

Traditional Food Consumption, Anthropometry, Nutrient Intake and the Emerging
Relationship between Inuit Youth and Traditional Knowledge in a Baffin Island
Community.

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ABSTRACT

In 2006 a youth health survey was conducted in Pangnirtung, Nunavut as part of a community collaboration. The survey assessed food use, nutrient status and anthropometry. Thirty four percent of youth were above healthy weight; soft drink consumption averaged 1 litre per day; and nutrient intake distributions showed likelihood of inadequacies in the diet. Traditional food (TF) consumption, however, had a beneficial effect on nutrient status as iron, vitamin A and protein intake was significantly higher among those who consumed TF.

Elder stories about TF were used as a pilot intervention aimed to promote TF by increasing traditional knowledge (TK) to community youth. Stories were played on a DVD and pre/post questionnaires were administered; independent and paired t-tests revealed a significant transfer of TK to youth. Qualitative analysis further revealed deep respect for TK, indicating that future initiatives should consider incorporating TK in health promotion strategies.

R É S U M É

En 2006, une enquête sur la santé des jeunes a été menée en collaboration avec la ville de Pangnirtung au Nunavut. L'enquête a évalué les choix alimentaires, l'état nutritionnel ainsi que l'anthropométrie. Trente quatre pour cents des jeunes avaient un poids au dessus de la normale; la consommation de boissons gazeuses avoisinait 1 litre par jour; et la distribution de l'apport nutritionnel provenant des aliments indiquait la possibilité d'un régime inadéquat. L'apport en fer, vitamine A et en protéines était significativement plus élevé chez ceux consommant des aliments traditionnels (AT), ce qui porte à croire que la consommation d'AT aurait des effets bénéfiques sur l'état nutritionnel.

Des récits des aînés concernant les AT ont été utilisés dans une intervention pilote afin de promouvoir les AT en accroissant le savoir traditionnel (ST) chez les jeunes. Les récits ont été visionnés sur DVD et des questionnaires pré/post visionnement ont été administrés aux jeunes. Des t-tests ont indiqué un transfert significatif du ST des aînées vers les jeunes. Une analyse qualitative des données a révélé un profond respect pour le ST, indiquant que de futures initiatives devraient considérer incorporer le ST dans les stratégies de promotion de la santé

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CONTRIBUTION OF AUTHORS

Dr. G Egeland, supervisor to the candidate, was initially contacted by community members for collaboration in developing the community health promotion initiative. Dr. Egeland was involved in the development of objectives, obtaining funding, and overseeing all activities for this project; she further oversaw the youth health survey conducted in 2006 and facilitated the analyses and the interpretation of results.

Guyline Charbonneau organized and conducted the youth survey; she was also responsible for hiring, training and supervising survey staff.

The candidate managed the database, verified coded raw data and built CANDAT and SAS databases for analysis. All analyses were conducted by the candidate with guidance from Dr. Egeland.

This initiative is one of 12 communities documenting Traditional Food Systems for future health promotion activities under Dr. Kuhnlein's "CINE Global Health Case Studies" initiative.

The initial draft for the manuscript entitled "Inuit Youth and the Nutrition Transition: Consumption of Traditional Food, Nutrient Intake and Anthropometry" was prepared by the candidate and co-authored by members of the committee.

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List of Abbreviations

AI	Adequate Intake
AMDR	Acceptable Macronutrient Distribution Range
CINE	Centre for Indigenous Peoples' Nutrition and Environment
CHR	Community Health Representative
DM	Diabetes Mellitus
EAR	Estimated Average Requirement
FFQ	Food Frequency Questionnaire
HDL	High Density Lipoprotein
IQ	Inuit Qaujimajatuqangit
LDL	Low Density Lipoprotein
MF	Market Food
TF	Traditional Food
TK	Traditional Knowledge
WHO	World Health Organization

1. Introduction

The traditional way of life is undergoing many changes among Canadian Inuit. The movement away from the consumption of local food resources towards consumption of western store bought foods is just one indication of encroaching acculturation in the Canadian Arctic. The traditional diet is rich in micronutrients and macronutrients and the fatty acid profile is beneficial to cardiovascular health (Mulvad et al. 1996). However, many northern aboriginal communities are reported to be compromised in terms of dietary adequacy and nutrient intake (Kuhnlein et al. 1995; Receveur et al. 1997; Wein 1996). Partial explanation of dietary inadequacies may be explained by current changes in diet, including the "nutrition transition".

Drewnowski and Popkin (1997) defined the "nutrition transition" as a global uncoupling of income and fat intake, as well as a shift towards a higher proportion of fats, saturated fats and sugars in the diet. This trend partly describes the dietary changes occurring among Inuit; however, specific to Inuit is the movement away from traditional food (TF). Unfortunately, low quality market food (MF) is often replacing TF due to MF cost and food insecurity (Chan et al. 2006). This trend, compounded by other western influences, has lead to the emergence of chronic diseases once unheard of among Inuit (Egeland et al. in press).

Youth in particular are consuming less TF than older Inuit (Counil et al. 2008; Blanchet et al. 2000, Kuhnlein and Receveur 1996), placing them at increased risk for compromised nutrient status and future health concerns. Health indicators for youth were a major theme at the Iqaluit Declaration in 1998 (Gilman et al. 2005). Although many studies have been conducted on Arctic youth, data quality issues remain as sample sizes are often small making generalizations difficult. Currently, there have been few studies of dietary

adequacy among Inuit youth, creating a gap in information available to guide nutritional interventions and programs in the Arctic.

The Centre for Indigenous Peoples' Nutrition and Environment (CINE) seeks to respond to health concerns of Indigenous peoples through participatory action and education (<http://www.mcgill.ca/cine/>). When a resident of Pangnirtung, Nunavut, with knowledge of CINE became aware of the increasing problem of type 2 diabetes mellitus (DM) in his community he contacted CINE to begin a participatory research project. His vision involved health promotion using traditional knowledge (TK) and a return to TF consumption through community based interventions. After initial consultations and the formation of a community steering committee an adult community health screening was conducted in 2005 (Egeland et al. in press; Charbonneau-Roberts et al. 2007) and a youth survey in 2006.

The primary objectives of this thesis are as follows:

1. To investigate baseline patterns of TF and MF consumption among community youth, assessing how they correlate with nutrient intake.
2. To assess height and weight among youth in this community.

The second part of the thesis will present a short pilot intervention. The intervention was designed to determine the secondary objectives of this thesis:

1. To determine if TK in the form of Elder stories is a suitable method for transferring TK to community youth.
2. To assess knowledge, attitudes and beliefs (KABs) about TF and Elder knowledge in this population.

2. LITERATURE REVIEW

2.1 Inuit Relationship with the Land

In the Arctic, the role of traditional food (TF), called country food among Inuit, is central to the special relationship Inuit share with the land. The practice of hunting, harvesting and sharing of country food links human health and the environment and is therefore a fundamental component of life in Arctic communities (Royal Commission of Aboriginal Peoples', 2006). Sharing of country food is a tradition that has facilitated survival in the northern climate. Hence, Arctic food systems are vital for defining and conserving Inuit identity as they facilitate social, cultural and spiritual ties among northern people.

2.1.1 Protective Effect of Country Food

Beyond the role country food plays in culture and tradition, the Inuit diet has also been noted for its health benefits. It was unexpected to researchers that a diet high in fat and protein could be protective against chronic disease. Early studies documented Inuit as having lower serum plasma triglycerides than a European population, statistically lower levels of heart disease as well as "a complete absence of Diabetes Mellitus", this trend was coined "The Inuit Paradox" by Dyberg in 1989 (Bang et al. 1971; Dyberg et al. 1978).

Other epidemiological evidence at the time indicated a link between Japanese populations consuming a high amount of marine foods rich in polyunsaturated fatty acids (PUFA's), including *n*-3 fatty acids, and low levels of heart disease (Hirai et al. 1980). It was therefore believed that Inuit experienced the same protective effect also due to the marine based diet (Dyberg 1989). The observed Inuit populations in these studies were living a relatively traditional life and consuming high amounts of marine foods (Bang et al. 1971; Dyberg et al.

1978). These results led researchers to promote the consumption of sea foods for people with hypertension and other cardiovascular problems (Dyberg 1989).

Researchers have since began exploring other nutritional components of the Inuit diet which is now documented to be rich in retinol (Kuhnlein and Soueida 1992; Kuhnlein et al., 2006, Egeland et al., 2004), vitamin D (Kuhnlein et al. 2006; Blanchet et al. 2000), protein, and iron (Kuhnlein et al. 2004). Further, the combination of antioxidants (Kuhnlein et al., 2002) and *n*-3 fatty acids are thought to play an essential role in the protective effect of this traditional diet against coronary heart disease (Mulvad et al., 1996). Kuhnlein et al. (2004) named Inuit food systems as the best example of TF being superior to available MF in nutritional content.

2.1.2 Country Food

Country foods (or TF) are defined as animals and plants that are harvested from the local environment and culturally recognized as food. Market foods (MF) are defined as foods that are flown or shipped from southern communities to be bought in grocery stores (Kuhnlein and Receveur 1996).

Inuit country food is composed of a wide range of marine and land plants and mammals, with over 100 species documented for Baffin Island residents (<http://www.mcgill.ca/cine>). It should be noted that accessibility and variety depend on the season, latitude and the location of the community.

2.2 Transitions of the North

Due to a host of complex and integrated changes, including climate change, globalization, and acculturation, the traditional Inuit way of life is undergoing rapid transitions (Kuhnlein and Receveur 1996; Egeland et al. in press). Some researchers propose that Inuit are transitioning at an accelerated

pace compared to southern aboriginal groups due to geographic isolation (Healey and Meadows 2008). These transitions are impacting the amount of country food consumed and most other traditional ways of life for Inuit.

2.2.1 Nutrition Transition

The “nutrition transition”, described by Drewnowski and Popkin (1997) is defined as the movement away from a somewhat monotonous diet, to one that is more diverse, containing more animal protein, processed foods and alcohol. However, processed foods usually add more fat and sugar to the diet. As the Inuit diet incorporates more MF and less TF, key nutrients such as vitamin A (Egeland et al. 2004, Kuhnlein et al. 1996) are lacking.

