686
Potassium, g	4.0 ± 1.9	1.0	5.3 ± 3.7	1.0	-2.14	0.036
Sodium, g	4.0 ± 2.4	3,359	5.4 ± 4.1	4,304	-2.04	0.045
Zinc, mg	5.4 ± 3.8	4.6	11.2 ± 12.1	7.3	-3.20	0.002
Fiber, g	16 ± 10	14	27 ± 22	18	-3.19	0.002

Summary of Trends Presented by the Food Intake Data

Rural and urban Elders reported similar intakes of macronutrients energy, carbohydrates, protein and fat. Statistically significant differences were found for these vitamins: vitamin B6, vitamin B12, vitamin D and folate; and for these minerals: magnesium, potassium, sodium, zinc and fiber.

Future studies are needed to determine diet adequacy using Institute of Medicine (IOM) protocols when complete nutrient composition information is available for common Alaska foods eaten by Inupiaq communities.

DIFFERENCES IN INTAKE OF ALASKA HARVESTED FOODS

The rural and urban Inupiaq Elders' mean weekly food servings for the previous year were compared using self-reported data from the Block Food Frequency and List of Alaska Foods (Table 4.6). Intakes of Alaska food items were retrieved from the Block Food Frequency as grouped data, thus statistical testing for significant differences could not be done between locations. Rural Elders reported higher mean weekly servings than urban Elders by source categories. Rural Elders reported 5.52 servings of fish (including salmon, dried fish); urban Elders reported only 3.91 servings. Rural Elders also reported 2.92 servings of Native berries; urban Elders reported less than one serving. Seal oil and Caribou were the most frequently eaten items in the categories "foods from the sea" and "foods from the land," respectively.

Mean Reported Intake and Percentage of Total Intake Contributed by Harvested Foods

Data in Table 4.7 summarize the contribution by harvested foods (such as caribou, fish, bird eggs, agutuq, etc) of key nutrient intakes.

Rural Elders reported a higher percentage contribution by Alaska harvested foods to all nutrient intake examined with the exception of vitamin D (rural Elders' 13.9% versus urban Elders' 28.8%) and fiber. Both groups reported less than one percent of fiber coming from harvested foods.

Sixty-four percent of total protein intake for rural Elders came from harvested food, but harvested foods contributed only 42% of protein intake reported by urban Elders. Harvested foods also substantially contributed to reported iron intake,

Table 4.6. Mean Weekly Servings of Alaska Harvested Foods as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations

Source Category	Mean Weekly Servings	
	Rural n = 52	Urban n = 48
Fish and Fish Roe Total	5.52	3.91
Salmon	2.35	1.56
Dried fish, fried fish, fish not fried	1.26	0.55
Other fish like Char, Cisco	0.99	0.48
Agutuq with fish only	0.06	0.07
Herring eggs	0.64	0.25
Agutuq with fish and berries	0.21	0.30
Halibut	0.01	0.70
Native Berries and Greens Total	4.28	1.31
Native berries	2.92	0.70
Agutuq with berries	0.78	0.30
Native greens	0.57	0.27
Seaweed	0.01	0.04
Foods from the Sea Total	3.57	3.08
Seal oil	1.80	1.27
Bird eggs	0.80	0.12
Seal	0.62	0.63
Muktuk	0.21	0.83
Whale	0.11	0.14
Walrus	0.03	0.07
Sea Lion	0.00	0.02
Foods from the Land Total	3.11	2.42
Caribou, reindeer	2.02	1.07
Duck	0.34	0.25
Other game birds, ptarmigan	0.30	0.21
Moose	0.29	0.59
Deer, venison	0.08	0.04
Hare, rabbit	0.06	0.21
Beaver	0.02	0.05

constituting 54% of iron intakes for rural Elders, and 40% of iron intakes for urban Elders. Harvested foods contributed only 25% of the total fat in the diets of both the rural and urban Elders.

Table 4.7. Mean Intake and Percentage Contribution of Alaska Harvested Foods to Key Nutrients as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations

	Rural n = 52		Urban n = 48	
Key Nutrients	mean intake	(%)	mean intake	(%)
Macronutrients				
Energy, calories	993.4	(27.5%)	914.7	(21.2%)
Fat, g	37.1	(25.5%)	46.3	(25.4%)
Carbohydrates, g	21.3	(5.6%)	14.2	(3.0%)
Protein, g	109.1	(64.1%)	77.0	(41.6%)
Vitamins				
Vitamin A, mcg, RAE	1,059.0	(39.9%)	517.0	(19.7%)
Thiamin, mg	0.6	(27.4%)	0.4	(13.9%)
Riboflavin, mg	3.1	(60.6%)	1.5	(35.8%)
Niacin, mg, NE	19.5	(43.8%)	12.6	(25.6%)
Vitamin B_6, mg	0.2	(10.5%)	0.2	(7.4%)
Vitamin B_{12}, ug	2.6	(45.6%)	1.7	(19.4%)
Vitamin C, mg	60.3	(22.6%)	27.2	(10.3%)
Vitamin D, mcg	0.5	(13.9%)	1.8	(28.8%)
Vitamin E, mg, α-TE	2.1	(11.7%)	1.3	(6.7%)
Folate, mcg, DFE	27.6	(6.0%)	16.3	(2.3%)
Minerals and Fiber				
Calcium, mg	136.9	(13.8%)	66.8	(5.9%)
Iron, mg	18.4	(54.2%)	14.3	(39.6%)
Magnesium, mg	22.1	(7.2%)	25.7	(5.6%)
Phosphorus, mg	1,240.1	(50.6%)	785.3	(30.3%)
Potassium, mg	1,322.6	(33.2%)	918.3	(17.5%)
Sodium, mg	476.0	(11.9%)	417.0	(7.7%)
Zinc, mg	6.4	(38.2%)	4.4	(19.4%)
Fiber, g	0.1	(0.3%)	0.2	(0.6%)

RAEs indicates Retinol Activity Equivalents; α-TE indicates Alpha-Tocopherol Equivalents; NE indicates Niacin Equivalents; DFE indicates Dietary Folate Equivalents

NUTRITION RISK

Comparison of NSI Determine Checklist Between Inupiaq Elders Living in Rural and Urban Locations

Table 4.8 provides data used to assess nutrition risk for Inupiaq Elders living in rural and urban locations. Cronbach α was 0.645. Even though, the Cronbach α was below 0.70, the tool is widely used, and t-test analysis between locations was performed. Mean total scores by location were similar between groups ($t = -1.12$, $p = 0.266$) as was the distribution of nutritional risk ($X^2 = 2.71$, $p = 0.258$).

Significant differences by location for the items: "Eats less than 2 meals per day" ($X^2 = 6.99$, $p = 0.008$); "Takes $\geq$ 3 medications per day"($X^2 = 4.22$, $p = 0.040$); and "10 lb weight change" ($X^2 = 4.41$, $p = 0.036$). Twenty-six percent of urban Elders checked that they "Eat less than 2 meals per day" while only 6% of rural Elders did. Similarly, for a "10 lb weight change," 16% of urban Elders checked this item, but only 4% of rural Elders did. However, a greater percentage of rural Elders (29%) checked "Takes $\geq$ 3 medications per day" than urban Elders (12%).

DIET QUALITY

Healthy Eating Index

Table 4.9 provides data used to assess diet quality of Inupiaq Elders living in rural and urban locations. No significant differences were found in Healthy Eating Index Scores (HEI) by location. The HEI standards ranked the diet of Inupiaq Elders living in rural Alaska as 46% "poor," 52% "needs improvement," and only 2% "good." The highest rural score was 84, the lowest was 34.

The diet of Inupiaq Elders living in urban Alaska was ranked as 31% "poor", and 69% "needs improvement." The highest urban Elders score was 75, the lowest was 24.

Table 4.8. Comparison of Nutritional Risk Factors Using the Nutritional Screening Initiative (NSI) Determine Checklist between Alaskan Inupiaq Elders Living in Rural and Urban Locations

	Rural n = 50		Urban n = 48		X^2	p
	#	(%)	#	(%)		
Illness changed the kinds /amounts of foods eaten	6	(12%)	8	(16%)	0.48	0.486
Eats less than 2 meals per day	3	(6%)	12	(26%)	6.99	0.008
Eats few fruits and vegetables	13	(25%)	17	(35%)	1.14	0.287
Mouth problems create difficulties eating	12	(23%)	9	(18%)	0.34	0.560
Lacks money to buy food	13	(25%)	13	(25%)	0.03	0.860
Frequently eats alone	10	(19%)	8	(16%)	0.15	0.703
Takes ≥ 3 medications per day	15	(29%)	6	(12%)	4.22	0.040
10 lb. weight change	2	(4%)	8	(16%)	4.41	0.036
Unable to shop, cook, self-feed	5	(10%)	5	(10%)	0.01	0.921
Nutritional Risk						
No risk (score 0-2)	29	(56%)	27	(55%)	2.71	0.258
Moderate risk (score 3-5)	14	(27%)	8	(16%)		
High risk (score ≥ 6)	9	(17%)	14	(29%)		
Mean raw score ± sd					t-test	p
	3.13 ± 0.5		4.04 ± 0.6		-1.12	0.266
Cronbach α = 0.645						

Table 4.9. Comparison of the Healthy Eating Index (HEI) Scores and Diet Quality Ranking Between Alaskan Inupiaq Elders Living in Rural and Urban Locations.						
	Rural n = 52		Urban n = 48		X^2	p
	#	(%)	#	(%)		
Diet Quality Ranking Scores					a	
Good (80-100)	1	(2%)	0	(0%)		
Needs Improvement (51-79)	27	(52%)	33	(69%)		
Poor (≤ 50)	24	(46%)	15	(31%)		
					t-test	p
Mean raw score ± sd	52.6 ± 9.6		55.2 ± 13.4		-1.13	0.262
Range	84 to 34		75 to 24			

a. No statistics were computed due to small cell sizes.

USDA MyPyramid

Table 4.10 provides data to assess diet quality using the standards of the USDA MyPyramid. Intake patterns were similar between rural Elders and urban Elders for servings of breads and cereals, fruit and fruit juices and the milk, yogurt and cheese groups. Apparent differences were suggested for the reported servings of the protein group and the fats, oils and sweets, and vegetables. It appears that rural Elders reported fewer servings from the meat groups than did urban Elders, and fewer servings of vegetables. Compared to MyPyramid recommendations, only urban Elders met basic food group recommendations.

Group mean intake data without standard deviations were provided, precluding more detailed analysis.

Table 4.10. Comparison of Dietary Intakes of Alaskan Inupiaq Elders Living in Rural and Urban Locations to Recommended Servings from the USDA MyPyramid[1]			
	Recommended servings 2000 calories	Rural n = 52	Urban n = 48
Food group		Reported mean servings per day	
Meats/Fish/Poultry/Beans/Eggs	5.5 ounces	10.3	14.9
Breads/Cereals	6 servings	9.9	9.9
Vegetables, ½ cup servings	5 servings	3.6	5.2
Fruits/juices, ½ cup servings	4 servings	6.0	6.5
Milk/Yogurt/Cheese	3 servings	3.0	3.7
Fats/Oils/Sweets	6 teaspoons	9.9	8.6

[1]USDA MyPyramid recommendations accessed at http://www.mypyramid.gov on February 4, 2007.

RESEARCH QUESTION 1B:

Are there differences between Inupiaq Elders in rural and urban locations in community supports, as measured by:

a. Participation in community activities?
b. Participation in family activities?
c. Food security?
d. Food sharing networks?

Participation in Community Activities

Participation in community activities are presented in Table 4.11 and Table 4.12. A participation in community activities score was calculated as the sum of item responses to nine items the response range being: 1=never, 2 = rarely, 3 = sometimes, 4= most of the time, or regularly and 5=all of the time. The Cronbach's α of the total participation in community activities score was 0.881. While the mean scores were similar ($t = 0.85$, $p = 0.401$), examination of individual items suggests that the urban and rural environment did not differ except that rural Elders reported significantly higher levels of participation in berry picking and food preservation than urban.

Small group sizes precluded further analysis using X^2 without collapsing item categories. Rural Elders reported a higher frequency of related food activities: 42% of rural Elders reported food preparation/food preservation on a frequent basis versus 20% of urban Elders; 35% of rural Elders reported berries picking versus only 10% of urban Elders; and 18% of rural Elders reported hunting and fishing versus 8% of urban Elders. Regarding activities supporting Elders, rural respondents reported higher frequencies of "Sharing food with Elders," and "Contact with other villagers" than urban Elders.

Table 4.11. Percentage of Alaskan Inupiaq Elders Living in Rural and Urban Locations Reporting Participation in Selected Community Activities

	Rural n = 52 # (%)	Urban n = 47 # (%)
Hunting and fishing		
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		
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		
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%)
Participating in cultural event		
Never	22 (42%)	12 (25%)
Rarely	10 (19%)	12 (25%)
Sometimes	8 (15%)	14 (29%)
Most of the time, regularly	4 (8%)	10 (20%)
All the time	8 (15%)	8 (16%)
Contact with other villagers		
Never	16 (31%)	7 (14%)
Rarely	3 (6%)	6 (12%)
Sometimes	6 (12%)	17 (35%)
Most of the time, regularly	16 (31%)	7 (14%)
All the time	11 (21%)	12 (25%)
Participate in religious / spiritual events		
Never	19 (37%)	9 (18%)
Rarely	6 (12%)	9 (18%)
Sometimes	9 (17%)	14 (29%)
Most of the time, regularly	5 (10%)	14 (29%)
All the time	13 (25%)	3 (6%)
Sharing food with elders		
Never	13 (25%)	6 (12%)
Rarely	4 (8%)	7 (14%)
Sometimes	13 (25%)	13 (27%)
Most of the time, regularly	3 (6%)	14 (29%)
All the time	19 (37%)	9 (18%)
Use of traditional medicine		
Never	24 (46%)	25 (51%)
Rarely	4 (8%)	11 (22%)
Sometimes	16 (31%)	6 (12%)
Most of the time, regularly	5 (10%)	4 (8%)
All the time	3 (6%)	3 (6%)
Use of traditional healers		
Never	27 (52%)	27 (55%)
Rarely	5 (10%)	8 (16%)
Sometimes	11 (21%)	11 (22%)
Most of the time, regularly	6 (12%)	2 (4%)
All the time	3 (6%)	1 (2%)

Table 4.12. Means and Standard Deviations of the Likert Responses by Alaskan Inupiaq Elders Living in Rural and Urban Locations Reporting Participation in Selected Community Activities

	mean ± sd			
	Rural n = 52	Urban n = 48	t-test	p
Hunting, fishing	2.1 ± 1.3	2.2 ± 1.0	-0.81	0.420
Berry picking, harvesting wild greens	3.0 ± 1.5	2.3 ± 1.0	2.38	0.020
Food preparation, storage or food preservation activities	3.1 ± 1.5	2.6 ± 1.2	2.25	0.028
Cultural events	2.5 ± 1.5	2.6 ± 1.2	-0.62	0.540
Personal contact with others from your village	3.3 ± 1.4	3.3 ± 1.3	-0.11	0.914
Religious or spiritual events	2.9 ± 1.5	3.0 ± 1.2	-0.48	0.634
Sharing food with Elders	3.4 ± 1.5	3.4 ± 1.2	-0.37	0.713
Use of traditional medicine made by yourself or family	2.4 ± 1.3	2.0 ± 1.2	1.31	0.194
Use of traditional healers	2.2 ± 1.4	1.9 ± 1.1	1.33	0.188
Total Mean Score ± sd	24.9 ± 1.4	23.5 ± 1.0	0.85	0.401
Cronbach's α = 0.881				
Note: For all items: 1=never, 2 = rarely, 3 = sometimes, 4= most of the time or regularly, and 5=all of the time				

Participation in Family Activities

Four questions from the National Science Foundation's Social Transitions of the North study were used to evaluate the level of participation in family activities by Inupiaq Elders living in rural and urban locations (Table 4.13 and Table 4.14).

A participation in family activities score was calculated as the sum of item responses to four items, the response range being: 1 = never, 2 = rarely, 3 = sometimes, 4 = most of the time, or regularly, and 5 = all of the time. The Cronbach's α of the total participation in family activities score was 0.768.

Rural Elders had a significantly higher mean score than reported by urban Elders ($t = 2.03$, $p = 0.045$). Family participation may be easier in the rural communities if Elders' families live there as well, whereas urban Elders may be living away from family members. Small group sizes precluded further analysis using X^2 without collapsing item categories.

Table 4.13. Percentage of Alaskan Inupiaq Elders Living in Rural and Urban Locations Reporting Participation in Selected Family Activities

	Rural n = 52 # %	Urban n = 47 # %
Family members ask each other for help		
Never	6 (11%)	4 (8%)
Rarely	1 (2%)	2 (4%)
Sometimes	16 (31%)	14 (29%)
Most of the time, regularly	10 (19%)	17 (36%)
All the time	19 (37%)	11 (23%)
Family members feel close		
Never	0 (0%)	2 (4%)
Rarely	0 (0%)	2 (4%)
Sometimes	3 (6%)	6 (13%)
Most of the time, regularly	10 (19%)	15 (31%)
All the time	39 (75%)	23 (48%)
Family members consult each other on decisions		
Never	2 (4%)	2 (4%)
Rarely	2 (4%)	2 (4%)
Sometimes	11 (21%)	16 (34%)
Most of the time, regularly	7 (13%)	13 (27%)
All the time	30 (58%)	15 (31%)
Family members feel closer to family than others outside the family		
Never	4 (8%)	2 (4%)
Rarely	2 (4%)	3 (6%)
Sometimes	9 (17%)	11 (23%)
Most of the time, regularly	7 (13%)	14 (29%)
All the time	30 (58%)	18 (38%)

Table 4.14. Means and Standard Deviations of Participation in Selected Family Activities Scores Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations

	Rural n = 52	Urban n = 47	t-test	p
	mean ± sd			
Family members ask each other for help	3.7 ± 1.2	3.7 ± 1.0	0.27	0.768
Family members feel close	4.7 ± 0.6	4.3 ± 0.9	2.51	0.014
Family members consult each other on decisions	4.3 ± 1.1	3.9 ± 0.9	1.87	0.064
Family members feel closer to family than others outside the family	4.3 ± 0.9	3.9 ± 0.8	2.06	0.043
Total Mean Score ± sd	16.6 ± 3.0	15.2 ± 4.2	2.03	0.045

Cronbach's α = 0.768

For all items, 1 = never, 2 = rarely, 3 = sometimes, 4 = most of the time or regularly, and 5 = all of the time

Food Insecurity

Four questions were asked to assess food insecurity (Table 4.15).

The Cronbach's α of the total participation in family activities score was 0.826. A food insecurity score was calculated as the sum of item responses to four items, the responses being: 0 = no and 1 = yes, if this event occurred in their household.

The food insecurity score of rural Elders was not significantly higher than reported by urban Elders ($t = 0.83$, $p = 0.409$). Rural and urban Elders reported similar patterns of responses for all four questions, suggesting that location was not a determinant of food insecurity for these individuals. X^2 indicated no significant differences by location in the percentage of Elders who answered any of the four food insecurity items. Approximately one in four (26%) of the total group reported "Food didn't last and we couldn't get more;" 24% reported "We couldn't get the food we needed to eat healthy meals."

Table 4.15. Percentage of Alaskan Inupiaq Elders Living in Rural and Urban Locations Reporting Food Insecurity

	Rural n = 50	Urban n = 48	X^2	p
Food didn't last and we couldn't get more	16 (32%)	10 (21%)	1.57	0.258
We couldn't get the food we needed to eat healthy meals	13 (26%)	11 (24%)	0.06	0.814
Adults cut the size of meals or skipped meals	8 (16%)	5 (11%)	0.54	0.463
Times when household did not have enough to eat	10 (20%)	7 (15%)	0.38	0.540
Total mean score	mean ± sd	mean ± sd	t	p
	0.94 ± 1.33	0.72 ± 1.29	0.83	0.409

Cronbach's α = 0.826
0 = no, 1 = yes

Correlation of NSI Measures of Food Insecurity and Revised USDA Food Insecurity Questions

Similar questions on the NSI Determine Checklist were correlated to four revised USDA food insecurity questions using phi correlations for yes / no variables, and are presented in Table 4.16.

The NSI Determine Checklist has long been the standard to judge nutritional risk status among US populations. The total score of the revised USDA food insecurity questions was significantly correlated to the NSI Determine Checklist for the total group (n = 96, r = 0.399, p < 0.001).

For individual items, the question “Eats 2 or less meals per day” was significantly correlated with three of the four food insecurity questions: “Foods didn’t last and we couldn’t get more,” “We couldn’t get foods to eat healthy meals” and “Times when household didn’t have enough to eat,” $p < 0.05$. The question “Lacks money to buy food” was significantly correlated with two of the four food insecurity questions: “We couldn’t get the foods we needed to eat healthy meals” and “Adults cut the size of meals, or skipped meals,” $p < 0.01$.

Table 4.16. Phi Correlations Between Responses to Similar Food Insecurity Items from the Nutritional Screening Initiative (NSI) Determine Checklist and Modified USDA Food Insecurity Questions as Reported by All Alaskan Inupiaq Elders (n = 96)

	Nutritional risk factors			
Modified USDA food insecurity questions	Eats 2 or less meals per day		Lacks money to buy food	
	phi	p	phi	p
Food didn’t last and we couldn’t get more	0.21	0.037	0.19	0.054
We couldn’t get the food we needed to eat healthy meals	0.24	0.090	0.28	0.006
Adults cut the size of meals or skipped meals	0.18	0.077	0.26	0.009
Times when household did not have enough to eat	0.35	0.001	0.17	0.091

Analyses by location show differences in the correlational patterns of food insecurity based on these questions (Table 4.17). Rural Elders reported that they “Ate two or less meals per day” during “Times when household did not have enough to eat” (phi = 0.30, p = 0.038) which differed from the urban Elders who used this strategy when “Food didn’t last and we couldn’t get more” (phi = 0.33, p = 0.022) or when “Adults cut the size of meals or skipped meals” (phi = 0.30, p = 0.046) and during “Times when household did not have enough to eat,” (phi = 0.047, p = 0.001).

“Lacks money to buy food” was not significantly correlated with any of the four food insecurity scenarios presented to rural Elders. This differed for urban Elders who reported that “lacks money to buy food” was significantly correlated with “food didn’t last and we couldn’t get more,” (phi = 0.30, p = 0.041) and “we couldn’t get the food we needed to eat healthy meals,” (phi = 0.36, p = 0.041).

Table 4.17. Phi Correlations Between Responses to Similar Food Insecurity Items from the Nutritional Screening Initiative (NSI) Determine Checklist and Modified USDA Food Insecurity Questions as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations (rural n = 50, urban n = 48)

	NSI Determine Checklist items			
	Eats 2 or less meals/ day		Lacks money to buy food	
Modified USDA food insecurity items	phi	p	phi	p
Food didn’t last and we couldn’t get more				
Rural	0.19	0.192	0.12	0.421
Urban	0.33	0.022	0.30	0.041
We couldn’t get food needed to eat healthy meals				
Rural	0.23	0.102	0.20	0.162
Urban	0.28	0.057	0.36	0.013
Adults cut the size of meals or skipped meals				
Rural	0.12	0.409	0.27	0.062
Urban	0.30	0.046	0.27	0.070
Times when household did not have enough to eat				
Rural	0.30	0.038	0.19	0.193
Urban	0.47	0.001	0.16	0.283

Food Sharing Networks

Rural Elders reported significantly higher mean values for two food sharing network characteristics, at the $p<0.001$ level (Table 4.18). Rural networks had more food sharing episodes than urban Elders as measured by their links, and also shared more pounds of harvested food as measured by edible pounds of subsistence foods per household.

Table 4.18. Means and Standard Deviations of Food Sharing Networks as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations

	Rural n = 40	Urban n = 48	Mann-Whitney U Test	
	mean ± sd		z value	p
Food Sharing Network Links	55.1 ± 8.4 Range 12 to 217	2.9 ± 0.5 Range 0 to 13	-7.28	0.001
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

RESEARCH QUESTION 2A:

Are there differences between Inupiaq Elders in rural and urban locations in physical functioning, as measured by:

a. Limitations in Activities of Daily Living (ADLs)?
b. Limitations in Instrumental Activities of Daily Living (IADLs)?
c. Physical Functioning Component Summary score (PCS)?

Limitations in ADLs

Cronbach's α for the ADL scale was 0.653. Even though the Cronbach's α was below the established cutoff of 0.70, the ADL scale is widely used and was therefore used in the analysis. The frequency of ADLs reported by rural and urban Elders were not significantly different ($X^2 = 2.32$, $p = 0.127$). Both groups reported a low frequency of limitation of ADLs (Table 4.19). Ten percent of rural Elders had at least one ADL limitation and 20% of urban Elders did. The most frequently reported ADL identified by the total group were difficulties with walking (12%), and difficulties with bathing (9%).

Table 4.19. Percentages of Alaskan Inupiaq Elders Living in Rural and Urban Locations Reporting Limitations in Activities of Daily Living (ADLs)

	Rural n = 52	Urban n = 48	X^2	p
Bathing difficulties	2 (4%)	3 (6%)		[a]
Dressing difficulties	0 (0%)	1 (2%)		[a]
Eating difficulties	0 (0%)	3 (6%)		[a]
In/out bed difficulties	0 (0%)	2 (4%)		[a]
Walking difficulties	5 (10%)	7 (14%)	0.53	0.468
Toilet or toileting skills difficulties	0 (0%)	2 (4%)		[a]
Percent of Individuals with at least one ADL	5 (10%)	10 (20%)	2.32	0.127

[a] Small number of positive responses prevented analysis
Cronbach α = 0.653

Limitations in IADLs

Cronbach's α for the IADLs scale was 0.827. Similar patterns of limitations of Instrumental Activities of Daily Living IADLs (Table 4.20) were found between rural and urban Inupiaq Elders ($X^2 = 0.09$, $p=0.763$). Twenty-five percent of rural Elders had at least one limitation, and 22% of urban Elders did. The most frequently reported IADLs were difficulties in performing heavy housework (18%), and problems with shopping (12%).

Table 4.20. Percentages of Alaskan Inupiaq Elders Living in Rural and Urban Locations Reporting Limitations in Instrumental Activities of Daily Living (IADLs)

	Rural n = 52	Urban n = 48		
	# (%)	# (%)	X^2	p
Cooking and meal preparation	5 (10%)	3 (6%)		[a]
Shopping	8 (15%)	4 (8%)		[a]
Money management	7 (14%)	3 (6%)		[a]
Telephone skills	2 (4%)	2 (4%)		[a]
Heavy housework	12 (23%)	6 (12%)	2.02	0.155
Light housework	2 (4%)	2 (4%)		[a]
Getting outside	2 (4%)	0 (0%)		[a]
Percent of Individuals with at least one IADL	13 (25%)	11 (22%)	0.09	0.763

[a] Small number of positive responses prevented analysis

Cronbach α = 0.827

Measurement of Physical Functioning

Rural Elders reported significantly higher physical functioning summary scores than urban Elders ($t = 2.36$, $p = 0.02$), Table 4.22. Although rural Elders were older compared to urban Elders, they had significantly higher vitality scores ($t = 2.78$, $p = 0.007$) and less body pain ($t = 5.34$, $p < 0.001$) compared to urban Elders (Table 4.21). Of note, higher body pain scores indicated less levels of pain (Ware, et al, 2005).

Table 4.21. Means and Standard Deviations of the Component Factors of SF-12.v2 Physical Functioning Summary Score (PCS) as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations

	Rural n = 52	Urban n = 48		
	mean ± sd		t-test	p
Physical Activity	47.4 ± 12.9	46.3 ± 9.7	0.47	0.636
Role Physical	47.1 ± 12.3	46.9 ± 10.6	0.07	0.949
Body Pain	39.8 ± 14.9	26.0 ± 10.4	5.34	0.001
General Health	44.7 ± 12.2	45.1 ± 10.8	-0.21	0.835
Vitality	58.8 ± 11.1	53.4 ± 7.7	2.78	0.007

Higher SF-12 scores indicate higher functioning (higher body pain score indicates less pain.)

Inupiaq Physical Functioning Component Summary Scores (PCS) within Age Groups

Table 4.22 compares PCS scores within age groups consistent with SF-12.v2 norm scores by location. Significant differences were found in groups aged 45-54 years (t = 3.03, p = 0.009), and the 55-64 age group (t = 2.22, p = 0.032). The small number of Elders age 65 and older prevented analysis.

Rural Elders in the 45-54 age group averaged 9.1 points higher than their urban counterparts. Similarly, rural Elders in the 55-64 age group averaged 5.6 points higher than urban Elders.

Table 4.22. Means and Standard Deviations of SF-12.v2 Physical Functioning Summary Scores (PCS) as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations by SF-12.v2 Age Groupings

	Rural		Urban		t-test	p
	n	mean ± sd	n	mean ± sd		
All	52	43.4 ± 1.5	44	39.1 ± 0.9	2.36	0.020
Age 45-54	11	48.9 ± 9.0	18	39.8 ± 5.6	3.03	0.009
Age 55-64	21	44.2 ± 9.5	23	38.6 ± 6.7	2.22	0.032
Age 65+	20	39.5 ± 11.7	3	37.5 ± 7.5	[a]	

[a] Small group size prevented analysis
Higher SF-12 scores indicate higher functioning.

RESEARCH QUESTION 2B:

Are there differences between Inupiaq Elders in rural and urban locations in health, as measured by:

a. Self-Reported General Health (GH)?
b. SF-12.v2 Mental Component Summary score?

Self-Reported General Health (GH)

The Mann-Whitney U test, a two-sample non parametric test, was used to determine differences in the patterns of SF-12.v2 self-reported general health (GH) between rural and urban Inupiaq Elders. Patterns were found to be similar (Table 4.23). Sixty-one percent of rural Elders and 70% of urban Elders reported that their health was "good," "very good," or "excellent." Only one-third of both groups reported that their health was "fair" or "poor."

Table 4.23. Comparison of Patterns of SF-12.v2 Self-Reported General Health as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations

	Rural n = 52	Urban n = 47	Mann-Whitney U z value	p
Excellent	4 (8%)	2 (4%)	0.05	0.963
Very Good	9 (17%)	8 (16%)		
Good	19 (35%)	23 (47%)		
Fair	17 (32%)	13 (27%)		
Poor	3 (6%)	3 (6%)		

Measures of Mental Functioning

The SF-12.v2 Mental Functioning Summary Scores (MCS) was used to measure general mental health between rural and urban Elders. The rural and urban Elders generally displayed similar MCS scores ($t = 1.36$, $p = 0.177$).

Differences in component scores were then examined. T-tests indicated no significant differences in the component scores for social functioning component, and the role of emotional health (Table 4.24.) However, the mental health component (MH) was significantly different between rural and urban Elders (t = 2.08, p = 0.040). Rural Elders had higher functional mental health component scores compared to urban Elders.

Table 4.24. Means and Standard Deviations of Component Factors of SF-12.v2 Mental Functioning Summary Score (MCS) as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations

	Rural n = 52	Urban n = 48	t-test	p
	mean ± sd			
Social Functioning	48.2 ± 11.6	43.7 ± 12.8	1.85	0.067
Role Emotional	46.4 ± 13.0	48.1 ± 12.9	-0.66	0.513
Mental Health	53.9 ± 9.5	49.9 ± 9.4	2.08	0.040

Higher SF-12 scores indicate higher functioning.

Table 4.25 subdivides the rural and urban Elders into age groups consistent with the SF-12.v2 norm scores, and compares mean total mental functioning summary scores (MCS) within age groups. Rural Elders MCS scores reported by individuals aged 65 and older were significantly higher than urban Elders for the same age group, (t = 4.01, p < .001). MCS scores for rural and urban Elders compared by the age groups revealed no significant differences.

Table 4.25. Means and Standard Deviations of SF-12.v2 Mental Functioning Summary Scores (MCS) as Reported by Alaskan Inupiaq Elders Living in Rural and Urban Locations by SF-12.v2 Age Groupings

	Rural		Urban		t-test	p
	n	mean ± sd	n	mean ± sd		
All	52	53.9 ± 1.1	48	51.3 ± 1.7	1.36	0.177
Age: 45-54	11	54.2 ± 5.1	18	51.9 ± 10.2	0.79	0.435
Age 55-64	21	55.9 ± 6.0	23	52.0 ± 12.1	1.33	0.191
Age 65+	20	51.7 ± 10.5	3	41.6 ± 1.7	[a]	

[a] Small group size prevented analysis
Higher SF-12 scores indicate higher functioning.

RESEARCH QUESTION 3A:

In Inupiaq Elders, are there relationships among select nutrition parameters, community support variables, demographics characteristics, and 3 validated measures of physical functioning (Limitations in ADLs, Limitations in IADLs, and PCS):

Select Nutrition Parameters

a. Nutrient intake?
b. Nutrition risk?
c. Healthy Eating Index?

Community Support Variables

d. Participation in community activities?
e. Participation in family activities?
f. Food insecurity?
g. Pounds of food shared?
h. Number of food sharing episodes?

Demographic Characteristics

i. Age?
j. Body Mass Index?

Relationships among Select Nutrition Parameters, Community Support Variables, Demographic Characteristics and Measures of Physical Functioning (Limitations in ADLs, Limitations in IADLs, and PCS)

Correlations among nutrition parameters and three measures of physical functioning for all Elders are presented in Table 4.26.

As limitations in IADLs increased, total nutrition risk score increased (rho = 0.31, p = 0.008) as would be expected. As limitations in ADLs increased, food sharing episodes decreased (rho = -0.27, p = 0.024).

As the SF-12 Physical Component Scores (PCS) increased, thus indicating higher levels of physical abilities, participation in family activities increased (rho = 0.26, p = 0.023), the number of shared pounds of harvested foods increased (rho = 0.24, p = 0.041), and the number of food sharing episodes also increased (rho = 0.29, p = 0.015). This bears out the observation that Elders are involved in Native communities, and that the communities are providing support of their Elders by providing food.

Relationships among Community Support Variables and Physical Functioning

Table 4.26 correlates community support variables and measures of physical functioning. Higher participation scores in family activities was significantly correlated with higher PCS scores (rho = 0.26, p = 0.023). Higher participation was associated with better total physical functioning. No other significant statistical relationships were found among measures of community support and physical functioning.

Relationships among Demographic Characteristics and Physical Functioning

No significant statistical relationships were found among selected demographic characteristics and measures of physical functioning.

Table 4.26. Spearman's rho Correlations among Select Nutrition Parameters, Community Support Variables, Demographic Characteristics and Measures of Physical Functioning as Reported by All Alaskan Inupiaq Elders (n = 75)

	Measures of physical functioning					
	Limitations in ADLs		Limitations in IADLs		SF-12.v2 Physical Functioning Component Summary Score (PCS)	
	rho	p	rho	p	rho	p
Select nutrition parameters						
Nutrient Intake						
Energy, calories	0.03	0.805	0.01	0.944	0.02	0.858
Protein, g	0.04	0.711	-0.02	0.858	0.11	0.336
Gram Protein/Body Weight, kg	-0.03	0.791	-0.07	0.550	0.09	0.435
Nutrition Risk, raw score	0.22	0.053	0.31	0.008	-0.00	0.991
Healthy Eating Index	0.12	0.311	0.11	0.341	0.06	0.587
Community support variables						
Participation in Family Activities	0.01	0.915	-0.15	0.211	0.26	0.023
Participation in Community Activities	-0.04	0.749	0.19	0.111	0.13	0.260
Food Insecurity Score	-0.08	0.511	0.06	0.592	-0.01	0.913
Food Sharing Networks						
Number of edible pounds of harvested food	-0.11	0.331	0.02	0.899	0.24	0.041
Food Sharing Episodes (n = 72)	-0.27	0.024	0.00	0.977	0.29	0.015
Demographic characteristics						
Age	0.09	0.421	0.11	0.331	-0.12	0.302
Body Mass Index (BMI)	0.11	0.360	0.16	0.171	0.04	0.729

RESEARCH QUESTION 3B:

In Inupiaq Elders, are there relationships among select nutrition parameters, community support variables, demographic characteristics and 2 validated measures of health (Self-Reported General Health (GH), and Mental Component Scores (MCS):

Select Nutrition Parameters

a. Nutrition intake?
b. Nutrition risk?
c. Healthy Eating Index?

Community Support Variables

d. Participation in community activities?
e. Participation in family activities?
f. Food insecurity?
g. Pounds of food shared?
h. Number of food sharing episodes?

Demographic Characteristics

i. Age?
j. Body Mass Index (BMI)?

Relationships among Nutrition Parameters, Community Support Variables and Measures of Self-Reported General Health (GH)

No significant correlations were found among nutrition parameters and community support and self-reported General Health (GH) (Table 4.27).

Relationships among Community Support Variables and Mental Component Summary Scores (MCS)

Table 4.27 also shows three significant correlations among nutrition parameters, community support variables and SF-12.v2 Mental Functioning Component Summary Scores (MCS). These were: intake of protein (rho = 0.23, p = 0.047); food insecurity (rho = -0.27, p = 0.019); and participation in family activities (rho = 0.24, p = 0.040). Higher intakes of protein, lower food insecurity scores, and more participation in family activities were associated with higher SF-12.v2 mental component scores (MCS).

These finding supports the Elders' testimony given at the NRC statewide meetings (NRC 2005) when they said that rural Elders were not happy when they moved from rural villages to urban locations because they "*couldn't get their Native food*" and "*they didn't know anyone*." Higher mental component scores resulted when the Elders had access to more protein (we are assuming it was Native meats), and were with family.

Relationships among General Health (GH) and Mental Components Summary Scores (MCS) and Demographic Characteristics

Among all Elders, better self-reported general health (GH) was correlated with higher age (rho = 0.25, p = 0.029). We would anticipate that self-reported general health would decline as age increased. Inupiaq Elders may see declines in health in a positive light, as health declines may be anticipated as part of the Elders view of normal aging, and may signal the achievement of Elder status.

No significant correlations were found among other select nutritional parameters and community support variables (Table 4.27).

Table 4.27. Spearman's rho Correlations among Select Nutrition Parameters, Community Support Variables, Demographic Characteristics and Measures of Mental Functioning as Reported by all Alaskan Inupiaq Elders (n = 75)

	Measures of Mental Functioning			
	Self-reported General Health (GH)		SF-12.v2 Mental Functioning Component Summary Score (MCS)	
	rho	p	rho	p
Select nutrition parameters				
Nutrient Intake				
Energy, calories	-0.07	0.552	0.16	0.159
Protein, g	-0.10	0.402	0.23	0.047
Gram Protein / weight, kg	-0.09	0.425	0.20	0.090
Nutrition Risk, raw score	0.11	0.351	-0.05	0.666
Healthy Eating Index	-0.02	0.861	0.03	0.812
Community support variables				
Participation in Family Activities	0.01	0.912	0.24	0.040
Participation in Community Activities	0.09	0.557	0.20	0.085
Food Insecurity Score	0.18	0.128	-0.27	0.019
Food Sharing Networks				
Number of edible pounds of harvested food	0.06	0.584	-0.01	0.916
Food Sharing Episodes (n = 72)	0.06	0.618	0.05	0.683
Demographic characteristics				
Age	0.25	0.029	-0.03	0.780
Body Mass Index (BMI)	0.11	0.340	-0.08	0.505

RESEARCH QUESTION 3C:

In Inupiaq Elders, are there relationships among select nutrition parameters, community support variables, demographic characteristics and:

Select Nutrition Parameters

a. Nutrition intake?
b. Nutrition risk?
c. Healthy Eating Index (HEI)?

Community Support Variables

d. Participation in family activities?
e. Participation in community activities?
f. Food insecurity?
g. Food sharing networks: Pounds food exchanged?
h. Food sharing Networks: Number of food sharing episodes?

Demographic Characteristics

i. Age?
j. Body Mass Index (BMI)?

Relationships Among Select Nutrition Parameters, Community Support Variables and Demographic Characteristics

Relationships among nutrition parameters, community support variables and demographics characteristics are presented in Table 4.28.

Increased age was negatively correlated with food insecurity (rho = -0.29, p = 0.012) suggesting that, as Elders increase in age, their food needs are increasingly provided by the community and their food status becomes more secure. This indication is consistent with the data showing that those Elders with higher levels of food insecurity also received higher levels of shared food (rho = 0.290, p < 0.001). In addition, higher nutrition risk scores were correlated with higher reports of food insecurity (rho = 0.40, p < 0.001).

With 26% of the Elders reporting food insecurity, this may suggest that it is the "younger old" who feel the most food insecure. They may be at the beginning stages of physical and mental declines, yet they continue to bear the responsibility for providing food for those older, and perhaps supporting younger beginning families.

Body Mass Index (BMI) was negatively correlated with energy intake (rho = -0.41, p = 0.001), grams of protein (rho = -0.38, p = 0.001), the proportion of protein to body weight (rho = -0.57, p = 0.001), and with NSI Nutrition Risk scores (rho = -0.24, p = 0.041). Our data indicated that as energy intake increased, BMI scores decreased. As grams of protein increased, BMI decreased. As the proportion of protein to body weight increased, BMI scores decreased. And as nutrition risk increased, BMI decreased. The first three correlations with BMI relate to energy balance, and for the Inupiaq Elders in this study, energy balance in a cold arctic climate. Unfortunately, energy expenditure was not included in the survey, but may have been helpful in understanding the counter-intuitive (Albright 1995) appearance of these results. In other Tribes, low physical activity has been related to increases in body weight (Esparza 2000).

These results also may suggest the inappropriateness of BMI to evaluate arctic Native populations. Recent studies have questioned the exclusive use of BMI to accurately describe body composition and body size in relation to health outcomes (Michels 1998) among many population groups including older adults, both African Americans and Caucasians (Gallagher 1996). BMI has been commonly used with American Native populations. However, few researchers have questioned that BMI may not accurately describe populations characterized by short stature who are muscular due to high levels of physical activity or have genetic patterns of short stature (Jamison 1978). Gallagher reported that body fat varies by age at each level of BMI (Gallagher, et al, 2000). Currently age is not calculated into the BMI evaluation of body weight to determine healthy weight.

Research by Blair at the Cooper Heart Institute in Texas had shown that heavy individuals who are physically active had less mortality than thin individuals who are not physically active (Blair and Brodney, 1999). From Blair's data, physically active individuals could be considered in good health regardless of BMI or body size.

Intake of energy was correlated with the intake of protein (rho = 0.87, $p = 0.001$), and the proportion of protein to body weight (rho = 0.93, $p = 0.001$).

As expected, an increased number of pounds of harvested food was correlated with an increased number of food sharing episodes (rho = 0.62, $p = 0.001$). Also, food sharing episodes were positively correlated with high participation in community activities (rho = 0.36, $p = 0.004$).

Likewise, increased participation in community activity positively correlated to increased family participation (rho = 0.25, $p = 0.030$).