This type of dietary shift is compounded by a more sedentary western lifestyle and is associated with increased rates of obesity and chronic diseases, such as type 2 DM and cardiovascular disease (Young 2003; Young 1988). Urbanization has been independently linked to increased type 2 DM (Hazuda et al. 1998, Jarrett et al. 1989). It is therefore not surprising that as Inuit become more westernized type 2 DM now exists in their communities (Egeland et al. in press; Ebbesson et al. 1998, Risica et al. 2000; Bjerregaard and Young 1998)

Dietary adequacy has been assessed in many northern aboriginal populations. Compromised intake has been reported for key nutrients (Kuhnlein et al. 1995; Receveur et al. 1997; Wein 1996), resulting in researchers calling for health promotion activities and nutritional interventions for northern residents.

2.2.2 Youth and the Nutrition Transition

Inuit youth, in particular, are consuming less TF than previous generations (Counil et al. 2008; Blanchet et al. 2008; Kuhnlein and Receveur 1996). This group is growing up amid large social and cultural changes and are therefore

relying more on MFs than previous generations. In a health survey among Inuit in Northern Quebec (Nunavik) and Greenland it was found that Inuit in the youngest age category had less energy intake from TF and less *n*-3 fatty acids in their red blood cell membranes compared to the older age groups (Counil et al. 2008). These results indicate that Inuit youth may not be benefiting from the nutrients available in their traditional diet.

2.2.3 Climate Change

Climate change is beginning to affect every aspect of life in the Arctic. Important implications for country food consumption include the changing migratory patterns and health of animals (http://www.cihri-irsc.gc.ca/e/pdf_14828.htm). Climate change has also produced altering and sometimes unstable water, ice and land conditions, which in turn have implications for hunters on the land. Some implications of these changes include farther travel for hunting (Guyot et al. 2006). Further, environmental cues hunters relied upon in the past are slowly changing (White et al. 2007) requiring adaptive hunting practices.

The changing environment also means new safety concerns; one example being changing ice patterns, putting hunters at risk of becoming trapped on drifting ice. The impact of climate change on the environment is therefore requiring Inuit to adapt their hunting practices. Guyot et al. (2006) conducted focus group testing with northern peoples of the Yukon and Northwest Territories and determined that, although slowly, changes in hunting practices are indeed emerging as environmental cues change.

Current and impending future changes in climate call for the need to protect TF systems through government policy (Guyot et al. 2006). It is also necessary to include Inuit perspectives in climate change research to ensure their needs are a priority. It also allows researchers to gain from traditional

knowledge and decide the best ways to integrate this knowledge into policy (Hovelsrud et al. 2008).

2.2.4 Social Change

The impact of residential schooling compounded by the government housing program propelled Inuit into a western lifestyle (Dawson 2008) and essentially began the movement away from the traditional Inuit way of life. Considering Inuit were being forced into settlements in the 1950's, the scale of social change occurring in the Canadian north is vast. As acculturation continues to occur in the north, language and customs, including TF consumption, are transitioning towards western ways. Broad social changes include less youth fluent in Inuktitut and less TK being transferred from Elders to the younger generation (Healey and Meadows 2008). In terms of directly impacting country food availability, hunters are working from Monday to Friday and are therefore restricted to hunting on weekends (Chan et al. 2006) and in turn likely harvesting less TF.

2.2.5 Contaminants

Country food consumption may also be effected by the uncertainty of the amount of contaminants in northern animals (Poirier and Brooke, 2000). Contaminants, as defined here, are a group of chemicals including polychlorinated biphenyls (PCB's), organochlorine pesticides, and heavy metals that have gathered in the air, land and animals of the Arctic. Once these contaminants are in the environment they biomagnify; that is, they accumulate in successive food chain levels, mainly large animals (Van Oostdam et al. 2005).

Although long term clinical impact associated with contaminants at the exposure levels in the Arctic are unknown, there is evidence of subclinical effects. Mercury exposure has been associated with tremor amplitude (Despres

et al. 2005) and visual impairment (St. Amor et al. 2006) in Arctic youth. Moreover, PCBs in maternal cord blood have also been associated with lower birth weight and a shorter pregnancy in a Dutch population (Patandin et al. 1999). PCB's are further suspected to affect thyroid hormone functioning (Porterfield and Hendry 1998). The issue of contaminants is worrisome and accordingly there is more than one organization focusing on contaminant issues. One such organization is the Northern Contaminants Program (http://www.aainc-inac.gc.ca/nu/nuv/cbk_e.html) whose agenda is to:

“eliminate contaminants in traditionally harvested foods, while providing information that assists informed decision making by individuals and communities in their food use.”

The Nunavut government also recently formed the ‘Nunavut Environmental Contaminants Committee’ to facilitate awareness and to keep community issues a priority in this area of research (http://www.aainc-inac.gc.ca/nr/prs/m-a2000/2-00155_e.html).

The messages surrounding TF and contaminants may be confusing to Inuit who fear for their health and also wish to continue eating TF (Myers and Furgal, 2005). The confusion often begins with translation of the term “contaminant” from English to Inuktitut (Poirier and Brooke, 2000). Myers and Furgal (2004) reported that the word “contaminant” had been translated in Inuktitut to mean ‘rusty metals, garbage on the land, old batteries or garbage’. These results indicate that properly defining ‘contaminants’ is a challenge that hinders proper communication between Inuit and researchers.

Myers and Furgal (2004) also discovered that ‘safety’ and ‘contamination’ were not given as reasons why country food was not consumed. Interviewed participants instead stated geography and availability as reasons for decreased consumption of TF. This indicates that Inuit may not yet be changing

consumption patterns of country foods due to contaminants. Further, Inuit may not be compelled to change consumption due to the deep trust in the traditional ecological knowledge held by Elders and hunters at detecting unfit country food. There is also indication that Inuit are skeptical of government messages promoting decreased consumption of country food, which some Inuit suspect are attempting to devalue TF systems (Poirer and Brooke, 2000). When developing messages about contaminants in the food system, the “social, cultural, spiritual, nutritional and economic benefits” of country food (Van Oostdam et al., 2005) must also be considered.

The issue of contaminants is clearly controversial and there needs to be more work done to allow for Inuit perspective to be included in current research. This action will help develop messages that are comprehensible, informative and trusted by Inuit.

2.3 Health Status

Health disparities of Aboriginal people's in Canada are vast. Inuit in particular have the lowest life expectancy at birth among all Indigenous groups in Canada (Royal Commission on Aboriginal People, 1996). This trend has called for the need of Government policies and intervention to close these gaps (Adelson 2008). There is also a need to ‘decolonize methodologies’ (Smith 1999) in the research process and include communities to the full extent to produce sustainable and meaningful outcomes, this action can also potentially empower the individual and the community.

2.3.1 Epidemiological Trends

Diabetes mellitus (DM) was relatively uncommon among Inuit in the past (Scott and Griffith 1957; Mouratoff and Scott 1957; Dyberg 1989). As western conveniences and the diet changes to include more MF and less TF, obesity

(Risica et al. 2000; Bjerregaard and Young 1998) and related chronic diseases, such as type 2 DM (Ebbesson et al. 1998) are slowly emerging.

2.3.2 Barriers to Health

Barriers to health must be identified to better understand why disparities persist. Food insecurity and cultural barriers are among the key challenges to be discussed.

2.3.2.1 Food Security

Food security defined by the FAO :

“exists when all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (<http://www.fao.org/spfs/en/>).

Forty nine percent of Nunavut households have reported ‘sometimes’ not having enough to eat in the past month (Ledrou and Gervais, 2005) illustrating food security as a serious problem for northern residents. Skinner et al. (2006) conducted focus group testing in a northern aboriginal community to determine barriers to healthy eating. Participants stated the store managers did not accommodate requests for specific food items. Further, items on sale would run out quickly and prices for rotting produce were not reduced. Participants also stated they were ignored by managers when they complained about produce quality. In a similar study Chan et al. (2006) conducted focus testing in 6 Nunavut communities and determined that food cost was a main barrier and income was not perceived as sufficient for healthy food purchases. Food security was also perceived as more of a problem for large families and for families on income support (Chan et al. 2006).

Further the context of MF cost in the Arctic and prevalence of poverty need to be considered when discussing food accessibility. While country foods are typically nutrient dense, in many cases healthy, accessible MF's are not affordable (Receveur et al. 1997). There is also a need for awareness of healthy market foods that are affordable, as currently there may not be a cultural context for certain foods that could be incorporated into the diet.

This trend has presented the need for programs in northern communities that address food security. The Nunavut government has tried to facilitate the purchase of healthy MFs by implementing the "Food Mail" program, which subsidizes the cost of shipping food to towns in Nunavut. Despite this and other initiatives, there is still a need for more policies and programs to be implemented as obtaining food remains a problem in northern communities (Chan et al. 2006).

2.3.2.2. Food Security and Inuit Youth

There is evidence that younger people in the Arctic are food insecure at the same level or higher than adults. In a baseline food security survey in Kugaaruk, Nunavut, 30% of youth surveyed were food insecure without hunger compared to 24% of adults (INAC 2003). In a similar study in Kangiqsujuaq, Nunavik, 33% of adults and 34% of youth were food insecure without hunger (INAC 2004). Power (2008) proposes that some food insecurity among youth is explained by youth not acquiring a 'taste' for TF and therefore not accessing it when MF is unavailable. This presents a possible concern for future and cultural health among northern youth.

2.3.2.3. Cultural Context

Inuit perspectives must be considered when pursuing health promotion and health care in northern communities. Bird et al. (2008) interviewed Inuit living with type 2 DM and found a skeptical attitude towards the healthcare system.