These data may also suggest metabolic adaptation to cold climates (Steegmann 1975). Leutin (2001) reported that plasma insulin levels lowered in a sample of Russian workers who moved from temperate to cold climates. Several studies showed evidence of physical acclimatization to similar arctic climates which included changes in blood pressure, vascular fluid shifts, decreases in hematocrit and erythrocyte count, but increases in mean corpuscular hemoglobin concentration (Rintamaki 2000, citing earlier work by D'Alesandro et al 1992). Edwards (1991) and King (1993) published studies showing an increased energy needs for field troops stationed on maneuvers in Alaska. US military troops needed an additional 10 calories per kilogram of body weight per day to maintain weight status. Thus, while the Elders reported increased energy and protein intake, they perhaps were not consuming sufficient quantities to maintain their body weight.

More research is needed to understand the affects of consistent cold temperature on the metabolic needs and the physiological status of populations living in arctic climates. Factors that may impact body weight are little known in the Alaska rural populations who live routinely in cold weather, and among older individuals who may have different metabolic needs as they age.

Table 4.28. Spearman's rho Correlation Among and Between Select Nutrition Parameters, Community Support Variables and Demographic Characteristics as Reported by Alaskan Inupiaq Elders (n = 75)

	2. BMI Body Mass Index		3. Energy in calories		4. Protein intake in grams		5. Protein /body weight		6. NSI Nutrition Risk		7. HEI Healthy Eating Index		8. Food insecurity		9. Lbs shared food		10. (a) Sharing episodes		11. Family activities		12. Community activities	
	rho	p	rho	p	rho	p	rho	p	rho	p	rho	p	rho	p	rho	p	rho	p	rho	p	rho	p
1. Age	.18	.129	-.17	0.135	-.12	0.294	-.15	0.209	-.17	0.138	.02	0.865	-.29	0.012	-.01	0.924	.09	0.500	.11	0.367	.01	0.912
2. BMI			-.41	0.001	-.38	0.001	-.57	0.001	-.24	0.041	.04	0.735	.11	0.341	.20	0.079	.21	0.095	.10	0.395	-.08	0.480
3. Energy					.87	0.001	.86	0.001	.06	0.638	.05	0.670	.06	0.626	-.01	0.956	.04	0.773	-.01	0.932	.22	0.057
4. Protein							.93	0.001	-.04	0.719	.17	0.150	.03	0.793	.13	0.267	.10	0.441	.10	0.417	.22	0.058
5. Pro/ weight									-.99	0.401	.13	0.259	.02	0.864	.06	0.622	.05	0.682	.07	0.566	.19	0.104
6. NSI											-.11	0.351	.40	0.0001	.03	0.789	.01	0.936	-.02	0.886	.00	0.999
7. HEI													.01	0.942	.00	0.997	-.19	0.141	.23	0.045	.02	0.885
8. Food insecurity															.290	0.012	.28	0.024	-.13	0.269	.05	0.694
9. Lbs food																	.62	0.0001	.04	0.729	.03	0.795
10. Food sharing																			.09	0.470	.36	0.004
11. Family activities																					.25	0.030

(a) n = 72.

Notes: 1. AGE = age in years. 2. BMI = Body Mass Index. 3. Energy is measured in kilocalories. 4. Protein is measured in grams. 5. Pro/wt = grams protein to body weight in kilograms. 6. NSI = Nutrition Screening Initiative's Determine Your Nutrition Risk Checklist raw score. 7. HEI = Healthy Eating Index raw score. 8. Food Insecurity = number of responses to four screening questions. 9. Lbs Food = number of pound of subsistence foods harvested by or given to the household. 10. Sharing Episodes = number of sharing episodes that occurred within the Elder's household. 11. Family Activities = refers to the STN family activity score. 12. Community Activities = refers to the community activity score from the University of North Dakota's "Assessing Our Native Elders, version II."

COMPARISONS OF INUPIAQ ELDERS TO NATIONAL DATA AND DATA FROM OTHER NATIVE GROUPS

The data analyses in Chapter IV respond to the research questions about Inupiaq Elders, and compare findings in rural and urban groups. The results of this section take a broader look by comparing the data reported by Inupiaq Elders with data from other groups.

Comparison of Diet of Inupiaq Elders to US Population NHANES Data, 1999-2000

The nutrient values reported by the total group of Inupiaq Elders $\geq$ age 50 (n = 100) were reviewed for similarities to US population data from the NHANES, 1999-2000 (Ervin 2004, Wright 2003) in Table 4.29. NHANES data were published by age groups, although this comparison looks at only two groups: 40-59 years; and 60 years or over. To establish a value for comparison, values from the two age groups were averaged consistent with Bersamin (2006) methodology in the study of Alaska Yup'ik food intakes.

No statistical tests were performed due to the different methodologies used to collect the dietary data. However, a brief inspection suggests that mean intakes reported by Inupiaq Elders for most nutrients were higher than daily mean reported by intakes by NHANES participants.

Table 4.29. Comparison of Selected Dietary Nutrients as Reported by Alaskan Inupiaq Elders to US Population Data from the National Health and Nutritional Examination Study (NHANES 1999-2000)

	AK Inupiaq n = 100	NHANES 1999-2000
	mean ± sd	mean
Macronutrients		
Energy, calories	3,942 ± 2,664	1,984.00
Fat, g	163 ± 121	
% of calories	35.0 ± 6.10	33.05
Carbohydrates, g	422 ± 279	
% of calories	43.2 ± 8.90	50.15
Protein, g	177 ± 134	
% of calories	18.0 ± 5.90	15.75
Vitamins		
Vitamin A, RE	2,638 ± 2,156	1,038.50
Vitamin A, ug	1,705 ± 1,482	
Thiamin, Vit B_1, mg	2.6 ± 1.9	1.60
Riboflavin, Vit B_2, mg	4.7 ± 3.8	1.90
Niacin, mg	49 ± 33	22.05
Vitamin B_6, mg	2.3 ± 2.0	1.85
Vitamin B_{12}, ug	7.1 ± 6.6	4.80
Vitamin C, mg	265 ± 237	101.00
Vitamin D, ug	5.0 ± 4.2	
Vitamin E, a-TE, mg	18 ± 13	9.05
Folate, ug	554 ± 420	363.50
Minerals and Fiber		
Calcium, mg	1,063 ± 714	787.00
Iron, mg	35 ± 31	15.20
Magnesium, mg	381 ± 258	271.00
Phosphorus, mg	2,519 ± 1,726	1,131.00
Potassium, g	4.6 ± 2.9	2.68
Sodium, g	4.6 ± 3.4	3.20
Zinc, mg	8.1 ± 9.2	11.30
Fiber, g	21 ± 17	

Comparisons of Self-Reported Health of Inupiaq Elders to US American Indian Elders and to US NHANES III Participants

Alaska Native Elders reported better health status than US American Indians and equal or better than NHANES-III (1988-1994). Table 4.30 compares the data from this study to data from other US tribal groups and to the US population obtained from the US NHANES III Study (1988-1994) for all races. Aggregate Tribal data were obtained by the Native Resource Center for Native American Aging at the University of North Dakota using their “Assessing Our Elders, II” Survey (McDonald, et al, 2005).

Percentages of individuals reporting their health as “excellent”, “very good” or “good” were similar between the Alaska Elders (65%) and the NHANES III participants (65%); but differed significantly with the American Indian Elders; only 52% of US Tribal individuals reported their health at least “good”.

Patterns of chronic disease reported by Alaska Elders were similar to data from NHANES III with 36% of Alaska Elders and 40% of NHANES participants reporting arthritis, 40% of Alaska Elders and 43% of NHANES participants reporting hypertension, and 13% of Alaska Elders and 14% of NHANES reporting diabetes. US Tribal data reported higher percentages of Elders with arthritis (47%), and hypertension (50%), and with a much higher percentage of Elders with diabetes (37%) than Alaska Elders and NHANES participants. The Inupiaq reported 13% with diabetes compared to 14% in the NHANES III.

Frequency of ADL and IADL limitations reported by Alaska Elders were lower than those reported by US Tribal data and US general population data from NHANES III.

Limitations in ADLs and IADLs were less in the Inupiaq group data than the aggregate Tribal data of American Indian and Alaska Natives, and findings from the NHANES III study of the US population. This may suggest improved health status among the Inupiaq group. Or that the activities listed on the two tools may not accurately evaluate possible different activities of the Inupiaq Elder's subsistence lifestyle. This difference could also suggest that levels of support are high, and that accomplishing basic daily tasks is not a problem for these Inupiaq Elders.

In comparing Alaska Inupiaq Elders with other American Indian-Alaska Native groups and with the NHANES III study, generally, the Inupiaq Elders reported showing that their health was better than that of both groups reported in the aggregate Tribal data and the group of NHANES III respondents. The frequency of chronic disease was less in the Inupiaq Elders with the exception of cancer. Seven percent of Inupiaq respondents reported cancer compared to 0.8 to 3.4% from the aggregate Tribal data, and less than 1% to 3% reported in NHANES III. The rate of asthma was somewhat higher among Alaska Inupiaq Elders.

Alaska population reported few deficits that limited their activities, although their observed health was less than ideal. Observations of rural Elders bear this out. For example:

> *"Brenda" is petite in height, and filled out her kuspik fully. Brenda reports that she has arthritis, diabetes, cataracts, and high blood pressure, but she cheerfully reported her health as "good." She reports eating less than 2 meals per day, eats alone, and takes more than 3 medications per day. She walked to the interview – her house is almost a mile away, located at the other end of the village.*
>
> *"Susie" is a thin petite woman lacking teeth, and is profoundly deaf. She had Inupiaq skills that she taught to others when she was*

younger. She walks constantly. It is difficult to carry on a conversation, but she answers questions with simple answers. She has arthritis, and smokes 10+ cigarettes per day. Every day is filled by visiting in homes and in offices, offering greetings and then she goes on her way. She is beloved and respected and several residents made sure she was interviewed.

"Marie" reports that she has osteoarthritis, and is unable to get out of the house. She walks with bilateral crutches following a severe car accident in Anchorage. She said she couldn't make it there, and so they moved back to her home that she now shares with her nephew and their family. She scoots around the house in a rolling office chair purchased by her husband. She does report that she does have a lot of pain. She has cataracts on her left eye, macular degenerations, total deafness in her right ear, asthma and high blood pressure. She reports her health as "very good".

Individual cases in small groups could misrepresent population trends. Thus disease frequencies in the Inupiaq group must be interpreted carefully in case these data be used to estimate health status of other Inupiaq Elders or other Native groups in Alaska or elsewhere. These data do appear to propose that the Inupiaq Elders in this survey are remaining physically active and could be described as "aging well."

Table 4.30 Comparison of Selected Measures of Health Status as Reported by Alaskan Inupiaq Elders to National Data for Other Tribal Groups and to the US National Health and Nutritional Examination Study III (NHANES 1988-1994)

	Inupiaq Elders (50 and older) (n = 101)		American Indian Tribal Data (55 and older) (n = 9,296)	NHANES III 1988-1994 (55 and older) All Races
Self-Reported General Health (n = 101)	#	%	%	%
Excellent	6	(6%)	4.1%	11.0%
Very Good	17	(17%)	14.0%	20.0%
Good	41	(41%)	34.1%	34.0%
Fair	30	(30%)	33.7%	25.0%
Poor	6	(6%)	14.2%	9.0%
Chronic Diseases (n = 99)				
Arthritis	36	(36%)	47.0%	40.0%
Asthma	12	(12%)	9.9%	7.0%
Cancer	7	(7%)	0.8 – 3.4%	< 1 – 3%
Congestive Heart Failure	8	(8%)	11.5%	8.0%
Diabetes	13	(13%)	37.4%	14.0%
Hypertension	40	(40%)	49.8%	43.0%
Osteoporosis	6	(6%)		
Stroke	9	(9%)	9.1%	8.0%
Limitations in ADLs (n = 101)				
Bathing	5	(4.9%)	16.7%	36.8%
Dressing	1	(<1%)	11.6%	15.8%
Eating	3	(2.9%)	7.5%	8.1%
Getting in or out of bed	2	(1.9%)	13.1%	22.1%
Walking	12	(11.9%)	28.1%	33.7%
Toileting skills	2	(1.9%)	8.9%	22.8%
Limitations in IADLs (n = 99)				
Cooking / Meal preparation	8	(7.9%)	18.1%	19.7%
Shopping	12	(11.9%)	17.0%	34.8%
Money management	10	(9.9%)	10.3%	17.9%
Telephone	4	(3.9%)	8.0%	9.6%
Heavy housework	18	(17.8%)	37.3%	51.6%
Getting outside	2	(1.9%)	15.4%	44.2%

Comparison of NSI Between Alaska Inupiaq Elders and US Native American Elders

Table 4.31 compares the percentage of Alaska Inupiaq Elders reporting nutrition risk factors to the percentage found among their American Indian cohorts in the Continental United States. The group of Alaska Inupiaq Elders reported almost half the frequency of “illness that changes the types or amounts of food” (14% versus 29%, $p < 0.001$) and “Takes $\geq$3 medications” (21% versus 40%, $p < 0.001$) than the US American Indian sample. However, Alaska Elders also reported double the concerns over “Lacks money to buy food” (26% versus 12%, $p < 0.001$), and having “mouth problems that created difficulties in eating” (21% versus 12%, $p = 0.009$) than the US American Indian sample. The Alaska Inupiaq Elders reported themselves as being physically better than the US Native Elders except for mouth problems.

Inupiaq Elders, particularly rural Elders, report high levels of physical functioning even though they have diagnosed conditions of physical limitations, and take many medicines. The reason for these data does not appear to be denial, but perhaps demonstrates the Elders’ ability to maintain their rural lifestyle with impaired “health.” As a result, they declare themselves as healthy. The access to adaptive systems may help older individuals cope with changes in mental and functional status and, consequently, they see their health status as favorable (Mechanic 1968).

Table 4.31. Comparison of Nutritional Risk Factors Using the Nutritional Screening Initiative (NSI) Determine Checklist Between Alaskan Inupiaq Elders and US American Indians

	Alaska Inupiaq n = 98	US American Indian n = 9,296	X^2	p
	Percentage			
Illness changes the kinds or amounts of foods eaten	13.9	28.9	-3.33	0.001
Eats less than 2 meals per day	14.9	17.2	-0.61	0.546
Eats few fruits and vegetables	29.7	30.4	-0.15	0.881
Mouth problems / difficulties eating	20.8	12.3	2.60	0.009
Lacks money to buy food	25.7	11.7	4.38	0.001
Frequently eats alone	17.8	24.4	-1.54	0.124
Takes > 3 medications per day	20.8	40.1	-3.96	0.001
10 lb. weight change	9.9	12.8	-0.87	0.384
Unable to shop, cook, self-feed	9.9	10.6	-0.23	0.818

Comparison of the Percentage Contribution of Alaska Harvested Foods to Selected Nutrients by Alaskan Inupiaq Elders and Alaskan Yup'ik Elders

The contributions of Alaska harvested foods to selected nutrients reported by Inupiaq Elders were compared to those recently published for Yup'ik individuals aged 40-81 years (Bersamin 2006) from the Center for Alaska Native Heath Research Study, University of Alaska Fairbanks. Data are presented in Table 4.32.

The Inupiaq Elders reported that harvested foods contributed a higher percentage when compared to store-bought foods for several key nutrients (i.e. protein, iron, vitamin A, energy, vitamin C, calcium, and carbohydrates) than did their Yup'ik cohorts. The percentage contribution of Alaska harvested foods to total fat intake was similar between the two groups.

Table 4.32. Percent Contribution of Alaska Harvested Foods to Selected Nutrients as Reported by Alaskan Inupiaq Elders and Alaskan Yup'ik Elders

	AK Rural Inupiaq ≥ Age 50 n = 52	AK Yup'ik Age 40-81 n = 28
Selected Nutrients	Percentage Contributed by Harvested Foods	
Protein	64.1	41.5
Iron	54.2	40.0
Vitamin A	39.9	19.7
Energy, calories	27.5	21.2
Fat, g	25.5	25.4
Vitamin C	22.6	10.3
Calcium	13.8	5.9
Carbohydrates	5.6	3.0

Based on these data, an assumption could be made that the Inupiaq Elders consume more traditional foods and less store-bought foods than the Yup'ik Elders. The Yup'ik area of southwestern Alaska is closer to major urban centers. The reduced distance may result in increased store supplies.

The mean values obtained in the two studies were obtained using different food intake methodologies. Data for the Inupiaq Elders were collected using a food frequency to examine food intake over a year's time span. Yup'ik food intake data were collected using multiple-day 24-hour recall during a one five-day time span. At this time, it is unknown if either of these diet assessment tools provided a valid estimate of the overall characteristics of the Elders' diet.

Declining use of traditional foods as communities become more acculturated into the dominate society (Shephard 1996) have been noted in Native groups such as the Hopi (Kuhnlein and Calloway, 1978), Oklahoma Cherokee (Wiedman 1987), and the Lakota (Harnack 1999).

Comparison of MCS Scores to National SF-12.v2 Norms

Table 4.33 compares mean SF-12.v2 Mental Functioning Component Summary scores (MCS) obtained in rural and urban locations to SF-12.v2 national norm MCS scores. The overall mean SF-12.v2 MCS score reported by rural Elders was significantly higher than the SF-12 national norm scores ($t = 4.05$, $p < 0.001$). Scores for ages 45-55 were also significantly higher ($t = 2.78$, $p = 0.020$). Scores for ages 55-64 were higher as well ($t = 3.53$, $p = 0.002$). However, reported data from individuals age 65 years and older were similar to SF-12 national norms ($t = 0.08$, $p = 0.936$).

The overall mean SF-12.v2 MCS score reported by urban Elders was not significantly different than the SF-12 national norm ($t = 1.13$, $p = 0.263$), nor were the mean scores for ages 45-55 ($t = 0.83$, $p = 0.416$), or for ages 55-64 ($t = 0.48$, $p = 0.640$). However, reported data from urban individuals age 65 years and older were significantly less than SF-12 national norms ($t = -10.16$, $p = 0.01$).

Table 4.33. Comparison of Mean SF-12.v2 Mental Functioning Summary Scores (MCS) as Reported by Alaskan Inupiaq Elders Living In Rural and Urban Locations to US Norms for the General US Population by SF-12.v2 Age Groupings

	SF-12.v2 MCS Scores mean ± sd				Comparison to SF-12.v2 norms			
	n	Rural	n	Urban	Rural		Urban	
SF-12.v2 MCS Norm Scores					t-test	p	t-test	p
ALL: 49.37	52	53.9 ± 1.1	48	51.3 ± 1.7	4.05	0.001	1.13	0.263
Age 45-54: 49.90	11	54.2 ± 5.1	18	51.9 ± 10.2	2.78	0.020	0.83	0.416
Age 55-64: 50.84	21	55.9 ± 6.0	23	52.0 ± 12.1	3.53	0.002	0.48	0.640
Age 65+: 51.57	20	51.7 ± 10.5	3	41.6 ± 1.7	0.08	0.936	-10.16	0.010

Higher SF-12 scores indicate higher functioning

Comparison of SF-12v2 Physical Functioning Component Scores (PCS) to National Norms

Rural Elders' and urban Elders' mean SF-12.v2 scores differed from SF-12.v2 national norm scores (Table 4.34). Both rural Elders' and urban Elders' were significantly lower than SF-12.v2 national norms (rural: $t = -4.18$, urban: $t = -11.33$, both $p < 0.001$). Examination by age groups indicated that rural Elders' scores for these groups, age 45-54, age 55-64, and age 65 and older did not differ from the national norms. However, urban Elders scores were significantly less than national norms for both ages groups 45-54 ($t = -7.21$, $p < 0.001$), and for ages 55-64 ($t = -5.92$, $p < 0.001$). For age 65 and older, Urban Elders' SF-12.v2 scores did not significantly differ from national norm scores.

Table 4.34. Comparison of Mean SF-12.v2 Physical Functioning Summary Scores (PCS) as Reported by Alaskan Inupiaq Elders Living In Rural and Urban Locations to US Norms for the General US Population by SF-12.v2 Age Groupings

	Inupiaq SF-12.v2 PCS Scores m ± sd				Comparison to SF-12.v2 norms			
	n	Rural	n	Urban	Rural		Urban	
SF-12.v2 PCS Norm Scores					t-test	p	t-test	p
All ages: 49.63	52	43.4 ± 1.5	48	39.1 ± 6.2	-4.18	0.001	-11.33	<0.001
Age 45-54: 49.35	11	48.9 ± 9.0	18	39.8 ± 5.6	-0.15	0.884	-7.21	<0.001
Age 55-64: 46.90	21	44.2 ± 9.5	23	38.6 ± 6.7	1.32	0.202	-5.92	<0.001
Age 65+: 43.93	20	39.5 ± 12.0	3	37.5 ± 7.5	-1.67	0.112	-1.47	0.280

Higher SF-12 scores indicate higher physical functioning.

TABULATION OF THE RESEARCH QUESTIONS, INSTRUMENTS, STATISTICAL ANALYSIS AND RESULTS

Table 4.35 provides a brief description of the research questions, methods, statistical analysis and the results.

Table 4.35. Tabulation of Research Questions, Instruments, Statistical Analysis and Results.

Research Questions	Instruments or Data Source	Statistical Analysis	Results
1A. Are there differences between Inupiaq Elders in rural and urban locations in select nutrition parameters:			
a. Mean and median intake of energy, macronutrients, micronutrients and fiber?	Block 98-item Food Frequency Tool, combined with a supplemental list of Alaska harvested foods. (mean daily intake over a year)	t-test between means	Macronutrients by percentage were similar between RURAL and URBAN. Vitamins: URBAN reported higher intakes of B_6, B_{12}, D, and folate. Minerals and Fiber: URBAN reported higher intake magnesium, potassium, sodium, zinc and fiber.
b. Intake of harvested foods?	Supplemental list of Alaska harvested foods (servings per week)	Data are retrieved as group data, thus, no analyses are planned	RURAL reported higher intakes than URBAN.
c. Harvested food contributions to overall nutrient intake?	Supplemental list of Alaska harvested foods (mean daily intake over a year)	Data are retrieved as group data, thus, no analyses are planned	Harvested foods (Native berries, fish, especially salmon, and dried salmon) contributed more to all nutrients for RURAL.
d. Nutrition Risk?	Nutrition Screening Initiative Determine Checklist	Cronbach's α, X^2 and t-tests	Nutrition Risk Raw Score: Mean raw risk scores were similar. Nutrition Risk Category: Over half (57%) reported "no risk," 22% "moderate risk," 23% "high risk." Similar patterns between groups.
e. Diet Quality?	(1) Healthy Eating Index	X^2 and t-tests	ALL Elders: 46% had "poor" diet, 52% "diet needs improvement," only 2% had "good diet".
	(2) USDA Food Guide Pyramid	Data were retrieved as group data, thus, no	URBAN met minimum recommendations. RURAL met all serving recommendations with the

		analyses were planned	exception of vegetables. Inupiaq Elders reported more servings of meat, and fruit/juice than US sample.
1B. Are there differences between Inupiaq Elders in rural and urban locations in community support as measured by:			
a. Participation in community activities?	North Dakota "Survey of Our Elders II"	Cronbach's α and t- test	Similar for RURAL and URBAN.
b. Participation in family activities?	Questions from NSF Study of Social Transition in the North	Cronbach's α and t- test	RURAL reported higher levels of than URBAN ($p = 0.045$).
c. Food insecurity?	ADF&G/NPS Household Harvest Survey	Cronbach's α, t-test, X^2 test, Phi Correlations	Similar rates, ALL Elders: 27% "food didn't last."
d. Food sharing networks?	ADF&G/NPS Household Harvest Survey (pounds of food shared per year, number of food sharing episodes per year)	Mann-Whitney U Test,	RURAL reported more links in food sharing networks ($p < 0.001$), and more edible pounds harvested by or given to household ($p < 0.001$).
2A. Are there differences between Inupiaq Elders in rural and urban locations in physical functioning, as measured by:			
a. Limitations in Activities of Daily Living (ADLs)?	Validated piece of ND survey	Cronbach α, X^2	Few limitations of ADLs and IADLs reported by either RURAL or URBAN.
b. Limitations in Instrumental Activities of Daily Living (IADLs)?	Validated piece of ND survey	Cronbach α, X^2	Few limitations of ADLs and IADLs reported by either RURAL or URBAN.
c. SF-12 Physical Functioning Component Summary score (PCS)?	SF-12v.2 questions on physical functioning	t-test	RURAL had higher mean SF-12 PCS than URBAN ($p = 0.020$). Rural reported higher pain scores indicating less pain, and higher vitality scores ($p = 0.007$). Examination by age groups: RURAL had higher PCS for ages 44-54 ($p= 0.009$), ages 55-64 ($p = 0.032$). PCS were

			similar between Elders over 65 years old.
2B. Are there differences between Inupiaq Elders in rural and urban locations in health, as measured by:			
a. Self-Reported General Health (GH)?	SF-12.v2 question on general health	Mann-Whitney U-score	Self-reported GH Scores were similar between RURAL and URBAN groups.
b. SF-12.v2 Mental Functioning Component Summary score (MCS)?	SF-12.v2 questions on mental functioning	t-test	MCS were similar between RURAL and URBAN groups overall, but mental health higher for RURAL 65+ years than URBAN.
3A. In Inupiaq Elders, are there relationships among the following select nutrition parameters, community support variables and the following 3 validated measures of physical functioning:			
Select Nutrition Parameters a. Nutrient intake? b. Nutrition risk? c. Healthy Eating Index? Community Support Variables d. Participation in community activities? e. Participation in family activities? f. Food security? g. Pounds of food shared? h. Number of food sharing episodes? Demographic Characteristics i. Age? j. Body Mass Index (BMI)?	Physical functioning a. Limitations in Activities of Daily Living (ADLs)? b. Limitations in Instrumental Activities of Daily Living (IADLs)? c. SF-12 Physical Component Summary scores (PCS)?	Spearman's rho Correlation	Select Nutrition Parameters Limitations in IALDs was correlated with NSI Risk Scores (rho = 0.31, p = 0.008). Community Support Variables Limitations in ADL: negatively correlated with food sharing episodes (rho = -0.27, p = 0.024). Physical Functioning: correlated with participation in family activities (rho = 0.26, p = 0.023), pounds foods shared (rho = 0.024, p = 0.041); food sharing episodes (rho = 0.29, p = 0.015). Demographic Characteristics Age correlated with Self-Reported General Health (rho 0.25, p = 0.029), and negatively with food insecurity (rho = -0.29, p = 0.012). BMI negatively correlated with Nutrition Risk Score (rho = -0.57, p = 0.001).

<table>
<tr><th colspan="4">3B. In Inupiaq Elders, are there relationships among select nutrition parameters, community support variables and the following 2 validated measures of self-reported health:</th></tr>
<tr>
<td>Select Nutrition Parameters
a. Nutrient intake?
b. Nutrition risk?
c. Healthy Eating Index?

Community Support Variables
d. Participation in community activities?
e. Participation in family activities?
f. Food insecurity?
g. Pounds of food shared?
h. Number of food sharing episodes?

Demographic Characteristics
i. Age?
j. Body Mass Index (BMI)?</td>
<td>Health:
a. SF-12.v2 Mental. Component summary score (MCS)?
b. SF-12.v2 Self-Reported Health Score?</td>
<td>Spearman's rho Correlations</td>
<td>Select Nutrition Parameters
<u>Protein intake correlated with Mental Component Score</u>: (rho = 0.23, p = 0.047)
Community Support Variables
<u>Participation in family activities</u> (rho = 0.24, p = 0.040).
<u>Food insecurity</u> (rho = -0.27, p = 0.019)

Demographic Characteristics
<u>Self-Reported General Health</u>: Correlated with age (rho = 0.25, p = 0.029).
<u>Mental Component Score</u>: correlated with protein intake (rho = 0.23, p = 0.047)</td>
</tr>
</table>

<table>
<tr><th colspan="4">3C: In Inupiaq Elders, are there relationships among select nutrition parameters, community support variables, demographic characteristics, and:</th></tr>
<tr>
<td>Select Nutrition Parameters
a. Nutrient intake?
b. Nutrition risk?
c. Healthy Eating Index?

Community Support Variables
d. Participation in community activities?
e. Participation in family activities?
f. Food insecurity?
g. Pounds of food shared?
h. Number of food sharing episodes?

Demographic Characteristics
i. Age?
j. BMI?
k. Gram Protein per Kg of body weight?</td>
<td>Select Nutrition Parameters
a. Nutrient intake?
b. Nutrition risk?
c. Healthy Eating Index?

Community Support Variables
d. Participation in community activities?
e. Participation in family activities?
f. Food insecurity?
g. Pounds of food shared?
h. Number of food sharing episodes?

Demographic</td>
<td>Spearman's rho Correlations</td>
<td>Select Nutrition Parameters
<u>Intake of energy (calories)</u>: BMI (rho = -0.38, p = 0.001), protein/body weight (kg) (rho = 0.86, p = 0.001).
<u>Nutrition Risk</u>: correlated with food insecurity (rho = 0.40, p = 0.001).
<u>Healthy Eating Index</u>: correlated with participation in family activities (rho = 0.23, p = 0.045).

Community Support Variables
<u>Community Activities</u>: correlated with number of food episodes, and participation in family activities.</td>
</tr>
</table>

	Characteristics i. Age? j. BMI? k. Gram Protein per Kg of body weight?		Family Activities: correlated with HEI (rho = 0.23, p = 0.045), community activities (rho = 0.25, p = 0.030). Food Insecurity: negatively correlated with age rho -0.29, p = 0.012), positive correlation with nutrition risk (rho = 0.40, p = 0.001), food sharing networks: pounds shared food (rho = 0.29, p = 0.012), food sharing episodes (rho = 0.28, p = 0.024). Food Sharing Networks: Lbs Food Exchanged: correlated with food insecurity (rho = 0.29, p = 0.012), and foods sharing episodes (rho = 0.28, p = 0.024). Food Sharing Networks: Number of Episodes: correlated with food insecurity (rho = 0.28, p = 0.024), participation in family activities (rho = 0.36, p = 0.004). Demographics Characteristics Age: negatively correlated with food insecurity (rho -0.29, p = 0.012). BMI: negatively correlated with protein (rho = -0.38, p = 0.001), protein/ kg weight (rho = -0.57, p = 0.001), nutrition risk (rho = 0.24, p = 0.041).

CHAPTER V

DISCUSSION

DISCUSSION OF THE RESEARCH QUESTIONS

The ability of Inupiaq Elders to continue in traditional advisory and supportive roles pivots on their ability to remain in their home communities. Despite the availability of increased services in Alaska urban locations, Elders appear to do as well or better in rural settings.

1A: SELECT NUTRITION PARAMETERS

Nutrient Intake

Nutrient intakes were compared by rural or urban location. Intakes of macronutrients (protein, fat and carbohydrates) were similar between the two groups. Urban Elders reported significantly higher intakes of vitamin B_6, vitamin B_{12}, vitamin D, and folate, magnesium, potassium, sodium, zinc, and fiber. These findings may reflect higher intakes of meat and vegetables reported by urban Elders when evaluated using the USDA MyPyramid.

In many respects, both rural and urban populations were well nourished. Only 15 individuals (15%) reported intakes less than 1500 calories, and 11 individuals (11%) reported intakes of less than 57 grams of protein. Due to the limitations of the collection tools for the dietary data, we are unable to evaluate the adequacy of these intakes.

Consideration must be noted that all of the nutrient intake data are unreliable. The food frequency tool does not purport to measure “usual” intake to allow comparison of the data to the DRIs as discussed earlier. In addition, there is a lack of food composition data for many of the commonly eaten Alaska foods that appear to have contributed significantly to the nutrients examined, and the limited accuracy of the self-reported food intake data from elderly individuals. Any inferences as to the level of nutrient deficiencies using food frequency data and comparison to DRIs would be of little use to future researchers who might be interested in the total nutrient intake of Inupiaq Elders, and suggest future research needs for this group. Nevertheless, results of the broad comparisons of nutrient intake to DRIs are contained in the appendix.

The importance of the examination of food patterns is not understated in this work, despite the possible limitations. Increased westernization of the diets of Inupiaq and other Arctic Native Tribes reported by the number of servings of store-bought foods on the food frequency in this study and others (Kuhnlein, et al, 1996, Wein, et al, 1998) is of an important concern especially in light of increased research is relating food intake to the occurrence of chronic disease (McNaughton, et al, 2007). Future studies are needed to develop appropriate assessment methodology for population groups with unique food consumption patterns (Barkoukis, et als, 2007) that is acceptable to the population under study, and provides data quality that can be compared to current standards.

Differences in Intake of Alaska Harvested Foods

A total of 77% of rural respondents reported eating subsistence foods the day before the survey, almost twice the rate reported by urban respondents. Harvested foods contributed 64% of all protein intakes for rural Elders and 42% for urban Elders. Despite the limitations of incomplete micronutrient food composition data, harvested foods appeared to contribute approximately half or more of the total intake to riboflavin (61%), iron (54%), phosphorus (51%), niacin (44%), and vitamin B_{12} (44%). For urban Elders, none of the contribution of Alaska harvested foods exceeded a contribution of 40% of the total intake.

Nutritional Risk

Nutritional risk is the potential for malnutrition. The majority of rural and urban participants reported little nutritional risk. Nutrition risk scores were correlated with limitations in IADLs (rho = 0.31, p = 0.008), and the presence of food insecurity (rho = 0.40, p = 0.0001).

In this study, there were few items with responses showing significant differences on the ten questions of the Nutrition Screening Initiative Determine Checklist by rural or urban location. The majority of participants, 57% (n = 56), reported "no risk" and 22% (n = 22) reported moderate risk. Only 23% (n = 23) were classified at "high risk" – 14 in the urban group, and 9 in the rural group.

Although the number of "high risk" participants was not significantly different, a larger number of "high risk" individuals were found in the urban community, and were younger than the rural Elders.

Diet Quality

Two tools were used to evaluate diet quality: the Healthy Eating Index (HEI) (Kennedy, et al, 1995) and the USDA MyPryamid (2006). It was of interest to appraise the use of a single tool to assess general diet parameters. Constraints of this study did not allow for measurement biomarkers, e.g. serum or plasma, to determine true diet adequacy.

A number of measures in both the HEI and MyPyramid rely heavily on the availability of fruits and vegetables and fresh milk products. Rural Inupiaq Elders lived in very small communities where milk, fruits and vegetables tend to be very expensive and sporadically available. This is in contrast to urban Elders with greater access to large supermarkets. Surprisingly, the urban Elders' reported diet quality was not statistically different from the rural Elders using the HEI tool. The HEI ranked 52% of rural Elders and 69% of urban Elders with diets that "needs improvement," and 46% of rural Elders and 31% of urban Elders as having "poor" diets.

Using the USDA MyPyramid to evaluate overall general diet quality, urban Elders appeared to report more servings of meat and vegetables although no statistical analyses were possible. Rural appeared to report more servings of fats. Rural and urban Elders reported similar intakes of breads and cereals, fruit and fruit juices, milk, yogurt and cheese. Results of MyPyramid and HEI seem to be dissimilar.

More data are needed to understand the patterns suggested by these data. On the surface, a tool that ranks all in a population in a similar way with little variance may suggest the inability of the tool to differentiate characteristics of diet quality to segregate Inupiaq individuals that are receiving adequate diets and those who are not. It may also suggest that diet quality of the two groups were indeed similar.

We found that poor diet quality findings from the two diet quality tools were not substantiated by other data. Intake of calories and protein were adequate, although calorie and protein intake by themselves don't define diet quality.

There were some inconsistencies in evaluation of nutrition risk of malnutrition. The majority of respondents in both communities reported no nutritional risk using the Nutrition Screening Initiative Checklist (NSI), which was consistent with servings from the USDA MyPyramid that suggest diet adequacy. However, findings from the Healthy Eating Index (HEI) showed that the majority of the population ranked as "diet needs improvement" (rural 52%, and urban 69%), and the remainder ranked as "diet poor" (rural 46% and urban 31%).

Four of the ten HEI judging categories used to evaluate diet quality relate to the intake of meat, total fat, saturated fat, and cholesterol. For most in the US general population, animal meat is a high fat item, and thus, a reduction in meat improves diet quality by reducing overall fat and sources of cholesterol. The intake of fish and sea mammals is very low among the general US population, in comparison to the high amounts of fish and sea mammals consumed by Inupiaq individuals.

Harvested meats lend to be very lean and provide little fat and thus contribute little cholesterol (Speth 1989). In addition, the dietary fats found in salmon and sea mammals are high in omega 3 fatty acids, and act to reduce serum cholesterol. The premise underlying the HEI to reduce meat consumption to improve diet quality would not appear to be appropriate within the eating patterns of the Inupiaq peoples at this time. If the use of store bought foods increase replacing the beneficial traditional meats as observed in other Native communities in the mainland US, perhaps then the recommendations of the Healthy Eating Index would have value.

1B: COMMUNITY SUPPORT VARIABLES

Community supports variables were measured by the Elders' level of participation in family and community activities, food security status, and food sharing networks.

Participation in Family and Community Activities

Cultural strengths were compared by two Likert scales that measured the participation in cultural activities and family activities. Few differences were found between rural and urban respondents. It was encouraging to find that many of the rural Tribal customs are being continued in the urban setting.

Conversations with Elders provided their perspective that services are provided to Native Elders out of "respect", seemingly independent of the physical abilities of the Elders. Examples of the services were bringing gifts of raw and prepared food, walking to the store to purchase groceries or to pick up mail, giving Elders rides to community events, washing dishes, sweeping snow from walkways, and delivering water or firewood. Similar comments were obtained from both rural and urban participants. The difference between providing services "out of respect" and "out of need" may be subtle, and the differentiation hard to describe. Rural Elders may have more support simply as a function of being in the village closer to kin and family. Rural villages may allow older individuals to continue in leadership and social roles longer than urban locations due to the increased community support provided by the villagers.

There were few differences by location in most of the components listed for participation in community activities, although the rural group had higher scores for food preservation activities than the urban group. Rural Elders reside close to traditional hunting and fishing camps, so this finding was not unexpected.

There were few differences by location for these social and cultural support variables. The data suggest that the Inupiaq culture remains strong among Elders regardless of location, which is encouraging as Alaska populations migrate from rural to urban areas. The retention of this support could be threatened as more time elapses away from the village, or if the age of the immigrants becomes younger.

Higher mental functioning scores were reported by rural Elders than by urban Elders, but the differences were not significant. For the group as a whole, participation in family activities correlated to higher physical functioning scores (rho =0.26, $p = 0.023$), and higher mental functioning scores (rho = 0.24, $p = 0.040$).

It is possible that the ability of Inupiaq Elders to continue in advisory and supportive roles may be at the heart of defining valuable functioning for the Elders.

Food Insecurity

Food insecurity is lack of sufficient food to meet metabolic needs within the individual's perspective of acceptable foods in an acceptable social context. This measure differs from hunger in that "hunger" is defined to occur when there is not sufficient food to meet metabolic needs. Food insecurity is also the perceived inability to maintain a consistent food supply.

Four indicators of food insecurity and hunger were measured. Of the 98 individuals who responded to these questions, one in four (26%) reported responses suggesting perceptions of food insecurity. There were no statistical differences between rural and urban locations for these measures.

The rates of reported food insecurity (26%) were similar to the rates of nutrition risk (25.5%).

Food insecurity was also negatively correlated with age and mental functioning scores. This suggests that as Elders age and mental capacity declines, their food needs are increasingly provided by family or the community, perhaps decreasing the food insecurity status.

Food insecurity was 26% among the Inupiaq Elders, but not as high as rates reported by the younger Native sample at 37% from the Alaska WIC Healthy Moms Study (Rody, et al, 2002). Food insecurity rates for the US population in 2005 were 11%, and 3.9% for hunger (Nord, et al, 2006). All of the Alaska food insecurity data were collected during the summer months. Differences in seasonal intakes have been described for other populations (Joachim 1997), but it is unknown if rates of food insecurity would also differ if the surveys had been implemented during different times of the year. Nord, et al (2006) reported correlation of rates of food insecurity with heating and cooling costs especially in elderly households. Alaska food insecurity rates may increase during times of uncontrolled living expenses in response to severe winter weather.

Food Sharing Networks

Food sharing networks are complex, organized social structures existing in Inupiaq communities that provide foods to Elders and families. The work by Magdanz and coworkers (2002) work revealed patterns of food sharing among closely related family members in the two rural communities.

Rural food sharing networks had more links and shared more pounds of food than those food sharing networks reported in the urban community. This difference did not appear to influence rates of food insecurity and nutrition risk, which were not different by location. Future work is needed to understand the dynamics of the relationships within the networks in order to provide recognition of the efficiencies of this system in providing nourishment to Native Elders.

These data document the first descriptions of food sharing networks in an urban setting. It is significant that the rural traditions of network organization have been replicated in the urban setting among the group of migrated Inupiaq individuals. Two types of networks were identified in which urban Elders appear to participate: (1) traditional kin-based food sharing networks, and (2) inter-tribal networks food sharing networks.

In the urban kin-based networks, providers of food to Elders continued to be related to family, but the relationships were more distant. For example, one urban older lady spoke that her sister's grandson brought meat from a whale festival held in the region.

Another example of extended kin-based networks in the urban community was observed during the process of gathering data in Anchorage. One family invited Inupiaq friends to their house for me to interview. On one visit to their house, several ladies of distant relationships were talking with two younger women who had come in from the village for chemotherapy. Their conversation tended to indicate that perhaps they knew of each other, but not well, prior to this visit. The visiting women had brought gifts of tomcod for us to enjoy. Although the package of fish was not very big, the gifts of food demonstrated the continuation of complex reciprocating bonds between Inupiaq people described in previous historical writings (Spenser 1959, Burch and Burch, Jr, 2005). Along with the gifts of food, news of relatives and friends, knowledge on how to navigate the Anchorage hospital systems and the women's upcoming medical therapy were also exchanged.

Recognition of the inter-tribal food sharing networks may help to understand why urban Elders reported more total pounds of some Native food items such as whale meat and blubber than did rural Elders in this survey. In the summer of 2005, urban Elders reported 0.83 servings per week of muktuk and 0.14 servings per week of whale meat, compared to rural Elders who reported only 0.21 servings per week of muktuk and 0.11 servings per week of whale meat. In that particular year, the rural villages had not been successful in the harvest of a whale, and were perhaps bound by the limits of their regional food sharing networks. In contrast, it appears that for 2005, urban Elders may have benefited from the many overlapping food sharing networks provided in the inter-tribal network that was present in Anchorage. As a result, urban Elders received more muktuk and whale meat.

Conversations with the Elders in the urban group indicated that informal inter-tribal network was composed of Native families from all over Alaska and the United

States. Elders were held in high esteem within the group, even though the Elder was not from their particular tribe or region. Various events throughout the year sponsored by one or more of the Native groups provided a place to meet, share common traditions, as well as a place to share food.

It was beyond the scope of this project to determine the organization, or leadership roles of members of food sharing networks in either rural or urban location, although it would be an excellent topic for further investigation.