Other issues included the lack of nurses that speak Inuktitut and a high turn over of health professionals. Another language barrier in grocery stores was noted as store signs and food labels are not available in Inuktitut (Bird et al. 2008). Further some Inuit may not feel comfortable with the current western style of health care. These factors indicate that there is a need for an Inuit specific cultural context within the healthcare system

2.4 Invitation to Pangnirtung

Pangnirtung is an Inuit community in Nunavut on the southeastern tip of Baffin Island. Nunavut became the newest territory of Canada in 1999 and is a land with Inuit self government. Approximately 1200 people reside in Pangnirtung, the population is predominantly Inuit and Inuktitut is widely spoken by all age groups. It is a beautiful community situated on a fjord; and is called 'the Swiss of the north' by local residents.

A resident of Pangnirtung who had a family incident of type 2 DM was concerned about the transitions towards MF's in his community and decided to contact the Centre for Indigenous People's Nutrition and Environment (CINE) at McGill to see what action could be taken.

CINE has worked with Indigenous groups around the world to document and promote traditional food systems; however Canadian aboriginal peoples, particularly its northern people's, are the priority at CINE (www.mcgill.ca/cine/).

Researchers at CINE adhere to a participatory research process, documented by CINE and the WHO (2003), where the community is in equal partnership during the research process. Hence, a community based steering committee was assembled and included a local community health representative (CHR), a community nurse and a government health promotion officer. After initial consultations with the steering committee and CINE researchers an action

plan was decided upon as follows: 1) conduct a health screening for adults in the community; 2) conduct a youth health survey; 3) construct an intervention to promote country food based on Elder story telling.

2.4.1 Adult Health Screening

The adult health screening was conducted in 2005 where a variety of health indicators were assessed among a volunteer population. These measures included diet, using a traditional and market Food Frequency Questionnaire (FFQ) and 24 hour recalls; physical activity was determined using a modifiable physical activity questionnaire. Anthropometric measures of weight and height were also collected. Clinical measures included fasting glucose and insulin, and 2-hour oral glucose tolerance test as well as serum HDL and LDL cholesterol levels. Blood pressure was also measured along with questions around food security and TF.

Fifty four adults representing 10% of the adult population in the community chose to take part in the survey; no new diabetic cases were documented however two cases of impaired fasting glucose and two cases of impaired glucose tolerance were found. Additionally, 62% of adults had low HDL cholesterol and as expected, a positive relationship between TF consumption and serum n-3 fatty acid was found. The opposite effect was found with trans-fats, as it had a negative relationship with the consumption of TF. Both of these correlations indicate an association of a healthy blood fatty acid profile when TF's are consumed (Egeland et al. in press).

2.5 Traditional Knowledge

Traditional Knowledge (TK) or Inuit Qaujimajatuqangit (IQ) is a concept that is not easy to define for academic purposes as it encompasses all knowledge that was observed and used traditionally in past generations among

Inuit. It is, in short, the collective historical knowledge of Inuit. At a conference in 1995 representative Inuit described IQ as the following (Berkes 1999):

“Practical common sense; teachings and experience passed through generations; knowing the country; being rooted in spiritual health; a way of life; an authority system of rules for resource use; respect; obligation to share; wisdom in using knowledge; using heart and head together.”

Inuit have enjoyed an oral history of sharing TK and Elders are the ambassadors to this ancient knowledge. TK is passed on by Elders choosing the appropriate person and the appropriate time to disseminate information, in this way the knowledge gets passed on from generation to generation. Due to this critical role, Elders are well respected for their vital cultural role in northern communities. McShane et al. (2006) conducted focus testing with Inuit about health perspectives and found that Inuit often consult with Elders about health information gathered from mainstream healthcare. Elders were also found to be a major source of health information; this study further discovered that Inuit are more receptive to health information when received from other Inuit. These perspectives and preferences must be considered and incorporated when creating and delivering health promotion materials for Inuit.

Bird et al. (2008) had similar findings, indicating that there is a disconnect between the healthcare system delivered to Inuit in the north and with Inuit culture. Producing culturally relevant resources for Inuit people involves incorporating Inuit values, culture and beliefs to western institutions prevailing in the north, from education (Russell 2006) to healthcare (McShane 2006).

2.5.1 Storytelling

Storytelling in particular is part of the oral tradition that has sustained Inuit culture; it is the backbone of Inuit history and identity as explained by the Inuit Tapiriit Kanatami (<http://www.itk.ca/publications/5000YearHeritage.pdf>).

“Our past is preserved and explained through the telling of stories and the passing of information from one generation to the next through what is called the oral tradition. Inuit recognize the importance of maintaining the oral tradition as a part of our culture and way of learning.”

In Pangnirtung, the community steering committee wanted the foundation of health promotion material to come from local Elders in the form of stories about country food and their health benefits. It was important to share the stories with all local residents because they are a part of the community's collective history.

Northern youth are an important target for this project because they are growing up in a westernized Arctic. Youth are not acquiring a taste for country foods (Power 2008) partly because they are introduced to MF earlier and partly because the cultural changes occurring in the north do not support a traditional way of life. Storytelling was how children and youth learned traditional ways from Elders historically; hence this is a culturally appropriate vehicle to share TK about TF with community youth.

The Elders themselves expressed interest that community youth would hear their stories. Further, because Inuit youth are eating less country foods (Counil et al. 2008; Blanchet et al. 2000; Kuhnlein and Receveur 1996) the steering committee and CINE had also decided this group was important to engage. Therefore, youth are a target for this project as trends of acculturation

and TF consumption among them make a worthy group to more fully understand in terms of their dynamic relationship with country food to enable tailored future interventions.

2.6 Knowledge and Behavior School Interventions

Population health approaches for behavior change can include increasing knowledge (Contento et al. 1995) which will, in theory, influence attitudes and behavior. School based interventions are a common means to access youth which is important as behavior in childhood is known to track into adulthood (Kelder et al, 1994; Lytle et al. 2000). There have been many school based interventions that have promoted fruits and vegetables and increased physical activity (Simons-Morton et al. 1991; Donnelly et al. 1996; French and Stables 2003) and there has been success in school based diabetes interventions in aboriginal communities (Ho et al. 2008; Saksvig et al. 2005).

'Language, Heritage and Culture' was listed as a Social Determinant of Health by the Assembly of First Nations, who in 2007 published the "First Nations Wholistic Policy and Planning Model", a tool designed for researchers and policy makers. This document supports having strong cultural ties as being conducive to good health in aboriginal populations and points to the development of culturally appropriate interventions for these populations.

The number of culturally appropriate school based programs developed for aboriginal youth is slowly increasing (Davis et al 1999; Macaulay et al. 1997; Saksvig et al 2005). Saksvig et al. (2005) used the Kahnawake Schools Diabetes Prevention curriculum for a school based intervention in Sandy Lake, a northern Ontario aboriginal community. Cultural adaptations to the curriculum included promoting traditional foods, community activities and Elder knowledge. This strategy was successful and resulted in a significant improvement in self efficacy, dietary preference and dietary knowledge about fat. Consumption behavior also

improved as there was a significant decrease in dietary fat intake. The success of this study and the trend of incorporating culture in aboriginal health research demonstrate an increased awareness of researchers and policymakers to the value of culture and tradition.

3. YOUTH SURVEY METHODOLOGY

3.1 Participatory Process

CINE has developed and adheres to a Participatory Process for working with Indigenous Peoples that involves working in full partnership with the community throughout the project, from initial consultations to knowledge translation. The Participatory Process developed at CINE for working with Indigenous Peoples' has since been used to direct Participatory guidelines for the World Health Organization (WHO and CINE, 2003).

CINE was contacted by a resident of Pangnirtung who wanted to address local health concerns and initial consultations with the community were held. Consultations involved key community stakeholders including representation from the local Hamlet council. A local steering committee was then formed which included residents involved in health promotion and primary healthcare, along with concerned and active members of the community. The Inuit Tapiriit Kanatami (ITK), an Ottawa based organization focused on 'representing and promoting the interests of Inuit' (<http://www.itk.ca/About-ITK>), was also consulted for advice and input towards the initiative.

3.2 Activities

Initial activities agreed upon by the steering committee and CINE were as follows: 1) an adult health screening; 2) a youth health survey; 3) a health promotion campaign using traditional knowledge and Elder story telling.

The adult health screening and youth surveys were an initial step in documenting current dietary patterns in the community and to determine current health status. The steering committee has been self directed in organizing meetings and hiring and supervising project staff and consulting with CINE

partners. Dr. Egeland of CINE provided the academic logistics and planning of the health surveys; funding was obtained through CIHR, SSHRC, and the Max Bell Foundation.

3.3 Ethics Approval

Ethics approval was granted by the Institutional Review Board at the Faculty of Medicine. Approval of the study was also granted by the local Hamlet and a research license was issued by the Nunavut Research Institute.

3.4 Study Population and Recruitment

The cross sectional youth health survey took place in May 2006 over 10 weekdays. Recruitment was conducted through the local high school and all students between the ages of 11 and 17 were invited to take part. A total of 75 students participated in the survey.

At the time of recruitment community events (a flu outbreak and grieving over a death) resulted in staffing problems and failure to record refusal rates. However, the 75 students represented nearly a complete census of students currently attending school. Attendance rates drop by 45-50% in the second semester therefore the original 149 students enrolled in September would have been reduced to between 67 to 75. The participation rate was therefore likely very high.

3.4.1 Informed Consent

A detailed consent and assent form, coupled with an information sheet about the interview process, was distributed to students in class. Thus both students and parents were provided the opportunity to understand the assessment process and benefits of taking part in the screening. The form was

translated from English to Inuktitut by a member of the steering committee and both languages were available to participants and their families. Informed consent and assent was obtained for each youth and each youth's guardian/parent before a health survey would be conducted.

3.5 Survey

All youth between the ages of 11 and 17 years available in school were requested to participate in the health survey. Those with signed consent/assent forms were interviewed confidentially during school hours. Youth were interviewed in either Inuktitut or English as hired staff was bilingual. The survey included anthropometric measurements, TF Frequency Questionnaire (FFQ), an abbreviated MF FFQ and two 24 hour recalls conducted on non-consecutive weekdays. Each assessment took approximately one and a half hours to conduct.