Food sharing networks are more important than mere vehicles to share food (Burch 1998). As the social climate has changed, food sharing networks may have patterned relationships between individuals that allowed for collective problem-solving skills to occur (Ellanna and Sherrod, 1984). Those skills continue to be used today in both rural and urban locations. It appears that Elders are central to this process, as they play a crucial role in transmitting knowledge needed for these networks to survive.

2A: PHYSICAL FUNCTIONING

Differences in Physical Functioning by Location

Physical functioning is described as the ability to perform certain tasks of daily living, allowing a person's continued engagement with family and community. Commonly, measures of physical ability are made by the capacity to perform the Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs).

Physical functioning summary scores from the SF-12 were higher in rural communities than urban ($t = 2.36$, $p = 0.020$). The mean age of the rural respondents was five years older than the urban group, and the rural Elders reported less pain. As Elders fulfill their roles as advisors and teachers, there may be more outdoor activities available in which the Elders participate, such as helping at fish camp, or gathering grasses at the coast to teach a grandchild how to weave baskets. Elders in rural households had increased responsibilities for the care of grandchildren ($X^2 = 6.21$, $p = 0.013$) which may have kept the Elders more physically active. Measurement of physical activity was not part of this initial baseline study, and more data are needed to understand these relationships.

The measurement of physical limitations of rural and urban Inupiaq Elders proved challenging. Both groups of Elders surveyed were observed and self-reported as being active and physically able. The tools used showed few limitations of activities of daily living (ADLs) and instrumental activities of daily living (IADLs) among the rural and urban Elders, yet many had visible physical ailments. To evaluate limits of physical ability within Inupiaq Elders, a scale may have more utility if the questions included culturally appropriate day-to-day activities, such as the ability to clean fish, carry grandchildren, or lift a bucket of water that are necessary when living in a rural Inupiaq village.

Relationships Between SF-12 PCS, and Limitations in ADLs and IADLs

Few relationships were found between the SF-12.v2 physical functioning component summary scores (PCS) and measures of physical ability (Limitations in ADLs and IADLs). Although, differences reported by rural and urban Elders in physical functioning scores (PCS) were significant ($t = 2.36$, $p = 0.020$). The small group and the low number of respondents who reported limitations in ADLs and IADLs may have prevented strong associations.

2B: HEALTH

Self-Reported General Health

There were no significant differences between categories of self-reported general health by rural and urban Elders. Self-reported general health scores were correlated with age (rho = 0.25, p = 0.029).

Among rural respondents, 81% reported their health to be “excellent”, “very good” and “good”, compared to 76% reported by urban areas. Only 19% of rural Elders and 25% of urban Elders reported their health as “fair” or “poor”.

During our brief time in each community, Elders seemed to express a general sense of optimism about life, and perhaps, this is reflected in the reporting of their general health. Fienup-Riordan (1994) wrote of the Alaska Native philosophy that words have power to change the future. For example, if an Elder reported that their health was “good,” their health would be “good” and their words would become true. Johnson and Wilinsky (1993) also described the inconsistencies of disease diagnosis and perceived health.

Magdanz, et al (2002) reported similar positive projection on future events when recording the harvest of wild game, sea mammals and fish. As one Elder told him, “*The fish have ears.*” implying the belief that the Elder’s comments about the fish could determine the Elder’s ability to catch the fish in the future.

Mental Functioning

Mental functioning scores were obtained using the SF-12 survey tool. Only 17 individuals (17%) of the total respondents had mental functioning scores below national SF-12.v2 norms.

Reported mental functioning summary scores were slightly higher among rural respondents than urban, although not significantly. Higher mental function composite scores (MCS) were positively correlated with protein intake (rho = 0.23, p = 0.047), the absence of food insecurity (rho = -0.27, p = 0.019), and higher participation in family activities (rho = 0.24, p = 0.040). A rural environment appeared to offer the respondents in this study a positive environment in which to age.

Observations were made of Elders living in both the rural and urban settings who reported their overall general health as “excellent” or “very good”, but who had limiting physical ailments. In the supportive Inupiaq villages, despite their physical limitations, the Elders were included in community activities, which is consistent with the Elders’ traditional roles and expected duties. In both the rural and urban locations, it appears that being old is viewed not as a diminished social position, but as an honor to be cherished both by the individual and the community.

In the presence of a supportive rural community, the occurrence of physical and mental ailments may be viewed as a natural part of the aging process. The very act of surviving the harsh arctic environment may have imprinted on Elders a realistically stoic view of life. Inupiaq individuals may have developed an age-appropriate view of life that accepts physical limitations. Comparison data from American Indian residing in the continental United States (McDonald, et al, 2005) indicated that their cohorts reported higher number of limitation in ADLs, IADLs and lower self-reported general health status than Alaskan Inupiaq Elders. This may suggest a greater retention of cultural practices in rural Alaskan Native communities that values and cares for their Elders. Lower reported general health reported by US American Indian Elders may suggest disappointment in being less able to achieve their anticipated elevated community role.

Relationship Among Variables

The last three research question examined relationships among the selected variables of this study. As the first base-line study of food customs of Inupiaq Elders it was recognized that the variables selected may not adequately quantify underlying cultural themes that may uniquely shape responses to meet basic needs. It is naive to assume that we can understand the deep rich culture of the Inupiaq of northwest Alaska by using a quantitative survey, even though a large amount of data were collected during the process. The caveat in looking at the relationships between variables is the recognition of the tremendous gaps in data that may help us understand how the variables interplay in the day-to-day lives of the Inupiaq Elders.

We did not have the benefit in this initial study of including qualitative data from community group discussions and from informant interviews to define cultural beliefs and values that may anchor the community behaviors that provide support to Elders. Future studies will want to include systematically collected narrative data to capture the Elders' views on the changing social and economics factors, and the kinship relationships that appear to help families remain strong and vibrant. However, the outward migration of Elders from rural to urban locations may suggest that the traditional values towards Elders may be shifting and if so, may be reflected in their increasing use of non-traditional strategies to maintain their own nutritional wellness.

In looking at the relationships between the variables, it was difficult to anticipate how the variables would relate. Human behavior is seldom linear, as these preliminary data may suggest.

3A: RELATIONSHIPS AMONG SELECT NUTRITION PARAMETERS AND PHYSICAL FUNCTIONING

Relationships between Nutritional Parameters and Physical Functioning (Limitations in ADLs, IADLs, and SF-12v.2 Physical Functioning Component Scores (PCS))

Several studies have linked adequate nutrition with resulting health and the lack of disabilities. Sharkey, et al, (2002) found relationships between both increased disability and unintended weight change, and the use of more than three medications. Gerrior (2002) analyzed the NHANES III data and found a pattern of nutrient adequacy that was associated with continued activity.

In this group of Inupiaq Elders, few relationships were found between nutrition parameters and limitations in ADLs and IADLs perhaps due to few numbers of Inupiaq Elders that reported physical limitations. The negative correlation between food sharing episodes and increased limitations of ADLs is noteworthy in that the number of pounds of harvested food was not correlated as ADLs increased. This may suggest that more food was shared in fewer episodes.

Correlations of higher SF-12.v2 PCS scores with greater participation in family activities, increased pounds of shared food, and more food sharing episodes may indicate the continued physical abilities of this aging population group.

The low reporting of ADLs and IADLs could be a reflection of Inupiaq cultural values. Following two years of discussion by community-selected Elders Inupiaq cultural values were codified in 1981 by The Northwest Alaska Native Association (NANA). From these conferences, a list of 15 cultural values was recognized by the NANA Council and then approved by the northwest Alaska Native villages. The values promote a positive atmosphere of work, being helpful, avoiding idleness, and having a sense of humor. If an individual had an attitude of negativity or was one to complain they would not be following the spirit of these values. As a result, the Inupiaq Elders may not have been fully forthright in their assessment of their physical status, and may have under-reported limitations with daily and instrumental activities.

As expected, nutrition risk was found to have significant correlations with limitations in IADLs. Higher SF-12.v2 physical functioning scores (PCS) was positively correlated with more pounds of harvested food shared with the Elder household (rho = 0.236, $p < 0.05$).

3B: THE RELATIONSHIP AMONG SELECT NUTRITION PARAMETERS AND HEALTH?

The Relationship between Select Nutrition Parameters and Self-Reported General Health (GH), SF-12.v2 Mental Functioning Summary Score (MCS)

In this small group of Inupiaq Elders, increased age was positively associated with increased general health (GH) (rho = 0.25, $p = 0.029$). These data are in contrast to the SF-12.v2 norms that decline with increased age. This phenomenon may suggest that aging within the Inupiaq community is not considered burdensome.

The Inupiaq responses that were inconsistent with the national SF-12 norms (Ware, et al, 2005) may also suggest that this question was not appropriate within the Inupiaq community. Only one question on the SF-12.v2 series addressed general health status. Individuals are asked to describe their health by responding to a list of descriptive terms (excellent, very good, good, fair, or poor) which may possess different shades of interpretation within the Inupiaq language. Most of the Elders spoke the Inupiaq language as children, and as they age they may be more comfortable using traditional linguistic patterns of their Native tongue.

Inupiaq Elders may have interpreted the SF-12.v2 measure for general health in a more holistic view of health. From a western perspective to answer this question one might cognitively synthesize the number of diseases, or count various symptoms before answering this question. Within a culture that believes that all things are related, they may see their general health as the total health of their situation in life, their favorable status as an Elder, or may address other broad constructs of health.

Mental Component Summary Scores (MCS) were positively correlated with the intake of protein (rho = 0.23, $p = 0.047$) but was negatively correlated with participation in family activities scores (rho = -0.24, $p < 0.05$), but was negatively correlated with the presence of food insecurity (rho = -0.27, $p < 0.05$). MCS increased as protein intake increased, family participation increased and as food security increased. Participating in family activities may increase levels protein intake through increased activity through the food sharing process, and also may buffer the Elder from food insecurity.

In this group, MCS was not however, correlated with the number of pounds of harvested food (rho = -0.01, p = 0.916), although the number of food sharing episodes did approach significance (rho = 0.20, p = 0.085). The assumption is made that increased protein comes from the food sharing networks, but there may be other confounding variables in play that have influence. (Increased income may also affect increased intake of protein, but was not evaluated in this study). However the triad of variables: food sharing, family participation and mental health are similar to the initial triad of problems described by the Elders at the NRC listening session (NRC 2005). The Elders emphatically reported that when they moved from rural to urban, that the Elders "*couldn't get their Native food*," "*they didn't know anyone*," and because of this "*they willed themselves to die*."

The rural setting may enable Elders to participate in traditional activities and be in traditional social roles as they had anticipated. The rural environment may be less stress producing for an Elder than living in an urban environment "*away from people they know*" (testimony at the National Resource Center, NRC, for American Indian, Alaska Natives and Native Hawaiian Elders "Voices of Our Elders" Conferences, 2005). In addition, access to traditional or Native food may offer physiological benefits that influence perceived health that were not tested in this study. For example, Elders reported that one of the benefits of seal oil was that they "*felt good*" when they had it available. There is a limited amount of research (Bourre 2005) that supports the Elders' beliefs.

3C: RELATIONSHIPS AMONG SELECT NUTRITION PARAMETERS, COMMUNITY SUPPORT VARIABLES AND DEMOGRAPHIC CHARACTERISTICS

This question examined the potential of relationships between and among select nutrition parameters, community support variables and demographic characteristics.

Relationships with Nutrient Intake

Intake of energy was positively correlated with the intake of protein (rho = 0.87, p = 0.001), and the proportion of protein to body weight (rho = 0.93, p = 0.001). As intake of energy increased, so did the protein, and thus the proportion of protein to body weight also increased.

Relationships with Food Insecurity

Increased age was negatively correlated with food insecurity (rho = -0.29, p = 0.012) suggesting that, as Elders increase in age, their food needs are increasingly provided by the community. This indication is consistent with the data showing that those Elders with higher levels of food insecurity also received higher levels of shared food (rho = 0.29, $p < 0.001$). As expected, higher nutrition risk scores were correlated with higher reports of food insecurity (rho = 0.40, $p < 0.001$).

Higher BMI were correlated with lower NSI Nutrition Risk scores (rho = -0.24, p = 0.041). Mean body index (BMI) for rural Elders was 27.3 ± 4.9, and was 26.6 ± 5.3 for urban Elders. Higher BMI may indicate a preference for body image that has not been examined for the Inupiaq population and deserves further study.

Among predominantly Caucasian populations, a thin body profile is a desired physical appearance within the definition of healthy body (Cash 1985, Fallon 1990, Freedman 1990, Furnham and Baguma 1994), and certainly has been promoted as part of good general health (CDC 2006). Body image has been defined by Schilder (1950) to be "*not only a cognitive construction but also a reflection of wishes, emotional attitudes and interactions with other*."

In a preliminary pilot test as part of the Alaska WIC Healthy Moms Study (Rody, et al, 2002), clinic staff in five villages were asked to pick a silhouette of a woman in poor health. The thin, but healthy silhouettes were repeatedly chosen with remarks such as *"if she is that thin, she must be drinking, or using drugs*". One clinic staff added, "*she must be HIV positive*". None of the clinic staff chose an overweight silhouette as unhealthy. The strong emotional comments were surprising. Thinness in other cultural groups, such as Western Caucasians, is not usually associated with socially undesirable behavior. The preference for a non-thin body shape found in the rural clinics is also not consistent with the desire for thinness expressed by American Indians living in urban settings (Sherwood, et al, 2000, Story, et al 1995, Bjerregaard, et al, 2002).

Fabricatore (2007) proposed that the preference for higher BMIs may be the result of underlying cognitive foundations, a theoretical framework that emphasizes benefits of behaviors. The association of higher BMIs and lower rates of food insecurity may suggest a preference for higher BMIs among women in Inupiaq communities. Brown and Konner (2000) proposed that both genetic and cultural pressures could predispose a culture to excess body weight. Excess body weight or fatness may have historically guaranteed survival of a pregnancy, and survival during times of limited food supplies. In addition, Brown and Konner (2000) expressed that many cultural groups valued excess body weight as a symbol of the ability to provide for a family, and as an "index of general health."

There may also be cultural pressures to have a larger body habitus. Many cultures view large round bodies as a sign of beauty and as a trait to be desired, especially among women. The Havasupai Indians of the American Southwest (Smithson 1959), and the Tarahumara of Northern Mexico (Bennett and Zingg 1935) both have historically valued women who were overweight or obese. More recently, Gittelsohn examined perception of healthy body shapes among Ojibway-Cree living in the Sandy Lake Community of Canada and found that there were differences among age and gender groups with older populations preferring larger body shapes (Gittelsohn, et al, 1996).

In this study, BMI was negatively correlated with the proportion of protein to body weight (rho = -0.57, p = 0.001). Lower BMIs were found for individuals with higher protein to body weight ratios. This may suggest that the traditional diet high in protein and low in carbohydrates reported in the past (Draper 1978) may continue to be effective in maintaining a lower BMI. This warrants further study, especially as the rate of diabetes mellitus (characterized by increased carbohydrate intolerance) increases among all Native populations.

Relationships with Community Support Variables

As expected, an increased number of pounds of harvested food was correlated with an increased number of food sharing episodes (rho = 0.62, p = 0.001). Also, food sharing episodes were positively correlated with high participation in community activities (rho = 0.36, p = 0.004). Likewise, increased participation in community activity correlated to increased family participation (rho = 0.25, p = 0.030).

APPLICATION TO THEORY

Two theories, the theory of social ecology (Stokols 1996), and the theory of cultural materialism (Harris 1987, Ross 1987), were considered when this study was designed to understand Inupiaq food customs and behaviors. Key themes of these theories are applicable to understand the conclusion that "Rural Elders fared as well or better than urban Inupiaq Elders in terms of diet, mental and physical health."

Cultural materialism proposes that cultural beliefs, social systems and technology result from food acquisition, distribution and consumption, and these are reflective of the physical habitat in which they exist (Harris 1987:61). Harris proposed that optimization of resources are balanced with the physical cost of harvesting the resources, thus comparing success rate and yield. Food sharing networks reduce the cost of securing food by the individual by spreading the risk of food procurement among a group of hunters (Harris 1988:390). Hunting large sea mammals is too risky for one hunter, and requires the work of many individuals.

As the theory of cultural materialism has predicted, the Inupiaq villages demonstrated the interrelatedness of individuals with the larger systems in which they operate through the use of identifiable food sharing networks. Networks of individuals work together to jointly plan the harvest and distribute the food. Rural food processing is central to daily activities and requires social interaction of both genders and all age groups. Cooperative activities are reflected in large rural food sharing networks. Cultural materialist would conclude that food procurement activities precipitate a higher sense of well-being resulting in higher physical and mental scores.

The rural village's diverse food supply exemplified by harvesting of diversified number of species of animals, fish, sea mammals and plants is consistent with Harris's theory of cultural materialism when he wrote, "*the need to eat is a constant, but the quantities and kinds of food that can be eaten vary in conformity with technology and habitat*" (Harris 1988:388). supports not only Harris's writing on this subject (Harris 1987:74), but Cohen's work as well on community resiliency strategies to forestall food stress (Cohen 1977).

In urban communities, daily activities are not directed at subsistence food harvest and processing, but that of purchasing food items. The urban Elder’s knowledge and years of experience is not required in the urban setting, and the Elder may receive less appreciation than Elders receive in rural settings. Urban food activities are less important as sources of family interaction, thus the importance of the urban Elder’s role within the family may be diminished. The less concentrated system of required social interactions characteristic of urban life may impact lower mental and physical scores reported by the urban Elders in this study.

The social ecology theory describes basic relationships between health, food behaviors, social, and community climates. Many aspects of food and social climates were similar among Elders in both locations, as would be expected since most urban Elders have lived in the urban setting for less than five years. Should the Elder's length of time in the urban setting increase in the future, the differences may become more pronounced. Stokol proposed individuals shape the social and community climate to benefit health and food behaviors. This study found that Inupiaq cultural values support the importance of relationships within the community.

Relationships and cooperation between community members is essential for the success of food sharing networks. This study found that strong food sharing networks among related family continue to exist in the two rural communities surveyed. We also found in urban communities hybrid food sharing systems that included non-family have evolved among Inupiaq members that are living in an urban location. Urban networks are dependent upon harvested food goods that are mailed or delivered from family in rural villages. Urban Elders continue to have interactions with others from their home communities with a focus on entertainment and recreation, rather than on essential subsistence activities of food hunting and processing.

The presence of the thriving networks validate the continued traditions of shared resources, and is consistent with the underlying tenets of social ecology theory that groups will organize social systems to their benefit within the confines of their locations, even though the systems had different characteristics, as would be expected, based on the social climate in the rural and urban settings.

Social climate is determined by the underlying values established within a community. Inupiaq values as discussed earlier provided guidelines that expected cooperation among community members. This social climate was fundamental for survival in the harsh Arctic climate.

Foremost, this researcher observed in all visits to the study communities a continued respect for the Elders in the Inupiaq community. This identifiable trait is in keeping with the cultural materialism theory and the social ecology theory, as well. Rural Elders appear to be core to central functions of Inupiaq rural villages to maintain adequate food supply by sharing their knowledge of when to harvest and best methods to preserve the optimum amounts. Elders also appear to act as the storehouses of traditional knowledge needed for communities to adapt systems and technologies for the continuation of the culture. The Elder's wider-broader view of the purpose of communities guide young adults and families often from their youthful inner focus to a community focus through the application of the Inupiaq values, and by serving as an example for others to follow. The day-to-day support provided by the village for the Elders maintains the Elders' valued leadership role even though the Elder's physical abilities may be limited or declining. These relationships do not appear to be duplicated in the urban setting.

EVALUATION OF INSTRUMENTS

The research questions were designed to elicit information most relevant to describing the food customs. Although the scope of this study only extends to the Inupiaq tribal groups, some of the methodology could be applied to all Inupiaq people, and adapted to the study of other Native Tribes. As Elder indigenous populations continue to grow in both rural and urban areas worldwide, it becomes ever more important to find standard methods for describing and retaining strength of Native food customs.

As the first general baseline descriptive study, few validated tools were available for the assessment of the unique Inupiaq population. Several tools were used in this study that have had limited use in Alaska or have not been used previously with Alaska populations. The tools chosen were: Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs), the Block Food Frequency Questionnaire (BFFQ), the Healthy Eating Index (HEI), USDA's MyPyramid, and the Medical Outcome Study SF-12.v2.

ADLs and IADLs

Few limitations were reported using the ADL and IADL instruments by the Inupiaq Elders, yet physical limitations were observable by the surveyors. It appears from these data that these tools lacked sensitivity and specificity to assess functional limitations. It is unclear if the activities under review were not meaningful to the Inupiaq population. Or, that the Elders' felt that not being able to perform a function was not a limitation, but was an expected stage of life.

This may suggest cultural differences expressed by the Elders that decline in physical abilities are expected as part of the aging process. This also may suggest a bias in the selection of the survey participants. The survey examined only community dwelling individuals. In the rural community there were obvious physical limitations of some of the participants. In the urban community, we did not survey individuals living in assisted living or nursing home facilities.

Block Food Frequency Questionnaire

The BFFQ was slightly tedious to administer, but it appeared to include all foods consumed in both the rural and urban communities: both harvested and store-bought foods. Having the foods presented on a printed form created an accepting atmosphere for even the more socially undesirable foods such as sodas and potato chips. The Block FFQ is being used by the Strong Heart Study (Strong Heart Study Coordinating Center, 2006) that is examining the eating habits of American Indians which will offer future comparisons between the geographically diverse Native groups (Tribes in Alaska, the Dakotas, Arizona and Oklahoma) using data from the same tool. The ability to examine sub-groups within the Native population is an important step in looking at the diversity of health trends of all Native groups (Wiedman 2006).