3.5.1 Questionnaires

To determine country food habits a semi quantitative TF FFQ was developed based upon existing CINE (Centre for Indigenous Peoples' Nutrition and Environment) questionnaires. Country food availability depends on geography and latitude, further, consumption of certain animal parts depends on the culture of the community. Therefore it was important to create a TF FFQ accurate to Pangnirtung. Local hunters and Elders were consulted using the previous questionnaire as a template, creating a community specific TF FFQ. The final TF FFQ consisted of 38 items of country foods that are consumed during a typical year. Country foods included six beluga items, seven caribou items, three ringed seal items, berries and seaweed.

To determine TF seasonal variation, a harvest calendar specific to Pangnirtung was constructed by consultation with hunters and community

members. Observations about country food availability from the previous two years were used to construct the calendar. A harvest calendar allows frequency of consumption of these foods to be determined by day/week/month/ per season or by year.

An abbreviated MF FFQ using indicator foods was conducted in continuation with the TF FFQ. MF, again, is defined as food shipped or flown from the south and purchased in stores. The MF FFQ consisted of the following 5 items: soft drinks, powdered drinks, fruit juice, milk and chips. Milk served as an indicator of a healthy beverage and the remaining four items on the MF questionnaire served as indicators of high fat or high sugar foods. High sugar foods are defined as containing 25% or more of its energy from sugar. High fat food was defined as any food with fat contributing to 40% or more of its energy content.

Core activities also included two 24 hour recalls conducted on non consecutive weekdays for each participating student. As the students recalled what they ate and drank the previous day, food models were used by interviewers to demonstrate the volume of each item they consumed. The food models were available in many shapes and so the appropriate model was used according to the corresponding food item.

3.5.2 Staff and Training

Ten people were hired to conduct interviews, seven of which were local, bilingual residents. Training was provided by a CINE researcher over one day and the process of conducting the FFQ, and the 24 hour recall was instructed.

3.5.3 Anthropometry

Students were asked to wear light clothing the day of their interview and removed their shoes and socks before measurements were conducted. Height was collected using a stadiometer in meters to the nearest centimeter; weight was recorded in kilograms to the nearest 0.1 kg using a Tanita scale Model TBF-300A. Half of a kilogram was subtracted from the weight to account for clothing, as instructed by the Tanita manual. BMI was calculated as weight (kg)/height squared (m^2). BMI was plotted on individual percentile charts developed by the National Center for Health Statistics. These charts are specific for age and gender: underweight is defined as a BMI less than the 5th percentile, healthy weight as BMI between the 5th and 85th percentile, and at risk of overweight as a BMI between 85th and 95th percentile, overweight as BMI 95th percentile as defined by the CDC (<http://www.cdc.gov/growthcharts/>).

3.6 Statistical Analysis

Candi Database version 3.99 was used to determine the density for all TF's for calculation to grams when volume when used to record consumption. The harvest calendars from the previous two years were used to assign 'in' and 'off' season to each TF to calculate amounts according to season. A database was constructed in Microsoft Excel (2003) to organize and calculate amounts of TF consumed in the in season, off season and an average for the year was calculated for each student. The MF FFQ was assessed in the same way as the TF FFQ.

The Canadian Food Guide for First Nations, Inuit and Métis were used to assess servings of TF from calculated grams or volume consumed. These recommendations were also used to determine servings consumed on average from 24 hour recall data.

Candat version 2007 was used to assign nutrient values to all foods from 24 hour recall data and SAS version 9.1 was used to conduct statistical analysis.

3.6.1 Data Entry

Information gathered from the 24 hr recall and the TF and MF FFQ was entered at the MacDonald campus of McGill University and all data were validated by two separate researchers, once by the first author.

3.6.2 Dietary Adequacy

Dietary References Intakes (DRI's) were used to assess micronutrient intake from 24 hour recall data. No supplements were recorded in the 24 hour recall data hence nutrient values were solely attributed to foods and beverages. The Estimated Average Requirement (EAR) and Adequate Intake (AI) were used as cut off points to determine dietary adequacy. The EAR value is defined as the amount of a nutrient that is estimated to meet the requirements of half of a specified population (IOM, 2000). When an EAR cannot be determined the AI reference was used. AI is defined as the amount that is expected to meet or exceed what is necessary for healthy nutrient status (IOM, 2003).

Youth were grouped according to DRI categories based on age and gender. Median nutrient values were assigned, inter-individual variation was adjusted for using the Beaton adjustment technique (Tarasuk and Beaton, 1991), and unadjusted median values were used if the group's intra-individual variation was larger than the inter-group variation. Percentage below the EAR was calculated if inter-group variation was larger than intra-group variation for nutrient intake. Youth surveyed fell into two age categories for both sexes; therefore a weighted average of those below the EAR was calculated for boys and for girls. Adequate Intake was used as a cut-off to assess vitamin D, fibre and calcium. Although percentage below AI cannot definitively determine inadequate intake it

was important to assess these nutrients among this population and was attempted to capture the status of these nutrients.

Usual micronutrient and macronutrient intake was assessed from 24 hour recall data. Differences between TF consumers and non consumers, among both sexes were assessed using Student's t-tests conducted in SAS 9.1.

3.7 Pilot DVD Intervention

An original objective of the participatory project involved the use of traditional knowledge (TK) in the form of Elder stories to promote country food to community youth. Twenty one local Elders were interviewed about country food and 8 themes were retrieved through content analysis (Hsieh and Shannon 2005). Three themes from five selected interviews formed three audio segments that were formatted to DVD and served as the pilot intervention material.

Information from the DVD transcripts was gathered and 28 questions were constructed to form a pre/post DVD knowledge survey. The DVD was shared with youth through the local high school during 2 sessions over 2 weeks. The pre knowledge survey was self administered to youth and followed by the first two segments of the DVD, the following week the third DVD segment was viewed and the post survey was self administered.

The knowledge survey was analyzed through independent and paired t-test's to determine if there was a significant transfer of TK from the DVD viewing. The survey also served to facilitate exploration of current knowledge, attitudes and beliefs (KABs) about country food among local youth through open ended questions about TK and TF on the post survey. Both outcomes would serve to determine if TK in the form of Elder stories could be a suitable method to promote TK and TF to youth in the community.

**Inuit Youth and the Nutrition Transition: Consumption of Traditional Food,
Nutrient Intake and Anthropometry.**

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4.1 Abstract

Objective: To describe traditional food (TF) and market food (MF) consumption patterns, height and weight relative to age and nutrient intake among Inuit youth on a Baffin Island community.

Study Design: Cross sectional survey (n=75) of youth between 11-17 years using repeat 24 hour recall interviews; a TF and an abbreviated MF Food Frequency Questionnaire. Youth were further measured for height and weight.

Methods: MF consumption was determined among boys and girls and among those who did or did not consume TF. Student's t-tests determined differences in mean micronutrient and macronutrient intakes among boys and girls who consumed and did not consume TF. Dietary Reference Intakes (DRI's) were used to assess nutrient adequacy using the EAR cut-point method.

Results: Caribou and blueberries were consumed during the past year by 98.7 percent of those surveyed. Thirty four percent of youth were either at risk of overweight or overweight. Vitamin A, calcium and total fibre were probably inadequate in the diet. Boys and girls who consumed TF consumed a higher percentage of protein intake ($p<0.5$) and boys who consumed TF had significantly less saturated fat intake ($p<0.01$). Vitamin A intake was also significantly higher among girls who consumed TF ($p<0.01$). Overall, sweetened beverage consumption was high in the population, averaging 1.6 liters per day per child. However, carbonated sweetened beverage consumption was significantly higher among youth who did not consume TF.

Conclusion: TF use among youth in the community is common; however dietary inadequacy of key nutrients and high consumption of sweetened beverages indicates that nutritional interventions and health promotion activities

would be beneficial. Promotion of nutrient dense MF and TF through culturally relevant community based interventions would be valuable to this community.

4.2 Introduction

The traditional diet of the Inuit was originally documented for its protective effects against heart disease and type 2 diabetes mellitus (DM) (Bang et al., 1971; Dyberg et al., 1978). Much of these health outcomes have been attributed to the *n*-3 fatty acids in TF, which have been correlated with decreased coronary heart disease in a Japanese population (Hirai et al. 1980). Country food, as it is called among Inuit, has also been found to be rich in retinol, vitamin D, protein and iron (Kuhnlein and Soueida 1992; Kuhnlein et al. 2006, Egeland et al. 2004, Kuhnlein et al. 2006; Blanchet et al. 2000).

As the diet begins to include more market food (MF) and less traditional food (TF), adequacy of the diet is an increasing concern. Dietary studies conducted in northern aboriginal populations (Kuhnlein et al. 1995; Receveur et al. 1997; Wein 1996) all indicated low intakes of calcium and vitamin A among other nutrients. The importance of dietary adequacy is increasingly important for Inuit youth who are not 'acquiring a taste' for country food (Power 2008) and consuming less TF than older generations (Counil et al. 2008; Blanchet et al. 2000), putting them at risk for dietary deficiency and future chronic disease.

A member of an Inuit community on Baffin Island contacted the Centre for Indigenous Peoples' Nutrition and Environment (CINE) to begin collaborations for a community health promotion initiative. Activities of interest to the community involved documenting current health status and creating community driven, culturally appropriate interventions. In 2006 a youth health survey was conducted to determine current consumption patterns of TF, MF, nutrient intake and anthropometry.

4.3 Methods

4.3.1 Participatory Process and Background

A participatory process has been developed at CINE for working with Indigenous Peoples' which involves working in full partnership with the community (WHO and CINE, 2003). This process was adopted for the community initiative. A local steering committee was formed following community consultations and initial activities agreed upon included a youth health survey. Documenting current consumption patterns and assessing health indicators and nutrient status would serve to guide future interventions among this group if warranted.

4.3.2 Ethics

Ethics approval was granted by the McGill Faculty of Medicine Institutional Review Board. Approval of the study was also granted by the local Hamlet and a research license was issued by the Nunavut Research Institute.

4.3.3 Study Population and Recruitment

The cross sectional youth survey took place in May 2006 over 10 weekdays at the local secondary school, which houses both the community high school and junior high. Parents were contacted through the school and informed consent and assent was obtained before each youth took part. Consent forms were available in English and Inuktitut and a total of 75 students partook in the survey out of 149 enrolled in September of 2005, representing 50% of the September student population. Community events resulted in a failure to record refusal rates. However, school attendance falls by 50% in the second semester; hence a near complete census was likely obtained.

4.3.4 Survey and Questionnaires

The survey included anthropometric measurements, a TF Frequency Questionnaire (FFQ), an abbreviated MF FFQ and repeat 24 hour recalls. Each assessment took approximately one and a half hours to conduct.

The semi quantitative TF FFQ was developed based upon existing CINE (Centre for Indigenous Peoples' Nutrition and Environment) questionnaires and consultation with local hunters and Elders. The final TF FFQ consisted of 38 country food items that are consumed during a typical year in Pangnirtung. A harvest calendar was also used to allow frequency of consumption to be determined by day, month, season or year.

An abbreviated MF FFQ was administered; MF is defined as food shipped or flown from the south and purchased in stores. The MF FFQ consisted of the following 5: items, pop, powdered drinks, fruit juice, milk and chips. Four out of five served as indicators of high fat or high sugar foods. High sugar foods are defined as containing 25% or more of its energy from sugar. High fat food was defined as any food with fat contributing to 40% or more of its energy content. Milk served as an indicator of a healthy MF.

Core activities also included repeat 24 hour recalls conducted on non-consecutive weekdays for each participating student. As the students recalled what they ate and drank the previous day, food models were used by interviewers to demonstrate the volume of each item they consumed.

4.3.5 Staff and Training

Seven local interviewers were hired and a total of ten interviewers conducted the FFQ and 24 hour recall interviews. Training was provided by a

CINE researcher and the process of conducting the FFQ's, and the 24 hour recall was instructed using food models.

4.3.6 Anthropometry

Students were asked to wear light clothing the day of their interview and removed their shoes and socks before the measurements were collected. Height was measured using a stadiometer in meters to the nearest centimeter; weight was recorded in kilograms to the nearest 0.1 kg using a Tanita scale Model TBF-300A. Half of a kilogram was subtracted from the weight to account for clothing. BMI was calculated as weight (kg)/height squared (m^2). BMI was plotted on individual percentile charts developed by the National Center for Health Statistics. These charts are specific for age and gender: underweight is defined as a BMI below the 5th percentile, healthy weight is a BMI between the 5th and 85th percentile, and at risk of overweight is a BMI between the 85th and 95th percentile, and overweight is a BMI over the 95th percentile as defined by the CDC (<http://www.cdc.gov/growthcharts/>).

4.3.7 Statistical Analysis

Candi Database version 3.99 was used to determine densities for all TFs to calculate grams consumed. Harvest calendars from the previous two years were used to assign an 'in' and 'off' season to each TF allowing consumption amounts to be calculated according to season. A database was constructed in Microsoft Excel 2003 to organize and calculate amounts of TF consumed in the 'in' season, 'off' season and as a yearly average. A similar database was constructed for MFs to calculate consumption.

The Canadian Food Guide for First Nations, Inuit and Métis was used to assess servings of TF from calculated grams or volume consumed. These

recommendations were also used to determine mean servings consumed from 24 hour recall data.

Candat version 2007 was used to assign nutrient values to all foods from the 24 hour recall data and SAS version 9.1 was used to conduct statistical analyses.

4.3.8 Dietary Adequacy

Dietary References Intakes (DRI's) were used to assess micronutrient intake from 24 hour recall data. No supplements were recorded in the 24 hour recall data hence nutrient values were solely attributed to the diet. The Estimated Average Requirement (EAR's) and Adequate Intake (AI) were used as cut off points to determine dietary adequacy.

Youth were grouped according to DRI categories based on age and gender. Median nutrient values were assigned, inter-individual variation was adjusted for using the Beaton adjustment technique (Tarasuk and Beaton 1991). Unadjusted median values were used if the group's intra-individual variation was larger than the inter-group variation. Percentage below the EAR was calculated if inter-group variation was larger than intra-group variation for the group. Weighted averages of those below the EAR were calculated separately for boys and for girls. Adequate Intake (AI) recommendations were used as cut-off points to assess vitamin D, fibre and calcium.

Usual micronutrient and macronutrient intake was assessed from 24 hour recall data. Differences between TF consumers and non consumers, among both sexes were assessed using Student's t-tests.

Although three or more 24 hour recalls would more closely reflect usual intake, due to time constraints two were obtained. The 24 hour recall is a valid

method to gain information on the nutrient intake of a population, which was one goal of this study.

Estimated Average Requirement (EAR) or Adequate Intake (AI) for age and sex were used as reference values. Boys and girls fell into two DRI's categories therefore percentage below EAR was obtained for each age group and weighted percentages were calculated for both sexes. If percentage below the EAR was less than 10% then intake for the nutrient was categorized as probably adequate, if the percentage below the DRI was between 10% and 50% nutrient intake was categorized as possibly adequate and if more than 50% of the population fell below the DRI, nutrient intake was categorized as probably inadequate.

4.4 Results

4.4.1 Anthropometry

Table 1 summarizes the youth according to the 2000 CDC Growth Chart categories of underweight, healthy weight, at-risk-of-overweight and overweight. Almost 40% of girls surveyed were in the at-risk-of-overweight or overweight categories. Thirty percent of boys, on the other hand, were above the healthy weight percentile.

4.4.2 Traditional Food (TF) Consumed

Table 2 lists the percentage of youth who consumed TF items in the past year. Caribou and blueberries were consumed by the majority at 98.7 percent. Table 2 also lists the average daily grams of each TF item consumed in the past year of those who consumed the TF item. Weekly servings of TF consumed, according to the Canadian Food Guide for First Nations Inuit and Métis, are shown in Table 3. Among consumers; average caribou consumption throughout

the year was highest at 14 servings per week, shrimp was next at 12.9 servings per week. The least consumed TF's were sour leaves, polar bear and goose eggs, which were consumed on average less than once a week.

Figure 1 presents TF groups consumed on average by girls and boys. Thirty-eight food items were classified into the following categories: terrestrial animals, fowl and eggs, sea mammals, fish and shellfish, and plant foods. Boys consumed more grams of TF than girls in every category. Sea mammals were eaten most among boys at 264 grams as a daily average (not shown) and terrestrial animals were consumed most among girls with a daily average of 123.7 grams (not shown).

4.4.3 Energy Intake

Mean energy intake for boys was 2054 kilocalories; girls had a mean of 2309 kilocalories. To determine under-reporters, each youth's basal metabolic rate (BMR) defined as the energy needed to keep the body functioning in a resting state, was calculated using the Harrison Benedict equation as calculated by the Tanita scale. In an adult population a mean EI:BMR <1.5 indicates underreporting (Black et al. 1991). A ratio of the Energy Intake (EI) to BMR was calculated for each subject and an average of 1.6 ± 0.6 was calculated for the group indicating there was no serious underreporting.

4.4.4 Micronutrient status

Tables 4 and 5 show median intakes of micronutrients among boys and girls in Pangnirtung using 24 hour recall data. Ninety two percent of males were below the EAR for vitamin A, indicating it is likely inadequate in the diet. Further, intakes of calcium, vitamin D and total fibre may be inadequate as the median intake was below the AI value. Percentage below the EAR for boys ranged between 20 and 30% for selenium, zinc, vitamin B6 and vitamin C indicating

these nutrients are probably adequate in the diet. Further, all boys were above the recommended EAR for iron, niacin, thiamin and riboflavin. Unfortunately the percent below EAR could not be calculated for vitamin E, folate and vitamin B12 as between person variation was less than within person variation.

Between 5 and 11% of girls were below the recommended EAR for thiamin, iron, vitamin C and selenium, indicating these nutrients are likely adequate in the diet (not shown). Twenty two to thirty three percent of girls were below the EAR for phosphorous, folate and zinc, indicating these nutrients are probably adequate in the diet. Eighty three percent of girls were below the EAR for vitamin A, indicating it is likely inadequate in the diet. Finally, median intakes of calcium and total fibre, between were below the AI, indicating these nutrients may be inadequate in the diet. Again, some nutrients could not be adjusted to usual intake and percentage below the EAR or AI could not be calculated, these were vitamin E, vitamin B6, niacin, riboflavin, vitamin B12 and vitamin D.

Table 6 displays mean micronutrient intake between those who consumed and those who did not consume TF the previous day. Forty four youth (58.7 percent) reported consuming TF the previous day (not shown) and percent energy from TF among consumers was 11.8% (± 10.8). Iron, vitamin A, phosphorous, zinc, selenium, and vitamin D were non-significantly higher in the boys that consumed TF than those who did not consume TF. Girls who consumed TF had a significantly higher iron ($p < 0.01$) and vitamin A ($p < 0.01$) intake. Again many other nutrients were non-significantly higher among TF consumers, than non TF consumers. Both boys and girls who consumed TF (Table 7) had significantly higher protein intake ($p < 0.05$) than those who did not. Further, boys who consumed TF had significantly less saturated fat from the diet ($p < 0.01$); there was a non-significant tendency for total fat to be higher among those who did not consume TF.

4.4.5 Market Food (MF) Consumed

Based on FFQ data, MF patterns in Table 8 reveals that boys consume, non-significantly, more chips and drink more milk, juice, pop, powdered drinks than girls. TF consumers did however consume significantly less pop ($p<0.05$). Among youth, one liter of sweetened carbonated beverages is consumed per day; fruit juice and powdered drink consumption were also high. On average 235 ml of milk was consumed daily by youth, slightly less than one cup, which is half of the recommended intake according to the Canadian Food Guide for First Nations, Inuit and Métis. An average of 41.6 grams of chips was eaten daily per youth, roughly corresponding to one bag a day (44 grams). Pop was consumed within the last year by 99% of youth (not shown) followed by chips (95%), fruit juice (91%), powdered drinks (85%) and milk (78%).

Table 9 lists the recommended amounts for each food group according to Canada's Food Guide for First Nations, Inuit and Métis with corresponding amounts of consumption. The 'Vegetables and Fruit'; and 'Milk and Alternatives' categories were consumed below the recommended intakes. Vegetables and Fruit approached the recommendation with a mean of 4.6 servings, however, fruit juice made up 2.7 of these servings (not shown). Meat and alternatives intake was above the recommendation; and Grain products fell within the recommended intake.