Researchers are re-examining the use of dietary assessment tools in the examination of diet and chronic disease. Their focus appears to be defined by different concerns. One camp has focused on the error of the measurement methodologies, specifically the within-person variance of self-reported diets to determine "usual" intake (IOM 2000); while the other has focused on the inconsistencies of diet and many dietary biomarkers (Neuhouser 2007, Schatzkin, et al, 2003, Fowke, et al, 2003).

The challenge of selecting a diet assessment tool that was acceptable to the Inupiaq Elders and was feasible in terms of researcher resources were similar as those listed by Kristal (2005) in his call for new dietary assessment strategies for large cohort studies. The goal of this study was to look at differences in the food customs between rural and urban Inupiaq Elders to capture the sense of the Inupiaq yearly eating patterns.

The Block FFQ provided individual intake of nutrients. Group mean intake provided by food choices by rural and urban location limited the level of analysis.

Diet Quality Assessment Tools

The purpose of diet quality assessment tools such as the HEI and the USDA MyPyramid is to improve the intake of food groups that are proxy of key nutrients. Food groups were chosen for the US populations supported by scientific evidence that the nutrients improve health or reduce chronic disease (Kennedy, et al, 1995). Foods that contribute similar nutrient sources may be different in the food pattern of the Inupiaq culture.

a). <u>Healthy Eating Index</u>

Due to the lack of variance in the responses, it appears that the HEI may be inappropriate to evaluate eating patterns of populations who obtain a majority of their food from wildlife resources, especially meats (fish, game, marine mammals). The majority of Elders using the HEI classification were rated with “poor diets” (rural: 46%, urban 31%) or “diets that needed improvement” (rural 52%, urban 69%). Never-the-less, the Alaska results were consistent with Vitolins’ (2007) recent assessment of older adults over the age of 65 who were living in North Carolina.

The meat-focused Inupiaq diet appears to rate poorly using the HEI scale because four of the ten HEI judging categories evaluates the intake of meat, total fat, saturated fat, and cholesterol. To improve scores on the HEI scale, Inupiaq Elders would be required to reduce their intake of harvested meat and meat fats drastically changing traditional eating patterns that have developed over centuries.

b). <u>USDA's MyPyramid</u>

Vitolins (2007) also evaluated the reported intake of the North Carolina older adults to the USDA Food Guide Pyramid Servings, consistent with the methodology used in this study. Both the HEI and the Pyramid similarly ranked the North Carolina older adults with less than desirable diet patterns. However, where the HEI ranked the diet as inadequate, the Inupiaq Elders were able to meet minimum servings on the MyPyramid based on grouped data. If evaluation of MyPyramid servings using data by individuals shows variance of responses, the USDA MyPyramid may have potential to help Inupiaq Elders and other Native groups make informed choices as more store-bought foods are incorporated into their diet patterns.

Medical Outcome Study SF-12.v2 Health Survey

The Medical Outcomes Study SF-12.v2 Health Survey (SF-12.v2) was used to measure subjective self-assessment of key domains of health status. Twelve questions yielded two summary scores, physical functioning (PCS) and mental functioning (MCS), based on eight subscores (Ware, et al, 2005). To our knowledge, this is the first time that the SF-12.v2 has been used with Native individuals in Alaska. Sufficient variances of responses were obtained to allow comparison by locations.

The SF-12.v2 questions that dealt with anticipated performance that was projected into the future, such as the question that asked "Did you accomplish less than you would like as a result of your physical health (or mental health)?" created some confusion when proposed to the Elders. Some of Elders looked puzzled when we asked, "How much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives)?" Focus groups may be helpful to understand how Inupiaq Elders view their capacity for self determined action.

From a practical perspective, the question asking participation in moderate activities listed examples as "pushing a vacuum cleaner, bowling or playing golf" received a few giggles. Activities similar in endurance yet culturally compatible may elicit different responses.

LIMITATIONS OF THE DATA

Potential threats to validity and precision may exist as to the findings of this study design, beyond those controlled by the researchers. The cross-sectional data offered information at one point-in-time and may not imply causality.

This study was the first to use the SF-12 with Inupiaq Elders and as more data is obtained to evaluate the effectiveness of this tool, it may prove to be culturally inappropriate for Alaska Native populations. All tools were pilot-tested by members of the Elders Councils in the larger study community and have been used by researchers with other Native groups outside the State of Alaska.

The percentage of participation was very high (approximately 94% in rural villages). Self-reported data by self-selected interviewees may not be representative of the population as a whole. Jackson and Beard (2005) reported high levels of accuracy of self-reported data among older American Indian and Alaska Natives. The accuracy of the data presented in this study may also prove true as the data are evaluated by future researchers.

There are no validated diet assessment tools to evaluate Alaska unique foods used by Native Alaska populations. This study used a food frequency questionnaire which is intended to capture data concerning foods consumed over the period of a year. To record the diversity of the diet and the strong seasonality of food sources in rural communities (Ballew, et al, 2005), we also believed that the food frequency was the most feasible in terms of low burden on participants and cost. Willet and Hu (2007) recently commented on the practicality of food frequency tools for use in epidemiological studies. The unofficial sounding board of Alaska Native individuals who encouraged this work thought that the food frequency would be less invasive to older adults who were being surveyed by younger surveyors, than using 24 hour recall techniques.

The Institute of Medicine guidelines (2000) propose that evaluation of diet adequacy using the new Dietary Reference Intakes (DRIs) Adequate Intake (AI), Estimated Average Requirements (EARs), and Intakes Above Upper Limits (ULs) have not been calibrated to use with food frequency questionnaire data (personal correspondence with Sarah M. Nusser and Alicia L Carriquiry, April 4, 2007). Techniques to compare the DRIs to food frequency questionnaires are still being reviewed (personal correspondence with Alan R. Krystal, April 5, 2007). None are approved at the time of this project.

Mean intakes between rural and urban Elders were compared to look at changes in intakes by Inupiaq Elders living in rural and urban locations. Evaluations of nutrient adequacy of the diet of Inupiaq Elders will be reserved for future studies.

Demographics, constraints of culture and remote geography dictated that a self-selected population be used. However, every Elder over 50 years of age living in the partnering villages was personally contacted and asked to participate. The lack of frail Elders in the urban group may have limited the strength of comparisons. Differences in many of the variables may have been higher had rural and urban groups had been matched by age and gender.

Another potential limitation was that data collection occurred during a short period of time during the summer and fall of 2005. Communities are dynamic, constantly changing and are adapting to social and political environment. Conclusions made through brief encounters may inadvertently be misinterpreted based on limited observations. However, despite possible limitations, this new information substantially adds to the total body of knowledge that could be useful in future studies.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

The Inupiaq Tribe resides north of the Arctic Circle in northwestern Alaska. The people are characterized by their continued dependence on harvested fish, game and plants, known as a subsistence lifestyle. Many are suggesting that they leave their historical home and move to urban communities, places believed to be more comfortable for the Elders, away from the harsh climate found in the rural villages and nearer to more sophisticated health services. Tribal Elders disagree and have stated, "*Elders need to be near the river where they were raised*" (Branch 2005:1).

Foundation of the research questions examined the premise that traditional food customs are essential to the health and well-being of Inupiaq Elders. Specifically, the purpose of this research was to determine whether differences in food practices between rural and urban locations affect nutrient intake and self-reported general health of Inupiaq Elders living in rural and urban Alaskan settings. For this study, food customs were defined as the intake of specific nutrients and food groups, extent of food sharing networks, the presence of food insecurity, and frequency of cultural activities and patterns related to food. This study also compared the self-reported health (GH) of the rural and urban Elders and explored potential relationships between select nutrition parameters, community support and measures of mental (MH) and physical health: Activities of Daily Living (ADLs), Instrumental

Activities of Daily Living (IADLs) and SF-12 Physical Component Summary Score (PCS).

The survey group consisted of a total of 101 Inupiaq Elders over the age 50 were surveyed; 52 lived in two rural villages (26 male, 26 female) and 49 lived in Anchorage (28 male, 20 female). Individuals in the rural Native communities were older. Ninety-four percent of all eligible individuals living in two rural communities participated; they used many of the same food sharing networks, and had many common family ties. Urban participants were recruited using a snowball technique. Many urban participants were recruited from a list given by the rural Tribal Councils. Other urban individuals were identified from contacts within the Anchorage Native community, from presentations at local Native organizations and flyers posted at Native events.

Dietary intake data were collected using the Block 98-item Food Frequency to capture the intake of the seasonal patterns of subsistence harvest. To facilitate collection of food insecurity data, the researcher collaborated with the Economic Research Division of United States Department of Agriculture (USDA) on the development and use of a new research tool specifically designed for non-cash economies within a Native community. The USDA MyPyramid and the Healthy Eating Index were also employed to estimate diet quality, but they did not prove applicable to the unique dietary patterns of the Inupiaq Elders. The extent of food sharing networks and the presence of food insecurity were evaluated using the Alaska Department of Fish & Game/National Park Service (ADF&G/NPS) Household Harvest Survey and Nutrition risk was assessed with the Nutrition Screening

Initiative Determine Checklist. Data on the frequency of cultural activities and patterns related to food were gathered using the "Assessing Our Native Elders, Version II" tool of the United States Administration on Aging, developed by the University of North Dakota National Resource Center for Native American Elders. Mental (MCS) and physical (PCS) functioning and mental (MH), and general health (GH) were evaluated with the Medical Outcomes SF-12. To our knowledge, this was the first evaluation of the SF-12 among Alaska Native populations.

Once collected, data for each variable were analyzed and compared by rural and urban location using t-test, X^2, and Mann-Whitney U-tests depending on the type and distribution of the data. Strength of relationships among variables were measured by Spearman's rho correlations.

Data collection process was conducted consistent with the guidelines presented in "Ethical Principles for Conduct of Research in the North" (National Science Foundation, 1988) and the Institutional Review Board at Florida International University and University of Alaska, Anchorage. The study was designed to accommodate as much community participation by the Elders as possible.

Results found that rural and urban participants had similar intakes of energy, macronutrients and some micronutrients. Urban Elders had statistically higher intakes of B6, B12, vitamin D, folate, magnesium, potassium, sodium, and zinc. Rural Elders had higher percentage of nutrient intakes from harvested foods than urban Elders, with the exception of vitamin D and fiber, e.g., 64% of protein intakes of rural Elders came from harvested foods compared to 42% in urban Elders. Individuals in the rural Native communities had higher family participation scores and used larger food sharing networks (55 annual sharing episodes for rural individuals and 3 for urban), which correlated with greater intake of traditional foods by the Elders (mean household amounts of subsistence foods were 2,606 pounds for rural and 251 for urban). Rates of food insecurity were relatively high in Inupiaq Elders, i.e., 26% compared to 11% in the greater US sample, but were similar between rural and urban Elders.

Rural respondents had higher mean SF-12 Physical Functioning Component Summary Scores (PFS) (i.e., less disability and pain); although no group differences were found between the Elders' limitations in activities of daily living (ADLs) and limitations in instrumental activities of daily living (IADLs). Rural Elders reported higher mental health component scores (MH), but the mental function component summary score (MCS) were similar between the two groups. Likewise the general health component scores (GH) were also similar.

When data from rural and urban Elders were combined, a number of community support variables were correlated to Inupiaq Elder health and well-being. Greater participation in family activities and lower food insecurity were correlated to SF-12 Mental Functioning Component Summary Scores (MCS). The edible pounds of harvested foods and the number of food sharing episodes were positively correlated with SF-12 Physical Functioning Component Summary Scores (PCS).

CONCLUSIONS

The research questions focused on differences that location had on four groups of variables: nutrition parameters, community support, physical functioning, and health. Location did not appear to influence energy intake or intake of protein; levels of nutrition risk and food insecurity which had similar rates between the two groups, as did participation in community activity scores. Both rural and urban Elders reported few limitations of activities of daily living (ADLs), and instrumental activities of daily living. Self-reported general health scores (GH) were also comparable by location.

Overall, this study found that rural Inupiaq Elders fared as well or better than Inupiaq Elders living in Anchorage, the urban location. We can say as a group, Elders appear to be healthy and active and reported very few physical limitations. But at this point, we don't have the data to attribute this good health to diet quality. However, we can say that traditional food customs were practiced more in rural communities than in an urban setting.

Severe limitations in available assessment tools preclude us from making conclusions relative to adequacy of nutrient intake or diet quality in Inupiaq Elders. Specifically, the method for determining usual nutrient intake that is recommended by the Institute of Medicine (IOM) was not practical for use in a population with tremendous seasonal variation and unpredictable and variable harvests of game, fish, and plants. Further, even if accurate intake data are gathered, the exact nutrient content of many of these foods is unknown at this time. Existing approaches to evaluate overall diet quality also are of limited validity in this population. For example, dietary fat content is a major determinant of Healthy Eating Index scores, yet much of the fat in the diet of Native Alaskans is from sea mammals and fish, which contain no trans-fat and little saturated fat but are high in omega-3 fatty acids. We can say that, as a group, Elders appear to be healthy and active and report very few physical limitations. But at this point we don't have the data to attribute this good health to diet quality.

Traditional food customs, which are practiced more in rural communities than in an urban setting, support the health and well being of Inupiaq Elders. Rural Inupiaq Elders reported higher intakes of Native foods, had stronger food sharing networks, and had higher family activity scores than did urban Elders. These factors seem to influence the overall well being of the rural Inupiaq Elders as demonstrated by higher physical functioning scores. Rural Elders also reported higher vitality scores and less pain, even though their mean ages were five years older than the urban Elders. Further, presence of a rural community support network provides harvested food regardless of the physical and mental abilities of the older Native individual. It has been said that when Elders are in the rural setting they are near "*people they know,*" and it is a place "*where they can get their Native foods*" (NRC 2005).

Health services for Native Elders may be best provided within the framework of their community. Elders could remain longer in their villages, should their health decline, near family and friends if an expanded use of the existing village clinic system could be enhanced by regular visits of health experts (for example, nurses who could deliver chemotherapy at the village, rather than the infirmed Elder flying to the regional or state hospital). Elders would not have to be sent to urban nursing homes or distant medical centers if an assisted-living facility were available within the village. Perhaps the establishment of a geriatric specialization for community-health-aids who currently provide routine medical care could address the more specialized health needs of rural Elders at the village or community level. This approach is consistent with the desires of the Elders, i.e., the Elders told us, "*Elders need to be near the river where they were raised*" (Branch 2005). DeCourtney, et al (2003) discussed the Elders' concern of being alone when they died when they told her, "*Who will cross the river with me?*"

Usually, providing services to larger groups offer an important economy of scale which reduces the cost per individuals. However, within small Inupiaq communities, the cost of providing services to Elders may be less in the rural setting than the urban, although these costs have not been systematically evaluated. Currently, the costs of intangible support provided by the village are not included in the cost of service equations. Some of these rural intangibles, such as running errands, picking up the mail, or dropping by a plate of dinner, are costly when purchased or provided in the urban environment. Few supportive sources are available to urban older adults that are cost-free.

Establishing long-term-care services in rural communities would meet the health needs of Elders while engaging younger village inhabitants, and preserving the cultural value of caring for "our own." Paid work caring for the elders can provide income and pride in contributing to retention of the family networks, food sharing networks, the value of subsistence living and the retention of endangered food customs. In addition, with increased support in rural communities, it is possible that many of the tribal members currently in urban areas also would be able to return home.

RECOMMENDATIONS FOR FUTURE STUDIES

Throughout the manuscript the researchers have alluded to the need of future research as the limits of the data, limits of the tools, or when a phenomenon was noted that was not well defined in other literature were found. This was to assure the reader that we were aware of the limitations of the conclusions that were forthcoming. In addition, for as much as the dissertation process is an academic exercise to teach the skills of good research, the process also develops a platform for future research.

This study looked at differences in a plethora of variables reported by Inupiaq Elders living in rural and urban communities. More data are needed to understand the events that originally precipitated the Elders migration from rural to urban communities. Failing health, access to increased services, or to be near younger family members who are employed in urban setting have been suggested. Elders appear to be essential in creating a healthy atmosphere for young families. Answers to this fundamental question are needed to effectively support Inupiaq Elders in their homes to facilitate the stability of rural communities.

Universally, there is a new awareness that the eating patterns within and between cultural groups have great diversity and that more work is needed to develop appropriate assessment methodology for population groups with unique food consumption patterns (Barkoukis 2007). Within the Inupiaq culture, the harvest and preparation of food bridges past and present, bridges generations. Use of traditional foods appears to be a defining aspect of the Inupiaq culture. More studies are needed that emphasize the healthy components of the Inupiaq diet and encourage the use of harvested local plants, berries, meats and fish. Such campaigns should provide appropriate balance within Inupiaq communities of an appreciation of their own rich food heritage to combat the bombardment of advertising messages to increasingly incorporate more purchased foods.

Within Alaska, future studies are needed to rigorously examine nutrients intake including studies designed to identify shortfall nutrients and nutrients with high prevalence of excessive intakes. There is a dearth of food composition data for most of the Alaska foods consumed on a regular basis (whale, sea lion, seals, salmon, halibut and caribou) by Native groups. Hopefully, future researchers will help fill these gaps.

Populations in the Alaska environment have adapted in unique ways to ensure their survival. As populations were acculturated into larger populations with technology change, only isolated groups, such as found in Alaska, are these systems and processes still present and viable. One such a system are the food sharing networks documented in this work and others (Magdanz, et al, 2002, Burch 1998, Ray 1964), especially as they provide nutritional support to Native Elders. As noted earlier, further work is needed to understand the social and practical dynamics of these systems. Funding from The National Science Foundation grant has already been obtained to focus on the movement and distribution of food through the food sharing networks.

Until recently, little data on Alaska Native groups were collected in sufficient quantities and with sufficient standardization of methods that could allow comparisons between Tribes located in geographically different areas, or even within the same Tribe or area. Potentially, the next step will be to compare the food intake data obtained in this study with the Strong Heart data that also used the Block Food Frequency Tool. While there will be problems evaluating nutrient adequacy with the DRI standards as discussed earlier, the comparison between Tribes will nevertheless offer basic differences and similarities created by the different social and community environments.

A follow up study is to compare these data to earlier data collected using the same tools. One of the study communities that participated in this study also participated in the National Science Foundation's Social Transitions in the North study, 1993-1996. These data have just been released for examination following the tragic death of the researchers in 1996. The seven Alaska villages are anxious to see the earlier findings and examine possible changes that have occurred in their villages during the last ten years.

Most of the potential future studies included here are quantitative in nature. However to understand how the data came to be, qualitative data is also needed. Capturing the Elders' views on the changing social and economics factors is important in understanding the complex community and the kinship relationships that appear to help rural Native families remain strong and vibrant.

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Appendix A

Evaluation of Food Intake Data

Communication to the Participating Villages

Introduction

One of the objectives of this Inupiaq Elders' Food Customs Study was to estimate difference in nutrient intake of Inupiaq Elders living in rural and urban locations to allow for examining possible relationships between food customs and health.

The application of recommendations made based on data from the Inupiaq Elders' Study should be evaluated in light of several fundamental limitations. These limitations include (1) the nutrient intake recommendations from Institute of Medicine (IOM 2000) may not be appropriate for populations living in cold arctic climates, (2) the lack of food composition data for many of the commonly eaten foods by Inupiaq Elders may give the appearance of diet inadequacy when in reality, a healthy diet is currently being eaten, and (3) the food frequency tool used to collect the food intake data may not have accurately captured diet characteristics to make recommendations concerning specific nutrient adequacy or deficiencies.

In general, older populations are at increased risk for inadequate intake of vitamins and minerals as they age. Digestive systems are not as efficient in absorbing needed supplies of essential nutrients as individuals age. Declining physical abilities may prevent shopping for food, and food preparation. Taking certain medications may affect nutrient utilization of nutrients within the body. Social and economic conditions may also affect food choices and eating patterns. A diet that contains a variety of foods can provide essential nutrients to help Elders obtain maximum health.

Alaska Inupiaq Elders reported better health status than US American Indians. Aggregate Tribal data for US American Indians were obtained by the Native Resource

Center for Native American Aging at the University of North Dakota using their "Assessing Our Elders, II" Survey (McDonald, et al, 2005). The Inupiaq Elders reported equal or better health than older adults from the US general population surveyed in the National Health and Nutrition Evaluation Survey III (NHANES III) that was completed from 1988 to 1994. Table A1 compares the data from this Inupiaq Elders' study to data from other US tribal groups and to the US general population obtained from the NHANES III Survey that included all races.

Percentages of Inupiaq Elders reporting their health as "excellent", "very good" or "good" were similar between the Alaska Elders (65%) and the NHANES III participants (65%); but higher than that reported by American Indian Elders.

Patterns of chronic disease reported by Alaska Inupiaq Elders were similar to data from NHANES III. The Inupiaq Elders reported 13% with diabetes compared to 14% in the NHANES III. The incidents of diabetes reported by Inupiaq Elders are smaller than other Native Tribes.

Methods

Nutrient intake data were collected using a food frequency questionnaire (FFQ) that asked respondents if they eat foods from a standardized list, how much they ate, and how often the food was eaten. Food frequencies have been used to collect dietary data for over 50 years since the first surveys were developed by Burke (1947).