4.5 Discussion

4.5.1 Anthropometry

Trends of anthropometry among youth in Pangnirtung are similar to other populations of similar age. In the Canadian Community Health Survey (CCHS), 29% of youth between 2 and 17 years were overweight or obese (Shields, 2006). An American study using the CDC percentiles found that 30.4% of 12-19 year

olds were at risk of overweight and 15.5 were overweight (Ogden et al. 2002). Among the First Nation youth surveyed by Nakano et al. (2005b) 32% of girls and 31% of boys were at risk of overweight or overweight. Thirty four percent of the population in this study was above healthy weight hence the youth in Pangnirtung have risk of overweight and overweight prevalence comparable to populations of similar age.

The percentage of youth above normal weight in this community is comparable to other populations of similar age, showing similar trends in emerging obesity. The CCHS found a 70% increase in prevalence of obesity among Canadian youth in the past 20 years (Shields 2006).

Obesity and overweight are found to track into adulthood, obese children being two times more likely to become obese adults than normal weight children (Serdula et al.1993). Moreover, overweight adolescents are 18 times more likely to be overweight in adulthood compared to normal weight teens (Whitaker et al. 1997) presenting overweight as a future concern in this population.

The emerging trend in overweight and obesity is of concern in this population as obesity is correlated with type two diabetes and cardiovascular disease; two chronic diseases that are already emerging among older Inuit in this community (Egeland et al. in press).

4.5.2 TF Consumed

TF consumption was common among this group (Tables 4.2 and 4.3) indicating that the youth in Pangnirtung value country food and consume it often. Reported intakes also indicate youth have a range of country food available to them. The large standard deviations in Table 2 signify TF consumption data is highly variable, which is consistent with the nature of the FFQ (Barrett-Connor

1991). Nevertheless, the importance of TF as a diet staple among youth in this population is clearly illustrated from consumption trends.

4.5.3 Micronutrient and Macronutrient Intake

Of micronutrients assessed, vitamin A and calcium may be inadequate in the diet; vitamin D may also be inadequate. Due to within-person variability being larger than between person variability the vitamin E median could not be adjusted and hence percentage below the EAR for vitamin E was not determined. However, the unadjusted median intakes ranged from 2-3 mg and the EAR value is 9 mg for 9-13 year olds and 12 mg for 14-17 year olds, indicating vitamin E may also be lacking in the diet. These results reveal that there may be a need for nutritional intervention to increase intake of these micronutrients in this population.

Girls who consumed TF had significantly higher vitamin A and iron intake, indicating that even small amounts of TF can significantly improve nutrient status. This phenomenon was also found among Dene/Metis and Yukon children who consumed 5% of their energy from TF yet had significantly higher intakes of iron, protein, zinc, copper and magnesium (Nakano et al. 2005a) than those who did not consume TF.

Acceptable macronutrient distribution range (AMDR) recommendations are associated with a decreased risk of chronic disease while still allowing for adequate nutrient intake. The AMDR's for carbohydrate (45-65%), protein (10-30%) and fat (25-35%) were within range by all groups as shown in Table 4.7. Percent energy from TF was 11.9% among consumers and youth who consumed TF had a significantly higher percentage of protein intake in the diet. Boys who consumed TF consumed significantly less saturated fat, indicating that those who did not consume TF instead ate more low quality market foods. The non significant trend of increased fat consumption among boys who did not consume

TF may have been significant with a larger sample size but further suggests those who did not eat TF consumed foods that were high in fat. These results demonstrate the type of foods that are often replacing TF, and illustrate the worrisome nature of the “Nutrition Transition” in this population.

4.5.4 MF consumed

Of the 5 MF's assessed, sweetened beverage consumption was high among youth. Pop was the most highly consumed at 1 litre per day per youth. Although vitamin C can be gained from fruit juice, the sugar and energy from the amount of juice consumed is high. Food group assessment further confirms that three fourths of fruit and vegetable servings consumed by youth were retrieved from fruit juice. Hence youth are drinking a large amount of sweetened beverages in Pangnirtung, contributing a large proportion of kilocalories to the diet. Excessive consumption of sweetened beverages has been related to excess weight among child and adolescent populations (Thomas et al. 2000; Nicklas et al. 2003; Troiano et al. 2000) presenting this as a habit that needs to be addressed in this population.

Milk consumption was below the recommended value of the Canadian Food Guide for First Nations, Inuit and Métis. However, there is evidence that Inuit youth may be better equipped physiologically to absorb calcium from the diet. Sellers et al. (2003) gave 10 healthy Inuit youth a load of calcium and then observed for hypercalciuria. Compared to white and black reference populations, hypercalciuria was significantly more common among the Inuit youth indicating this population may have a genetic adaptation to a diet low in calcium. It is premature to change the recommendation of milk intake based on this study therefore the Canadian Food Guide for First Nations, Inuit and Métis continues to recommend dairy products as part of a healthy diet. Therefore, promoting dairy consumption would be beneficial to improving calcium and vitamin D intake among youth in this community in this community. Promotion of TF sources such

as stews and soups cooked with bones, although not established in the literature (Masood and Chen 1996), could also be an important means of increasing calcium intake.

4.6 Conclusion

To conclude, Pangnirtung remains a traditional community in many ways and food is usually one of the last casualties of acculturation, partly explaining frequent intakes of TF among this population. Some limitations to the study include the small sample size, it would be worthwhile to sample youth from other communities to get a more holistic view of consumption patterns and nutrient intake of Inuit youth. Further, this particular study was conducted in May, and seasonal variation of TF availability could have influenced nutrient intake. Twenty four hour recall data from all four seasons would have provided more comprehensive results of nutrient intake. Finally, quality of recall data obtained from this age group may not be as reliable as an adult population.

Results from this survey indicate that TF consumption among youth is still common and that youth have a variety of TFs available to them. However youth are still likely inadequate in many micronutrients, indicating nutritional interventions would be beneficial. Three important recommendations to improve health among youth in this community are as follows:

1. TF's are rich sources of many nutrients that are inadequate among youth in the community (Kuhnlein et al. 2006). Vitamins A, D and E, all low in this population, can be acquired through TF consumption. Promotion of TF consumption may therefore be the optimal vehicle to improve the nutrient status for these and other nutrients. Current consumption patterns of TF indicate that youth would be receptive to the promotion of TF in this population.

2. Vitamin C and fiber status can be improved by increasing consumption of MF's such as fruits, vegetables and whole grains. This action would also increase the amount of vegetable and fruit consumption recommended by Canada's Food Guide for First Nations, Inuit and Métis, found to be low in the survey.

3. Decreasing sweetened beverage consumption by promotion of water is important to decrease excess energy. Increasing milk consumption is also recommended to ensure adequate calcium and vitamin D intake.

The nutrition transition is just one aspect that is contributing to changing health status among Inuit. Diet, physical activity and overweight all contribute to overall health and must be addressed in an effective intervention strategy for youth in this community. Improving nutrient status through interventions that promote healthy MF and TF would be beneficial to youth in this community. It is also important to facilitate access to healthy MF and TF by improving and creating effective northern programs and policies. There is great opportunity for this community to improve health among its youth by improving diet and increasing physical activity through culturally relevant initiatives.

Table 4.1: Percentage of Inuit youth in Pangnirtung aged 11-17 years in underweight, normal weight, risk of overweight and overweight categories as defined by the 2000 CDC Growth Charts.

BMI Percentile	Category	Girls n=36		Boys n=39		Total n=75	
		n	%	n	%	n	%
<5	Underweight	0	0.0	1	2.6	1	1.3
5 to 85	Normal Weight	22	61.1	26	66.7	48	64.0
85 to 95	Risk of Overweight	11	30.5	4	10.3	15	20.0
>95	Overweight	3	8.3	8	20.5	11	14.6

Table 4.2: Average daily consumption (g) of traditional foods¹ in the 'in' season, 'off' season and as a daily average throughout the year among Inuit youth aged 11-17 years (n=74) who reported consumption.

TF Item	Average daily grams consumed			% of Youth that reported consumption
	In season Consumers of TF item ²	Off season Consumers of TF item ²	Yearly Average Consumers of TF item ²	
Caribou	134.8 (292.9)	85.3 (160.0)	117.5 (236.1)	98.7
Blueberries	75.6 (100.4)	23.1 (123.7)	31.9 (106.3)	98.7
Ringed Seal	41.8 (65.1)	30.9 (55.8)	39.7 (59.2)	93.2
Beluga	88.3 (266.2)	17.3 (53.9)	29.4 (83.7)	91.9
Arctic Char	30.8 (43.2)	27.6 (41.3)	28.7 (41.3)	87.8
Narwhal	60.2 (197.9)	14.6 (37.6)	22.2 (57.9)	68.9
Clams	10.7 (14.3)	1.4 (6.7)	4.5 (7.5)	64.9
Wet/Seaweed	4.5 (8.6)	1.9 (7.6)	3.2 (7.6)	58.1
Goose Eggs	32.0 (68.2)	0.0 (0.0)	5.4 (11.6)	54.1
Eider Duck	40.7 (107.1)	3.2 (17.5)	7.1 (18.6)	48.7
Shrimp	319.9 (27.4)	40.4 (2.8)	134.6 (9.2)	41.9
Polar Bear	4.5 (8.1)	1.1 (4.1)	3.1 (4.9)	40.5
Sour Leaves	3.0 (6.8)	0.02 (0.1)	0.8 (1.7)	37.8
Plumigian	58.0 (171.9)	11.2 (34.4)	30.6 (72.0)	21.6
Rabbit	8.0 (19.3)	1.5 (4.6)	4.2 (8.1)	21.6
Canada Goose	26.7 (52.7)	0.0 (0.0)	7.2 (14.3)	14.9
Walrus	17.3 (17.5)	1.9 (3.8)	3.2 (3.1)	12.2
Mussels	20.7 (39.1)	18.1 (40.5)	19.0 (40.0)	6.8
Halibut	46.4 *	0.0 *	11.4 *	1.4

¹Traditional Food (TF)

²Mean (SD)

*one consumer, no Standard Deviation

Table 4.3: Servings of traditional foods consumed as a weekly average in the 'in' and 'off' seasons based on past year reporting among Inuit youth aged 11-17 years (n=74) in Pangnirtung, Nunavut.