Table A1. Comparison of Selected Measures of Health Status as Reported by Alaskan Inupiaq Elders to National Data for Other Tribal Groups and to the US National Health And Nutritional Examination Study III (NHANES 1988-1994)

	Inupiaq Elders (50 and older) (n = 101)		American Indian Tribal Data (55 and older) (n = 9,296)	NHANES III 1988-1994 (55 and older) All Races
Self-Reported General Health (n = 101)	#	%	%	%
Excellent	6	(6%)	4.1%	11.0%
Very Good	17	(17%)	14.0%	20.0%
Good	41	(41%)	34.1%	34.0%
Fair	30	(30%)	33.7%	25.0%
Poor	6	(6%)	14.2%	9.0%
Chronic Diseases (n = 99)				
Arthritis	36	(36%)	47.0%	40.0%
Asthma	12	(12%)	9.9%	7.0%
Cancer	7	(7%)	0.8 – 3.4%	< 1 – 3%
Congestive Heart Failure	8	(8%)	11.5%	8.0%
Diabetes	13	(13%)	37.4%	14.0%
Hypertension	40	(40%)	49.8%	43.0%
Osteoporosis	6	(6%)		
Stroke	9	(9%)	9.1%	8.0%

Recommendations for nutrient intake by IOM were designed to promote health for the general US population who live in a generally temperate climate and may not be appropriate for populations residing in the Arctic on a year-long basis. Thus, this discussion on nutrient adequacy should be revisited as more information about specific nutrient needs and intakes for Arctic populations becomes available.

The nutrient database used in analyzing the food intake data presented in the main body of this study were based on nutrient composition analyses performed by Dr. Christine Heller (1950-1952) as part of her doctoral studies in nutrition at Cornell.

When the analyses of the Inupiaq Elder food intake data from this study were performed in 2005, Dr. Heller's data were the only information available at the time. At the insistence of many health professionals working in Alaska, USDA performed analyses on a very limited number of Alaska foods (Pehrsson 2005). The nutrient content of those foods were added to the USDA National Nutrient Database for Standard Reference, Release 18 in 2006. Thus, nutrients intake levels identified as potential shortfalls may have been adequately consumed if full nutrient content were available for all of the foods reported to be eaten by the Inupiaq Elders.

Findings

Intakes below DRIs Standards

Table A2 examines the calculated intake based on data reported by rural and urban Inupiaq Elders as to the distribution below 100% of nutrient standards set by Institute of Medicine (IOM) for vitamins, minerals, and fiber. The percentage of individuals in each location was compared using Pearson Chi-Square, X^2, a statistical test that allows the comparison of percentages between two sets of data. If the p value was found to be below 0.05, then the difference is considered to be a true difference between the two groups and indicates that there is less than a 5% chance that the difference could not have occurred just by chance.

Less than 10% of both rural and urban groups reported intakes below IOM recommendations for riboflavin, niacin, vitamin B_{12}, iron, phosphorus, and sodium which may suggest adequate intake of these nutrients; while a number of individuals from both groups reported insufficient intake of vitamin D, potassium, calcium, magnesium, vitamin B_6, and vitamin E.

By and large, the patterns of nutrient intake were very consistent between the Elders living in rural and urban areas. Only four nutrients showed significant differences between the location: vitamin B_6 ($X^2 = 5.29$, $p = 0.021$), potassium ($X^2 = 4.72$, $p = 0.030$), zinc ($X^2 = 7.42$, $p = 0.006$), and fiber ($X^2 = 8.85$, $p = 0.003$).

Intake Above DRIs Standards for Upper Tolerable Intakes (ULs)

The Institute of Medicine (IOM) has also issued standards of nutrient intake above which may be harmful to some individuals. The standards are called Upper Tolerable Limits (ULs). The IOM has also stated that there is little evidence of adverse effects from eating naturally occurring nutrients obtained from food. However, if Elders are taking vitamin or mineral supplements, even over the counter medications such as antacids, there is the potential of taking excessive amounts that could be harmful.

As stated earlier, the percentage of Inupiaq Elders living in rural and urban locations were compared using Pearson Chi-Square test (X^2) to statistically test if the patterns of reported intakes above the UL are similar or different. The X^2 test showed that generally the patterns were very consistent between the two groups. This may indicate that the traditional Tribal dietary customs have been maintained, even when Elders are living away from rural communities.

Table A2. Percentages of Individuals Below 100% of Dietary Reference Intakes (DRIs) for Vitamins and Minerals as Calculated from Data Reported by Alaskan Inupiaq Elders Living in Rural (n = 52) and Urban (n = 48) Locations

	Less than DRI Recommendations								
	DRI Recommendations			Rural		Urban		X^2	p
	Age, y	M	F	#	(%)	#	(%)		
VITAMINS									
Vitamin A, mcg, RAE*	51-70+	625	500	4	(8 %)	8	(17 %)	1.90	0.168
Thiamin, mg	51-70+	1.0	0.9	5	(12 %)	6	(17 %)	0.21	0.645
Riboflavin, mg	51-70+	1.1	0.9	0	(0 %)	4	(8 %)	b.	0.050
Niacin, mg	51-70+	12	11	1	(2 %)	4	(8 %)	b.	0.192
Vitamin B_6, mg	51-70+	1.4	1.3	22	(42 %)	10	(21 %)	5.29	0.021
Vitamin B_{12}, ug	51-70+	2.0		5	(10 %)	3	(6 %)	b.	0.717
Vitamin C, mg	51-70+	75	60	8	(15 %)	11	(23 %)	0.92	0.337
Vitamin D, mcg*	51-69 70+	10 15		50	(96%)	41	(85 %)	3.51	0.061
Vitamin E, a-TE, mg	51-70+	12		20	(39 %)	21	(44 %)	0.29	0.591
Folate, ug	51-70+	320		18	(35 %)	14	(29 %)	0.34	0.560
MINERALS and FIBER									
Calcium, mg*	51-70+	1,200		37	(71 %)	28	(58 %)	1.80	0.179
Iron, mg	51-70+	6	5	0	(0 %)	0	(0 %)	a.	
Magnesium, mg	51-70+	350	265	30	(58 %)	20	(42 %)	2.56	0.109
Phosphorus, mg	51-70+	580		2	(4 %)	4	(8 %)	b.	0.050
Potassium, g	51-70+	4.7		38	(73 %)	25	(52 %)	4.72	0.030
Sodium, g	51-69 70+	1.3 1.2		1	(2 %)	1	(2 %)	b.	1.00
Zinc, mg	51-70+	9.4	6.8	44	(85 %)	29	(60 %)	7.42	0.006
Fiber, g	51-70+	30	21	45	(87 %)	29	(60 %)	8.85	0.003

a. No statistics were computed.

b. Fisher's exact test was computed.

* Indicates requirements determined as adequate intakes (AIs), and have not yet been evaluated via the Dietary Reference (DRIs) process.

Table A3 present the percentage of rural and urban Inupiaq Elders that their calculated data suggested may have intakes above the Institute of Medicine's Upper Tolerable Limits (ULs). ULs have not been established for individuals older than 70 years of age for many macronutrients: energy, protein, and carbohydrates; for the vitamins thiamin, riboflavin, vitamin B_{12}, and vitamin A; for the minerals iron, potassium, sodium, and zinc; and for fiber.

Individuals in both locations reported in food frequency data that when calculated appear to be above the ULs standards. (As stated earlier these data were not collected in a format to estimate adequacy according to DRIs protocols (IOM 2000). The four nutrients identified above UL were folate, magnesium, phosphorus, and niacin, but only one nutrient exhibited differences in the distribution between rural and urban locations: magnesium ($X^2 = 6.62$, $p = 0.010$).

Table A3. Percentages of Individuals Above Upper Limits (ULs) for Vitamins, Minerals and Fiber Calculated from Data Reported by Alaskan Inupiaq Elders Living in Rural (n = 52) and Urban (n = 48) Locations

	Above ULs						
	ULs > 70 y	Rural #	Rural (%)	Urban #	Urban (%)	X^2	p
VITAMINS							
Vitamin A, mcg, RAE*	ND	-		-		-	
Thiamin, mg	ND	-		-		-	
Riboflavin, mg	ND	-		-		-	
Niacin, mg	35	33	(64 %)	24	(50 %)	1.85	0.174
Vitamin B_6, mg	100	0	(0 %)	0	(79 %)	a.	
Vitamin B_{12}, ug	ND	-		-		-	
Vitamin C, mg	2,000	0	(0 %)	0	(0 %)	a.	
Vitamin D, mcg*	50	0	(0 %)	0	(0 %)	a.	
Vitamin E, a-TE, mg	1,000	0	(0 %)	0	(0%)	a.	
Folate, ug	1,000	1	(2 %)	12	(25 %)	11.73	0.001
MINERALS and FIBER							
Calcium, mg*	2,500	0	(0%)	4	(8%)	a.	0.050
Iron, mg	ND	-		-		-	
Magnesium, mg	350	15	(29 %)	26	(54 %)	6.62	0.010
Phosphorus, mg	3,000	12	(23 %)	15	(31 %)	0.85	0.358
Potassium, g	ND	-		-		-	
Sodium, g	ND	-		-		-	
Zinc, mg	ND	-		-		-	
Fiber, g	ND	-		-		-	

a. No statistics were computed.

* Indicates requirements determined as adequate intakes (AIs), and have not yet been evaluated via the Dietary Reference (DRIs) process.

ND indicates that Upper Tolerable Limits (ULs) have not been established for these nutrients.

Functions of Nutrients and their Relationship to Chronic Disease

The following chart briefly describes the health function, the recommended amount, and common sources available that could be considered in the present Inupiaq diet.

Table A4. Information on Health Function of Shortfall Nutrients

	Health Function	DRI	Food Sources Found in Rural Areas	Food Sources Found in Urban Areas
Vitamin B6	B6 works in combination with folate, B12 to lower homocysteine, a risk factor in cardiovascular disease (CVD).	1.3 mg	Rice, yeast	Rice, Bran, Yeast
Vitamin D	Vit D reduces bone loss, and increases bone mineral density by working with calcium, phosphorus, and decreasing parathyroid hormone. High levels of parathyroid hormone appear to be associated with hip fractures.	400 IU	Salmon and cod livers, egg yolks, milk products	Fortified milk, eggs, saltwater fish, fish-liver oil
Vitamin E	Vit E is an antioxidant that strengthens smooth muscle such as in the heart. Studies are inconsistent in preventing CVD. Vit E also improves immune system to fight infections.	12 mg per day	Fish roe, seal oil, whale oil, salmon, cloudberries, wild blueberries	Salad oils, margarine, legumes, and nuts
Calcium	Vit D and calcium work together for strong bones and teeth. Calcium is important in blood coagulation; also used in activating enzymes; functioning of nerves and muscles. Severe deficiency: brittle bones, dental caries, rickets, tetany, and excessive bleeding.	1,200 mg per day	Soups with fish bones, Dry milk powder added to homemade breads and beverages Canned milk instead of coffee whiteners in coffee. Young willow leaves in salads or herbal tea	Milk and milk products, beans, cauliflower, chard, cheese, egg yolk, kale, rhubarb

Magnesium	Deficiency similar to tetany: weakness, mental depression. Adequate magnesium may help in improving diabetes; low magnesium may reduce the body's ability to absorb glucose	350 mg per day	Caribou and moose meat, goose, salmon	Red meat, caribou and moose meat, goose, salmon
Potassium	Muscles need proper balance of potassium, calcium, and magnesium, especially cardiac muscles. Deficiencies symptoms include muscle weakness, dizziness, mental confusion; changes in heart beat and heart rhythms.	4,700 mg per day	Eating more berries and greens, edible "safe" wild mushrooms, even though potassium content of these items is not currently available. Oranges, dry roasted almonds and potatoes	Oranges, dry roasted almonds and potatoes, all available fruit and vegetables.
Zinc	Zinc is important in helping the body fight off infection, maintaining the structure of proteins.	Males: 9.4 mg Females: 6.8 mg	Caribou meat, Moose meat, eggs, whole grains. Choose whole grain flour, bread, cereals and pasta whenever possible.	Red meat, sea foods, eggs and whole grains. Choose whole grain bread, cereals, and pasta whenever possible.
Fiber	Fiber is important in maintaining intestinal function.	Males 30 grams, Females 21 grams	Berries, greens, willow leaves. Fruit and vegetables, whole grains, nuts, Choose whole grain bread, cereals and pasta whenever possible.	Fruit and vegetables, whole grains, nuts, Choose whole grain bread, cereals, and pasta whenever possible.

Nutrients Possibly Consumed in Excess

There are no data to suggest that nutrients consumed from foods are harmful, thus, the following information is presented to help individuals obtain a variety of food choices.

Table A5. Information on Nutrients Possibly Consumed in Excess.				
	Symptoms of excessive intake	Tolerable Upper Intake limits	Food sources in rural communities	Food sources in urban communities
Folate	Masks vitamin B12 deficiency	1,000 ug per day	Tribal food patterns do not appear to have foods that contain excess folate. Folate is an essential nutrient to prevent birth defects, which is important for younger women of childbearing age. Since folate from foods is not harmful, Elders can make a significant contribution to the health of the community by encouraging the eating of folate rich foods – such as berries, greens, fruits and vegetables, by their example.	
Magnesium	Excess magnesium intake from supplements can cause diarrhea, gastrointestinal effects, or abdominal cramping	350 mg	Limit magnesium supplements. Limit antacids that contain magnesium.	Limit magnesium supplements. Limit antacids that contain magnesium.
Niacin	Excess niacin from supplements can cause nausea, vomiting, signs of liver toxicity, flushing of the arms, face, and chest.	35 mg per day	Limit niacin supplements.	Limit niacin supplements.
Phosphorus	Excess phosphorus is called hyperphosphatemia. Symptoms include changes in hormonal control that regulates calcium, calcium deposits formed in soft tissues, often the kidney; may reduce absorption of trace minerals such as copper, iron, and zinc. Phosphorus is needed to transport vitamin D	3,000 mg per day	Limit carbonated soft drinks, and increase consumption of teas, including traditional herbal teas	Limit carbonated soft drinks, and increase consumption of teas, including traditional herbal teas

USDA MyPyramid

From data reported on the food frequency form, the number of servings were grouped together by categories found on the USDA MyPyramid. Table A.6 shows the number of calculated servings based on data given by the Elders.

Intake patterns were similar between rural Elders and urban Elders for servings of breads and cereals; fruit and fruit juices; and the milk, yogurt, and cheese groups. There appears to be differences in the calculated servings of the protein group and the fats, oils and sweets, and vegetables. Rural Elders reported fewer servings of vegetables than are recommended in MyPyramid. Perhaps some of the fewer serving of vegetables could be attributed to the fact that potatoes are rarely eaten in rural villages. Potatoes are expensive to transport on planes, and don't have storage capacity to ship on barges. The higher number of bread, rice, and cereal servings is probably related to the limited use of potatoes.

Vegetables provide many nutrients such as vitamin A, potassium and are important sources of dietary fiber. Alaska vegetables that are available in rural communities include sourdock, sorrel, wild rhubarb, "mashu" roots, mushrooms, and young willow leaves.

Table A6. Comparison of Dietary Intakes of Alaskan Inupiaq Elders Living in Rural and Urban Locations to Recommended Servings from the USDA MyPyramid[1]

Food group	Recommended servings 2000 calories	Rural n = 52	Urban n = 48
		Reported mean servings per day	
Meats/Fish/Poultry/Beans/Eggs	5.5 ounces	10.3	14.9
Breads/Cereals	6 servings	9.9	9.9
Vegetables, ½ cup servings	5 servings	3.6	5.2
Fruits/juices, ½ cup servings	4 servings	6.0	6.5
Milk/Yogurt/Cheese	3 servings	3.0	3.7
Fats/Oils/Sweets	6 teaspoons	9.9	8.6

[1]USDA MyPyramid recommendations accessed at http://www.mypyramid.gov on February 4, 2007.

Application of these Findings

Recommendations and standards for the intakes of vitamins, minerals, and fiber issued by the Institute of Medicine were established to promote health among populations living in the United States and Canada. It is not known if the recommendations are appropriate for adequate metabolism and the obtainment of health for peoples that live in the harsh cold climate of the Alaska Arctic. Table A9 presents food intake from this study and two previous studies, the study by Dr. Christine Heller from 1956-1961, the study by Dr. Betsy Nobmann in the 1980's, and data from this current study of food customs of Inupiaq Elders. Calories seem to be increasing, but protein intakes are similar over time. Calcium intake appears to be increasing and this may be due to the increased supplies of milk products and calcium fortified food products available in rural communities. Data were collected using differing data collection methodologies, thus no firm conclusions can be made; but the trends are interesting.

Persons reading this report should remember that the numbers presented in the charts were all collected on tools that may not have truly represented the intakes of the Inupiaq Elders. None of the tools (food diaries, 24-hour recalls, and the food frequency tool) have been validated for Inupiaq Elders. Validation of a dietary assessment tool indicates that the tool accurately captures the true diet of the population that is being surveyed. The food frequency tool chosen in this study was to compare the two groups and to estimate possible nutrient intake trends.

Nutrient composition data for many foods that are commonly eaten by Inupiaq Elders are not complete. Available nutrient information from Christine Heller, USDA and Canada are presented in Table A7 and Table A8.

In addition, there are no data that indicates that consumption of nutrients that come from foods are in anyway harmful (IOM 2000, IOM 1997, IOM 1998), unless an individual has an underlying medical problem.

Future Studies – Next Steps

Should the communities decide to do so, these findings could be followed up with more rigorous laboratory analysis to examine serum blood levels of specific nutrients. If serum deficiencies or high levels are found, the nutrients should be addressed under medical supervision in a culturally focused broad-reaching public health format that would involve the Elders and the communities.

Data for this first study of food customs of Inupiaq Elders were collected using a food frequency questionnaire. Inupiaq communities wanting to pursue further investigations of specific nutrient intakes should consider study designs that incorporate the newer dietary assessment methodologies recommended by the Institute of Medicine (2000), such as using multiple non-consecutive 24-hour recalls to determine “usual intake”, and software such as C-Side, described by Nusser (1996), Tooze (2006) and Subar (2006). Communities should note that these methodologies are expensive and time-consuming, and may be considered some-what personally invasive by the Elders.

At this time, the multiple non-consecutive 24-hour food recalls methodology has not been validated for Alaska populations. The tremendous seasonal differences in the diet and the food supply harvested over a year, or multiple years, is a different food pattern than that among most older adults residing in the United States. The uniqueness of the food patterns among the Inupiaq population may influence the ability of any validated diet assessment for other populations to accurately evaluate the “usual” intake of specific nutrients for populations in Alaska communities. Researchers will need to validate the assumption that estimation of “usual” intake for rural subsistence communities can be determined using a small number of 24-hour recalls collected on non-consecutive days. The Alaska seasonal food intake patterns characterized by large intakes of a single food item during a short harvest period may require collection of multiple 24-hour recalls over multiple harvest seasons.

Communities may want to consider building public freezer facilities to allow more opportunities for the preservation of all subsistence foods, especially emphasizing berries and greens. Community fish smoking equipment could be included to avoid waste caused by incomplete drying during wet summers, or spoilage by insects. The IRA at Old Harbor on Kodiak Island has such a community facility, and may be able to offer information on the building design and operation.

All available nutrient data for Alaska foods are presented in Table A7. As noted previously, many commonly eaten food items have incomplete and missing data. All Native communities could be strong advocates to petition USDA to have these foods analyzed so that individuals can make informed decisions on food choices to improve their health. Without information, medical service providers must resort to giving information based on diets from populations living in other places than the Arctic shores of Alaska, which may or may not be appropriate.

Preserving Knowledge of the Elders

Elders through the centuries have carried the needed knowledge on how to select and prepare plants and berries for storage, as well as the knowledge to harvest essential sources of protein. Many younger individuals have said that they don't gather wild greens and mushrooms because they are afraid they will pick the wrong ones. Communities should seek out the knowledge of the Elders and actively make permanent records of this rich cultural heritage so that future generations will have the information available to them. Communities could provide opportunities for Elders to share their knowledge with the youth to involve them in the harvest and use of vitamin rich plants that provided their ancestors with the nutrients they needed.

Traditionally, the diet of the Inupiaq, Inupiat and the Inuit appears to have adequately provided for good health. One of the first records of the people living in

Norton Sound was made by Ellis (1782) who reported on the observations made during voyages of Captain Cook, and Captain Clerke's voyage in Alaska waters. Ellis described the Native men in north Alaska to be "*stout and well made, but in general below middle size, although three or four were nearly six feet tall.*" Simpson (1855) considered them to be "*robust, muscular and inclined to spareness rather than corpulence.*" Later height and weight data were recorded in Barrow by Dr. GS Oldmixon (1885) and published by Murdoch in 1892. Oldmixon wrote, "*their height varied between five feet, one inch, and five feet, nine and half inches, with their weights ranging from 125 to 195.*"

The Inupiaq diet appears to have adequately provided sufficient nutrients for enabling the physical activities to survive, but also provided sufficient nutrients to build families and effectively develop communities in a harsh climate on the Alaska Arctic coasts (Burch 1998). And once tuberculosis and measles were defeated, the life expectancy of Alaska Natives has rapidly increased from 64.4 years in 1980 to 69.5 years in 1997 (perhaps to that of their historic ancestors – but we have limited data on which to make this statement). Longer life expectancy has also increased the number of Alaska Native Elders (Lanier, et al, 2002), and as a result, Native Elders are the fastest growing segment of Alaska's population (US Census - Alaska 2000, Goldsmith, et al, 2004).

This study showed that the Inupiaq Elders reported good health in both settings, and apparently the good tribal food customs established by the Inupiaq ancestors are being maintained. The ability of urban residents to continue to afford some of their native foods and purchase appropriate store bought foods appears to be dependent on their economic conditions. For rural Elders, continued access to traditional harvest and hunting lands is needed. The ability of rural Elders to obtain and preserve sufficient subsistence foods will determine if this healthy lifestyle can continue. The subsistence lifestyle also maintains the value of the Elders, consequently enabling them to maintain their health so that Elders can remain active as they age, thus enabling them to provide guidance and wisdom to young Native families.