	Average Weekly Servings		
	'In' season	'Off' season	Per Year
Caribou [†]	12.8	8.0	11.0
Shrimp [†]	29.9	3.8	12.6
Beluga [†]	24.8	5.0	7.8
Ringed Seal [†]	3.9	2.8	3.7
Blueberries [‡]	6.9	2.1	2.9
Ptarmigan [†]	5.4	1.0	2.9
Arctic Char [†]	2.9	2.6	2.7
Narwhal [†]	5.6	1.3	2.1
Mussels [†]	1.9	1.7	1.8
Halibut [†]	4.3	0.0	1.1
Canada Goose [†]	2.5	0.0	0.7
Eider Duck	3.8	0.3	0.7
Clams [†]	1.0	0.1	0.4
Rabbit [†]	0.7	0.1	0.4
Walrus [†]	1.6	0.2	0.3
Welk/Seaweed [‡]	0.7	0.3	0.5
Polar Bear [†]	0.4	0.1	0.3
Sour Leaves [§]	0.7	0.0	0.2
Goose Eggs [†]	0.2	0.0	0.0

[†] serving as defined by the Canadian Food Guide for First Nations Inuit and Métis is 75 g.

[‡] serving as defined by the Canadian Food Guide for First Nations Inuit and Métis is ½ a cup.

[§] serving as defined by the Canadian Food Guide for First Nations Inuit and Métis is 1 cup.

Table 4.4: Usual¹ median intake of micronutrients by Inuit boys (n=39) aged 11-17 years in Pangnirtung Nunavut with corresponding Dietary Reference Intake (DRI).

	Boys 9-13 years		Boys 14-17 years	
	n=24	DRI	n=15	DRI
Iron (mg)	13.5	5.9	21.9	7.7
Vitamin C (mg)	123.4	39	51	63
Vitamin A ^a (µg)	301.8 [†]	445	260.2	630
Phosphorous (mg)	943	1055	1348.4	1055
Vitamin E ^b (mg)	2.25 [†]	9	2 [†]	12
Folate ^c (µg)	285.2 [†]	250	273.5 [†]	330
Selenium (µg)	46.0	35	80.8	45
Zn (mg)	8.9	7.0	11.3	8.5
Vitamin B6 (mg)	1.1	0.8	1.4	1.0
Niacin (mg)	26.9	9.0	41.5	12
Thiamin (mg)	1.5 [†]	0.7	1.6	1.0
Riboflavin (mg)	1.6 [†]	0.8	1.7	1.1
Vitamin B12(µg)	2.5 [†]	1.5	4.0 [†]	2.0
Ca (mg) [†]	540.8 [†]	1300 [‡]	626.6	1300 [‡]
Vitamin D (µg) [‡]	2.3	5 [‡]	2.3	5 [‡]
Total Fibre (g) [‡]	7.4	31 [‡]	11.5	38 [‡]

[†] Adjusted to usual intake

^a Measured as Retinol Active Equivalents (RAE)

^b Measured as Alpha Tocopherol

^c Measured as Dietary Folate Equivalent

[†] Not adjusted to usual intakes, mean value reported

[‡] Denotes Adequate Intake (AI) used as reference value, otherwise all DRI's refer to EAR

Table 4.5: Usual¹ median intake of micronutrients by Inuit girls (n=36) aged 11-17 years in Pangnirtung Nunavut with corresponding Dietary Reference Intake (DRI).

	Girls 9-13 years		Girls 14-17 years	
	n=19	DRI	n=17	DRI
Iron (mg)	14.9	5.7	17.1	7.9
Vitamin C (mg)	154.0	39	129.4	56
Vitamin A ^a (µg)	268.6	420	336.6	485
Phosphorous (mg)	1300.5 [†]	1055	1184.1	1055
Vitamin E ^b (mg)	3 [†]	9	2.9	12
Folate ^c (µg)	386.5	250	315.0	330
Selenium (µg)	67.6	35	71.7	45
Zn (mg)	8.1 [†]	7.0	9.7	7.3
Vitamin B6 (mg)	1.5 [†]	0.8	1.4	1.0
Niacin (mg)	33.8 [†]	9	30.0	12
Thiamin (mg)	1.6	0.7	1.3	0.9
Riboflavin (mg)	1.8 [†]	0.8 [†]	1.6	0.9
Vitamin B12(µg)	2.7 [†]	1.5 [†]	3.3	2.0
Ca (mg) [‡]	620.5	1300 [‡]	471.6	1300 [‡]
Vitamin D (µg) [‡]	3.1	5 [‡]	1.9	5 [‡]
Total Fibre (g) [‡]	9.5	26 [‡]	11.5	26 [‡]

[†] Adjusted to usual intake

^a Measured as Retinol Active Equivalents (RAE)

^b Measured as Alpha Tocopherol

^c Measured as Dietary Folate Equivalent

[‡] Not adjusted to usual intakes, mean intake reported

[‡] Denotes Adequate Intake (AI) used as reference value, otherwise all DRI's refer to EAR

Table 4.6: Usual¹ mean micronutrient intakes among Inuit boys (n=39) and girls (n=36) aged 11-17 years who consumed and did not consume traditional food² as reported from 24 hour recall data.

	Boys Mean Intake ³		Girls Mean Intake ³	
	TF not consumed n=14	TF consumed n=25	TF not consumed n=17	TF consumed n=19
Iron (mg)	14.3 (5.2)	18.7 (10.0)	13.1 (4.2)	19.8 (9.2)** ⁴
Vitamin C (mg)	128.6 (86.9)	107.7 (88.2)	156.5 (82.6)	160.6 (95.6)
Vitamin A (µg)	257.2 (59.9)	307 (101.0)	253.6 (79.9)	362.0 (144.2)** ⁴
Phosphorous (mg)	1019.4 (317.3)	1209.8 (419.2)	1155.0 (279.8)	1235.3 (222.7)
Selenium (µg)	63.0 (30.9)	65.9 (37.4)	66.6 (27.4)	75.0 (27.5)
Zn (mg)	8.8 (3.6)	10.5 (4.0)	8.1 (2.0)	9.3 (1.9)
Vitamin B6 (mg)	1.3 (0.6)	1.4 (0.6)	1.6 (0.7) [†]	1.5 (0.7) [†]
Niacin (mg)	29.1 (11.0)	35.6 (19.0)	34.0 (16.3) [†]	38.4 (14.8) [†]
Thiamin (mg)	1.6 (0.5)	1.6 (0.4)	1.4 (0.4)	1.5 (0.3)
Riboflavin (mg)	1.5 (0.3)	1.6 (0.3)	1.7 (0.6) [†]	2.1 (0.9) [†]
Ca (mg)	572.5 (126.0)	570.6 (116.2)	553.2 (179.2)	587.2 (167.8)
Vitamin D (µg)	2.2 (1.3)	2.7 (1.7)	2.8 (1.5) [†]	3.4 (2.0) [†]
Folate (µg)	372.1 (187.4) [†]	295.2 (135.7) [†]	322.0 (105.2)	364.3 (82.3)
Total Fibre (g)	8.7 (2.1)	9.5 (4.2)	10.3 (4.2)	11.0 (4.7)

¹Adjusted to usual intake

²Traditional food (TF)

**P<0.01

[†]unadjusted mean of two days intake presented because within person variability was larger than between person variability

³Mean (SD) micronutrient intake from two 24 hour recalls

⁴Student's t-test compared those who consumed and who did not consume TF

Table 4.7: Total energy and percent of energy from macronutrients among Inuit girls (n=36) and boys (n=39) who consumed and who did not consume traditional foods¹ the previous day.

	Boys		Girls	
	TF consumed ^{2,3} (n=25)	TF not consumed ^{2,3} (n=14)	TF consumed ^{2,3} (n=19)	TF not consumed ^{2,3} (n=17)
Total Energy	2127.97 (745.0)	1922.2 (762.4)	2213.2 (514.9)	2416.4 (817.0)
% Protein	19.8 (7.3) [†]	14.0 (4.8) ^{†*}	17.3 (6.8) [†]	11.7 (3.5) ^{†**}
% Carbohydrate	57.8 (8.4) [†]	60.4 (9.9) [†]	58.5 (11.3) [†]	63.8 (8.5) [†]
% Fat	22.8 (3.9) [†]	26.6 (6.0) [†]	24.5 (3.4)	25.5 (5.9)
% Saturated Fat	7.0 (1.5)	8.5 (1.9) ^{**}	7.8 (1.9)	7.8 (2.2)
% MUFA	8.7 (1.9) [†]	10.1 (2.3) [†]	9.9 (1.7)	9.5 (2.9)
% PUFA	4.4 (1.3) [†]	4.1 (2.2) [†]	4.7 (1.6) [†]	4.8 (1.7) [†]

*P<0.05

**P<0.01

†-unadjusted mean of two days intake presented because within person variability was larger than between person variability

¹-Traditional food (TF)

²Mean (SD) macronutrient intake reported from two 24 hr recalls

³Student's t-test compared those who consumed and who did not consume TF

Table 4.8: Average daily consumption of market foods by Inuit youth aged 11-17 years (n=74), by sex and by consumers of traditional food^{1,a} in Pangnirtung, Nunavut.