Table A7. Nutrient Contribution from Common Alaskan Inupiaq Foods

	Values Per 100 gram Edible Portion												
	Vitamin A, IU	Vitamin B6	Vitamin C, mg	Vitamin D, IU per gram (a)	Vitamin E, mg (alpha tocopherol)	Folate	Calcium, mg	Magnesium, mg	Niacin, mg	Phosphorus, mg	Potassium, mg	Zinc	Fiber
Bear, Polar bear meat (b)	1,400		2				17		4.0		40		
Berries/ Plants (raw, unless stated)							13	7		29	75	0.2	
Blueberries, wild Alaska (b)	115	0.1	18		1.7	33			0.6				
Cloudberries (*Rubus chamaemorus L.*)(a)	210		158						0.9				
Cranberry, low bush (a)	90		21				26			21			
Fireweed, young leaves (*Epilobium latifolium L*) (a)	5,720		99				13			166			
"Mashu" roots (a)	16		11						1.3	67			
Rhubarb, wild leaves, (*Polygenum Alaskanum*)	4,480		33						0.1				
Salmonberries (*Rubus spectabilis*)(b)	496	0.1	9		1.6	17	13	15	0.5	27	110	0.3	
Seaweed (black, dried (*Porphyra Sp*) (a)	4,719		17				157			624			
Sourdock (*Rumex Articus*) (a)	11,900		68				2			55			
Willow (*Salix pulchra Cham*)(a)	18,700		190				130		2.3	126			
Caribou													
Meat (a)	312	0.4	2			4	17	26	7.2	208		2.1	
Liver (a)	28,800						4			282			
Bone marrow, raw (b)	240								0.2	107			

	Vitamin A, IU	Vitamin B6	Vitamin C, mg	Vitamin D, IU per gr(c)	Vitamin E, mg (alpha tocopherol)	Folate	Calcium, mg	Magnesium, mg	Niacin, mg	Phosphorus, mg	Potassium, mg	Zinc	Fiber
Cod													
Ling Cod meat (Mudshark) (a)	230												
Ling Cod liver (a)	9100						5			123			
Ling Cod liver oil (a)				1,300									
Tom Cod, meat (Black cod) (a)	985								1.9				
Tom Cod, liver (a)	11,000		21				6		6.2	203			
Tom Cod liver, oil (a)				600									
Duck													
Scoter, white-winged, meat (a)	280						8			164			
Egg, goose (b)	650	0.2	0		1.29	76	60	16	0.2	208	210	1.3	0
Goose, Canadian (a)							13		9.3	312			
Moose													
Liver, braised (b)	96,000	0.9	23			217	7		10.7	429			
Meat (a)	310		4				5			165			
Pike, dried (a)	140								12	623			
Pike liver (a)	860						28			412			
Pollock, liver (a)	50												
Reindeer, meat (a)	187		0				16						
Seal													
Meat (Oogruk) (a)	1400						10		5.9	198			
Meat (Ringed Seal) (b)	385						5			238			
Liver (Ringed Seal) (a)	36,600						5			238			
Marine Mammal Oils													
Oil (Beluga whale) (b)	2.310			228	8.2								
Oil (Oogruk) (b)	5,020			30	10.4		0			0			

Oil (Mixed species) (a)	5,823						1			0			
Oil (Spotted Seal) (b)	1,044			30	6.3								

	Vitamin A, IU	Vitamin B6	Vitamin C, mg	Vitamin D, IU per, g (c)	Vitamin E, mg (alpha tocopherol)	Folate	Calcium, mg	Magnesium, mg	Niacin, mg	Phosphorus, mg	Potassium, mg	Zinc	Fiber
Salmon													
Chinook (King), meat, cooked (b)	390	0.4	4.0			30	26	95	8.4	175			
Chinook (King), liver (b)	3,140						28		5.0	412			
Chinook (King) roe										390			
Chinook (King) liver oil (a)				1,300									
Chinook (King) air dried (b)	277	0.5			0.3	12	120	67	17.5	645	900	1.6	
Humpback (Pink), meat, raw (b)	136	0.2	0		0.6	4	13	26	7.0	230	323	0.6	0
Dog (Chum), meat, raw (b)	99	0.4					11	22		283	429	0.5	
Dog (Chum) liver oil (a)				400									
Salmon trimmings oil (a)													
Walrus, meat, raw (b)	170						18		4.8	122			
Walrus, flesh and fat (a)	550						18			125			
Walrus, liver (a)	81,200									208			
Walrus, oil (a)	2,600						0						
Whale													
Beluga meat, raw (b)	340	0.1				4	7	22	5.4	239	283	2.8	
Beluga, liver, raw (b)	22,100						11			230			
Beluga, oil (b)	2,210			228	8.3								
Bowhead meat (a)	330						5			87			
Bowhead skin & fat (muktuk) (b)	750						5		0.8	87			
Bowhead, oil	2,810						0			0			
Whitefish													

Meat, mixed species (b)	540							33		280	317	0.9 9	
Liver (a), (b)	1,510						53		2.7	297			
Roe (b)	305	0.2	12		2.7	53	46		0.9	306	190	2.1	0
	Vitamin A, IU	Vitamin B6	Vitamin C, mg	Vitamin D, IU per 100 g	Vitamin E, mg (alpha tocopherol)	Folate	Calcium, mg	Magnesium, mg	Niacin, mg	Phosphorus, mg	Potassium, mg	Zinc	Fiber
Other Foods													
Pilot Bread (d)	25		1				93		7.8	192	229		
Comparison Foods													
Bananas (b)	64	0.4	8.7		0.1	20	5	27	0.7	22	358	0.2	2.6
Blueberries, commercially grown (b)	54	< 1	9.7		0.6	6	6	6	0.4	12	77	0.2	2.4
Butter, unsalted (b)	2,499	< 1	0	671	1.6	3	24	2	< 1	24	24	< 1	
Egg, chicken (b)	487	< 1	0	35	0.9	47	53	12	< 1	191	134	1.1	0
Ground beef (b)	0	< 1	0		0.4	7	33	17	4.0	166	241	5.8	0
Lettuce, iceberg (b)	502	< 1	2.8		0.2	29	18	7	0.1	20	141	0.2	1.2
Milk, dry, skim (nonfat solids), instant, reconstituted (b)	707	0.1	1.7	132		15	368	35	0.3	295	510	1.3 2	0
Orange juice from concentrate, unsweetened, reconstituted (b)	107	< 1	39			44	9	10	0.2	16	190	< 1	0.2

(a) Heller CA, Scott EM. The Alaska Dietary Survey: 1956-1961. Washington DC: US Government Printing Office. 1967: 182-185.
(b) USDA National Nutrient Database for Standard Reference, Release 19 (2006). Accessed on May 6, 2007 at http://riley.nal.usda.gov/NDL.
(c) McLester MS. Yearbook of Agriculture. Nutrition and Diet in Health and Disease. Philadelphia and London: WB Saunders Co. 1952.
(d) Nobmann ED. Nutrient Value of Alaska Native Foods. Anchorage AK: US Department of Health and Human Services, Indian Health Service, Alaska Area Native Health Service. 1992.

Table A8. Nutritive Values of Selected Foods Commonly Used by Canadian Indians and Inuits			
	90 gram portions		
	Calcium	Niacin	Vitamin C
Meat, Fish and Birds			
Bear, Polar, stewed	18	8.0	2
Caribou, stewed	17	10.4	0
Egg, wild duck	34	2.0	0
Fish head soup	142	6.7	0
Goose, liver, raw	39	9.3	4
Herring eggs on kelp, dried	238	2.1	3
Muktuk	14	-	1
Seal, cooked	23	-	tr
Seal, raw	17	10.4	2
Walrus, cooked	16	9.0	0
Berries and Plants			
Blueberries, raw	12	0.4	11
Dandelion greens, cooked	74	0	9
Fireweed (*Epilobium Latifolium*)	8	1.0	57
Lamb's Quarters (*Chenopodium Album*), cooked	211	0.7	30
Salmonberries (*Rubus spectabilis*), raw	8	0.5	47
Sourdock (*Rumex sp*)	52	0.3	51

Source: Appendix K: Nutritive Values of Selected Foods Commonly Used by Indian and Inuit. Northern Food – Tradition and Health. Native Foods and Nutrition: An Illustrated Reference Resource. Yellowknife NT, Canada: Greater North West Territory Department of Health, Nutrition Section. 1992.

Table A9. Overview of the Reported Intake of Selected Nutrients by Alaska Populations over the Last 50 years					
Nutrient	DRIs Female age 51-69+	Dietary Survey (b) 1956-1961 (n = 232) 60+ yr	Diet of AK Natives (b) 1987-1988 (n = 351) 83 (36%) ≥ 50 yr of age	Inupiaq Elders, Rural (b) (n = 52) Age ≥ 50 yr	Inupiaq Elders, Urban (c) (n = 48) Age ≥ 50 yr
Energy, calories	1,978	1,969	2,323 ± 1004	3,594 ± 2,122	4,319 ± 3,129
Protein, g	46	156	108 ± 62	170 ± 112	185 ± 156
Fat, g	ND		98 ± 57	146 ± 91	182 ± 146
Carbohydrates, g	ND		246 ± 118	379 ± 234	469 ± 312
% kcal from protein	ND	31.4	18.5	19.0 ± 6.6	16.9 ± 4.9
% kcal from fat	ND		37.9	36.0 ± 6.4	36.8 ± 5.9
% kcal from carbohydrates	ND		43.6	43.2 ± 9.4	45.3 ± 8.4
Vitamin A, RE	500	1,778	2,494	1,638 ± 1,244	1,779 ± 1,715
Vitamin A, IU		5,869	8,231 ± 8,423		
Thiamin, mg	1.0	1.2		2.3 ± 1.3	3.0 ± 2.4
Riboflavin, mg	1.1	2.3		5.2 ± 4.2	4.2 ± 3.4
Niacin, mg	11	32.2		45 ± 26	49 ± 39
Vitamin C, mg	60	23.5	120 ± 126	266 ± 235	264 ± 242
Vitamin D, IU	10			3.8 ± 2.5	6.2 ± 5.3
Vitamin E, aTE	12			17 ± 12	19 ± 15
Vitamin B6, mg	1.3			1.6 ± 0.9	3.1 ± 2.6
Vitamin B12	2.0			5.6 ± 4.6	8.6 ± 8.1
Folate, mcg	320			464 ± 271	652 ± 523
Calcium, mg *	1,200	391	599 ± 383	993 ± 509	1,138 ± 883
Iron, mg	5	25	17.2 ± 9.3	34 ± 26	36 ± 37
Magnesium, mg	265			309 ± 145	459 ± 324
Phosphorus, mg	700			2,452 ± 1,503	2,593 ± 1,954
Zinc, mg	6.8			5.4 ± 3.8	11.2 ± 12.1
Data collection method		Food diary	Multiple 24-hour recall	Food frequency	Food frequency

DRIs: Recommended amounts per day are Estimated Daily Requirements (EARs) determined as part of Dietary Reference Intakes for individuals 51 to 69 years for females, which include Adequate Intakes (AI) for Calcium; EARs for iron, vitamin A and vitamin C; and acceptable macronutrient distribution ranges for fat, carbohydrate, and protein. ND indicates that neither DRIs nor AIs have been established for these nutrients. * Indicates that these values are Adequate Intakes and DRIs have not been established for these nutrients.

a. Heller C. US Department of Defense Alaska Dietary Survey, 1956-1961. 1967
b. Nobmann ED, Dietary Intakes of Alaska Native Adults. Anchorage AK: Indian Health Service.1992.
c. Smith (dissertation) Food Customs of Rural and Urban Inupiaq Elders, 2007.

Appendix B

Sources of Information for Nutrient Content for Alaska Harvested Foods

Used in this Study

Appendix B. Sources of Information to Analyze Nutrient Content for Alaska Harvested Foods

	USDA 2002	Nutrient Values for AK Native Foods 1992	Missing Data	No Data	Reference	Notes:
Salmon						
King, dried, smoked, salted	X				10	USDA Chinook smoked
King, raw, frozen	X				10	USDA
King, cooked	X				10	USDA cooked dry heat
Silver, dried, smoked salted		X	X		2, 5	Dried, dried in seal oil
Silver, raw frozen	X				10	USDA
Silver, cooked	X				10	USDA cooked moist heat
Red dried, smoked, salted		X	X		3, 5, 7	Dried
Red raw frozen	X				10	USDA
Red cooked	X				10	USDA cooked dry heat
Pink dried, smoked, salted		X	X		2, 3, 5	Dried,
Pink raw frozen	X				10	USDA
Pink cooked	X				10	USDA cooked dry heat
Chum dried, smoked, salted		X	X		4, 5, 6	Both dried/salted
Chum raw frozen	X				10	USDA
Chum cooked	X				10	USDA cooked dry heat
Other Fish (not Salmon)						
Burbot	X				10	USDA, cooked dry heat
Cod, dried		X	X		2, 5	Tom cod dried
Cod, other	X				10	USDA Pacific & Ling Cod cooked dry heat
Blackfish		X	X		2, 5	whole raw
Dolly Varden				X		Lake trout data in Canadian chart
Grayling		X	X		2, 5, 9	assumed raw
Halibut, dried				X		no data
Halibut, other	X				10	Cooked Atlantic

						and Pacific mixed
Smelt/Candlefish, dried		X	X		2, 5, 9	
Smelt/Candlefish, other		X	X		2, 5	assumed raw
Trout, dried				X		no data
Trout, other	X				10	Mixed trout wild species, dry heat
Whitefish dried	X				10	Smoked, mixed species
Whitefish, other	X				10	Mixed species - cooked dry heat
Other Seafood						
Crab	X				10	USDA
Clams	X				10	USDA
Shrimp	X				10	USDA
Sea Mammals						
Whale muscle		X	X			beluga, and gray whale
Muktuk		X	X			beluga, and gray whale
Whale liver				X		no data
Whale kidney				X		no data
Whale oil		X	X		2, 4, 5, 8	bowhead
Seal liver		X	X		2, 5, 9	ringed seal
Seal kidney				X		no data
Seal bone				X		no data
Seal oil						beaded seal oil, and a mixed species oil
Walrus liver		X	X		2, 5	
Walrus blubber				X		walrus oil, but no blubber
Walrus kidney				X		no data
Land Animals						
Caribou muscle, dried				X		no data
Caribou muscle, cooked	X				10	USDA
Caribou liver	X	X	X		2, 5, 10	USDA
Caribou marrow		X	X		2, 5	
Caribou kidney				X		no data
Caribou fat		X	X		5, 6	
Caribou heart				X		no data (Canada list beef heart as their source)
Deer muscle, dried				X		no data
Deer muscle, cooked	X				10	USDA data
Deer liver				X		no data

Deer marrow				X		no data
Deer kidney				X		no data
Grizzly/Brown, meat	X				10	USDA data
Grizzly/Brown, bone				X		no data
Gray whale bone				X		no data
Gray whale muscle				X		"whale muscle" no data per species
Gray whale blubber				X		data for bowhead, no data for gray whale
Harbor/Hair seal oil				X		beaded seal oil, and mixed species oil
Northern Fur seal oil				X		beaded seal oil, and mixed species oil
Sea Lion, muscle				X		no data
Sea lion, liver				X		no data
Sea Lion, kidney				X		no data
Sea lion, heart				X		no data
Sea lion, oil				X		no data
Wild Birds						
Aleutian Geese				X		no data
Aleutian Green Winged teal				X		no data
Arctic Loon				X		no data
Barrow Goldeneye				X		no data
Black Brandt				X		no data
Black Ducks				X		no data
Canadian Geese		X	X		2, 5	"Branta Canadensis"
Gulls				X		no data
King Eider		X	X		2, 5	data for "Eider duck" – are they the same?
Least Auklet/Chuchki				X		no data
Mallards				X		no data
Murres (also called Sawbills)				X		no data
Black legged Kittiwake				X		no data
Red Legged Kittiwake				X		no data
Pintail Duck		X	X		5	
Horned Puffin				X		no data
Tufted Puffin				X		no data
Scoters		X	X		2, 5	
Willow Ptarmigan		X	X		2, 5, 6	Canada data

Bird Eggs		
Aleutian Green Wing Teal	X	no data
Murre Eggs	X	no data
Gull Eggs	X	no data

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(3) Hooper HM, Nutrient Analysis of Twenty Southeast Alaska Native Foods, Alaska Native News, 1984.

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(5) Nobmann ED. Nutrient Values of Selected Foods Consumed by Alaska Natives, Nutrition Services, AK Area Native Health Services. Supplement #2, Rev. 521-92, Foods Analyzed by Columbia Laboratories, Inc, Corbett Oregon. 1992.

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(9) Wo C. Nutritional Status of Alaska Eskimos with Respect to Fatty Acids, Vitamin A and Vitamin E. Dissertation. University of Illinois at Urbana-Champaign Urbana, IL. 1973.

(10) USDA Standard Reference, version 13, version 14.

Appendix C

Analyses of Alaska Agutuk Recipes

Analyses of Alaska Agutuk Recipes

Agutuq (or Eskimo Ice Cream) is a commonly eaten food in Alaska. There are many recipes for Agutuq, and most recipes contain a mixture of tallow, seal fat or shortening mixed with berries. Sometimes meat or fish is added. In the lower 48 states, a similar food mixture is called pemmican, although pemmican was usually dried for increased storage. In Alaska's cooler climate, the drying step is probably not necessary. Few Native populations' report eating pemmican, but Agutuq remains an Alaskan family favorite.

The practice of mixing meat and fat with berries is thought to have developed as a method to preserve limited food resources. Oils and fats obtained from sea mammals spoil very quickly due to the high levels of the unsaturated fats. Many of the Alaska berries contain high levels of antioxidant (Kalt 2001, Wang 2000) which may have prevented rancidity. Thus the extracted oils and fats from harvested game could be stored for longer periods of time (conversations with Dr. Rick Knecht, Museum of the Aleutians, Spring 2001). Harvested game has seasonal variations as to the fat content (Speth 1989). Historically, fat may have been very limited in many Alaska communities.

One of the first observations for Augutuq were written by Father Veniaminov in his notes recorded between 1824-1831, "*The best Aleut dishes are: crowberries with fat, beaten until white*" (Veniaminov 1984: 277). The long tradition of agutuq is supported by having specific words to describe the food. The Koyukon Athabaskan Dictionary lists the word "*deneyh bete haalggaadee< neyh::deneyh*" to mean moose meat with bearberries" (Jette' and Jones, 2000:476). In contrast, Frybread, Eskimo Doughnuts or Aladiks does not have similar descriptive words, supporting the recent arrival of this food to the Native diet (conversations with Dr. Patricia Kwashka, University of Alaska Fairbanks and Dr. Dennis Wiedman, Florida International University, July 2001).

Fourteen recipes for Agutuk and Eskimo Ice Cream obtained from respondents of the Alaska WIC Healthy Moms Study (unpublished data). Recipes were analyzed using Nutritionist IV software (N-Squared Computer and First Data Bank, San Bruno, CA 94066), and are presented in Table C. The ingredients varied greatly by community and preparer.

Our recipes averaged 1 cup fat to 16 cups of berries or fish/meat. Calories per 100 gram one-half cup serving were similar to other Agutuk recipes published in the *Nutrient Value of Alaska Native Foods* (Nobmann 1992). The variation and nutritive contribution of this Alaska food has not been thoroughly studied, but the lower carbohydrate levels in many of the recipes may be more desirable for individuals with glucose intolerance than dessert items with higher carbohydrate contributions such as chocolate cake with icing. Agutuk made with berries also contributes large amounts of vitamin C, folic acid and fiber which would not be present in flour-based desserts.

Table C. Macronutrient Comparison of 100 grams (1/2 cup portions) of Alaska Agutuk Recipes with Common Desserts

	Energy Calories	Carbohydrates (g) (1)	Protein (g) (1)	Fat (g) (1)
COLLECTED RECIPES				
Agutuk, fish only (n=1)	302.0	20.0	5.6	22.2
Agutuk, caribou only (n=1)	306.0	0.0	7.1	30.8
Agutuk, fish & berries (n=1)	329.0	38.0	4.7	17.5
Agutuk, berries and mashed potatoes (n=4)	168.0	17.9	0.7	10.5
Agutuk, berries only (n=7)	158.9	13.5	0.7	11.5
COMPARISONS to PUBLISHED AGUTUK RECIPES (2)				
Agutuk, fish with shortening	473	10.5	9.0	44.4
Agutuk, fish & berries	279	31.9	2.3	16.4
Agutuk, caribou	312	0.1	18.5	25.8
Agutuk, berries & shortening	281	14.4	0.4	25.6
COMPARISONS to COMMON DESSERTS (3)				
Chocolate Cake 1/16th of cake with chocolate icing (3)	312	53.6	4.0	11.3
Strawberry Shortcake with 1 T. Whipped Cream, 1/2 cup sweetened sliced strawberries (3)	308	48.4	2.5	9.85
Blueberry Pie topped (1/6th of pie) with 1/2 cup vanilla ice cream (3)	509	68.5	6.8	24.1

(1) Energy, carbohydrates, protein and fat calculated using the Nutrition IV software, (N-Squared Computer and First Data Bank, San Bruno, CA 94066).

(2) Nobmann ED, Nutrient Value of Alaska Native Foods. Anchorage AK. 1992.

(3) USDA, Nutritive Value of American Foods in Common Units, Agricultural Handbook No. 456. Agricultural Research Service, Washington D.C. 1975.

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Education

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Work Experience

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