Market Food Item	Sex		TF consumers ^{a,3,4}	Non-consumers ^{a,3,4}	Total ⁴
	Male ^{2,4} n=38	Female ^{2,4} n=36			
Chips (g)	39.3 (39.3)	44.0 (36.9)	44.0 (42.3)	38.2 (31.3)	41.6 (38.0)
Fruit Juice (ml)	1060.1 (1924.9)	504.9 (515.6)	832.0 (1381.8)	731.7 (1546.2)	790.0 (1443.5)
Milk (ml)	250.1 (263.4)	220.2 (279.3)	205.9 (216.3)	276.8 (329.6)	235.3 (269.8)
Powdered Drinks (ml)	633.9 (779.5)	483.2 (692.1)	577.4 (688.4)	537.3 (811.0)	560.6 (737.1)
Soft Drinks (ml)	1064.1 (1228.8)	937.4 (585.3)	794.3 (584.9)	1291.2 (1282.5)*	1002.5 (966.3)

^adefined using Food Frequency data

*p<0.05

¹Traditional Food (TF)

²Student's t-test compared difference between male and female consumption

³Student's t-test compared those who consumed and who did not consume TF

⁴Mean (SD) reported from semi quantitative Food Frequency Questionnaire

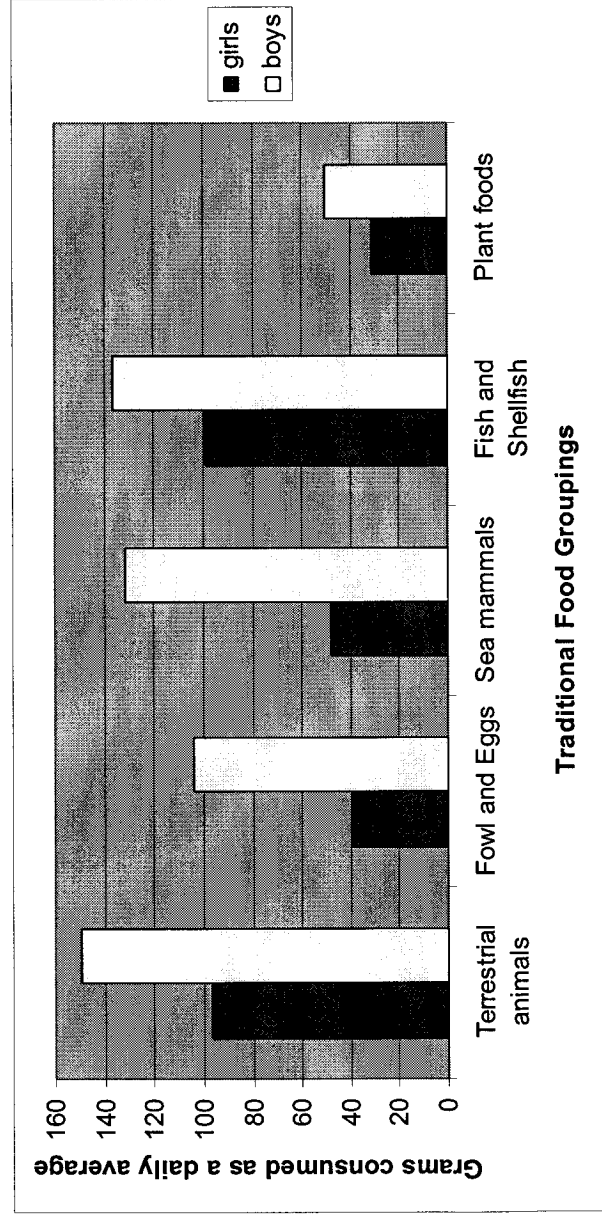
Table 4.9: Recommended daily servings by food group from Canada's Food Guide to Healthy Eating for First Nations, Inuit and Métis, and corresponding mean^{1,2} intakes from Inuit youth aged 11-17 years (n=75) in Pangnirtung, Nunavut.

Food Group	CGF recommended servings	Boys		Girls		All youth	
		n=38		n=36		n=74	
Vegetables and Fruit	5-8	4.1 (4.4)		4.7 (3.3)		4.6 (4.2)	
Grain Products	4-7	4.2 (1.9)		3.7 (1.9)		4.1 (2.2)	
Milk and Alternatives	2-4	1.1 (0.9)		1.0 (0.7)		1.1 (0.8)	
Meat and Alternatives	1-2	3.6 (2.6)		3.2 (1.6)		3.5 (2.2)	

¹Mean (SD)

²obtained from repeat 24 hour recall data

Figure 4.1: Traditional food (TF) consumption of Inuit boys (n=38) and girls (n=36) in Pangnirtung, Nunavut as a daily average¹ (g) according to TF food groupings.



¹ as reported from TF Food Frequency Questionnaire data

4.7 References

- Bang HO, Dyberg J, Nielsen AB. Plasma lipid and lipoprotein pattern in Greenlandic West Coast Eskimos. *Lancet*. 1971;1(7710):1143-1145.
- Barrett-Connor E. Nutrition epidemiology: how do we know what they ate? *Am J Clin Nutr*. 1991;54:S182-S187.
- Blanchet C, Dewailly E, Ayotte P, et al. Contribution of selected traditional and market foods to the diet of Nunavik Inuit women. *Can J Diet Pract Res*. 2000;61(2):50-59.
- Counil E, Dewailly E, Bjerregaard P, et al. Trans-polar-fat: all Inuit are not equal. *Brit J Nutr*. 2008;100(4):703-706.
- Dyberg J, Bang HO, Stoffersen E, et al. Eicosapentaenoic Acid and Prevention of Thrombosis and Atherosclerosis. *Lancet*. 1978;312(8081):117-119.
- Egeland GM, Charbonneau G, Kilabuk J, et al. Pangnirtung Initiative in Health Promotion: Executive Summary for the Hamlet Council. 2006.
- Egeland G, Charbonneau-Roberts G, Kuluguqtuq J, et al. Back to the Future: Using Traditional Food and Knowledge to Promote a Healthy Future among Inuit. FAO, in press.
- Hirai A, Hamazaki T, Terano T, et al. Eicosapentaenoic acid and platelet function in Japanese. *Lancet*. 1980;2:1132.
- Kuhnlein HV, Soueida R. Use and nutrient composition of traditional baffin inuit foods. *J Food Compos Anal*. 1992;5(2):112-126.
- Kuhnlein HV, Receveur O, Morrison NE, et al. Dietary nutrients of Sahtu Dene/Metis vary by food source, season, and age. *Ecol Food Nutr*. 1995;34:183-195.
- Kuhnlein HV, Barthet V, Farren A, et al. Vitamins A, D, and E in Canadian arctic traditional food and adult diets. *J Food Compos Anal*. 2006;19(6-7):495-506.
- Masood M, Chen TC. Calcium, phosphorous and nitrogenous compound contents of chicken broth from broiler breast frames as affected by various acidulants. *J food process preserve*. 1996;20(4):285-294.
- Nakano T, Fediuk K, Kassi N, et al. Food use of Dene/Metis and Yukon Children. *Int J Circumpolar Health*. 2005a;64(2):137-146.

Nakano T, Fediuk K, Kassi N, et al. Dietary Nutrients and Anthropometry of Dene/Metis and Yukon Children. *Int J Circumpolar Health*. 2005b;64(2):147-156.

Nicklas TA, Yang SJ, Baranowski T, et al. Eating patterns and obesity in children: The Bogalusa Heart Study. *Am J Prev Med*. 2003;25:9-16.

Ogden CL, Flegal KM, Carroll MD, et al. Prevalence and trends in overweight among US children and adolescents. *J Amer Med Assoc*. 2000;288:1728-1732.

Power EM. Conceptualizing Food Security for Aboriginal People in Canada. *C J Public Health*. 2008;99(2):95-97.

Receveur OM, Boulay M, Kuhnlein HV. Decreasing traditional food use affects diet quality for adult Dene/Metis in 16 communities of the Canadian Northwest Territories. *J Nutr*. 1997;127:2179-2186.

Sellers EAC, Sharma A, Rodd C. Adaptation of Inuit children to a low-calcium diet. *CMAJ*. 2003;168(9):1141-1143.

Serdula MK, Ivery D, Coates RJ, et al. Do obese children become obese adults? A review of the literature. *Prev Med*. 1993;22:167-177.

Shields M. Overweight and obesity among children and youth. *Health Rep*. 2006;17:27-42.

Tarasuk V, Beaton G. The nature and individuality of within-subject variation in energy intake. *Am J Clin Nutr*. 1991;54:464-470.

Troiano RP, Briefel RR, Carroll MD, et al. Energy and fat intakes of children and adolescents in the United States: Data from the National Health and Nutrition Examination Surveys. *Am J Clin Nutr*. 2000;72:1343S-1353S.

Thomas JP, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: Cluster randomized controlled trial. *BMJ*. 2000;328:1237-1239.

Wein EE. Nutrient intakes of First Nations People in four Yukon communities. *Nutr Res*. 1996;15(8):1105-1119.

Whitaker RC, Wright JA, Pepe MS, et al. Predicting obesity in young adulthood from childhood and parental obesity. *New Eng J Med*. 1997;337:869-873.

World Health Organization, Centre for Indigenous Peoples' Nutrition and Environment. Indigenous peoples and participatory health research. Geneva. 2003.

5. Bridge

Once the health surveys were completed the second phase of the community project was initiated. An original objective of the community initiative was to collect Traditional Knowledge (TK) about country food. Since TK and IQ is held and transferred from Elders to the next generation, Elder stories were decided upon as the foundation for this phase of the project. Elders and the steering committee named youth as an important target for this initiative as they are growing up among the many changes occurring in the Arctic.

This project attempts to address the secondary objective of this thesis: to determine if Elder stories can be used to transfer TK to community youth and to determine the emerging relationship between youth and country food.

6. ELDER STORIES AS A PILOT INTERVENTION

After the completion of the youth health survey in May 2006 a preliminary intervention using Elder stories was decided upon by the community steering committee and CINE.

6.1 Objectives

Three original objectives of this community initiative were as follows:

- 1) Share traditional knowledge with community members
- 2) Increase consumption of country food among community members
- 3) Create opportunities for informed choices at the grocery store.

To fulfill the first objective it was decided to construct a 'course' based on Elder stories for high school aged youth. Youth were targeted because it was important to the Elders interviewed and to the steering committee; further youth are migrating away from traditional ways at a fast pace. Healey and Meadows (2008) interviewed Inuit women in a northern community to determine how culture affected their perceptions of health. Women stated that less Inuit youth were speaking Inuktitut and that this was creating a traditional knowledge (TK) gap between generations. Other studies have documented that Inuit youth are eating less country food (Counil et al. 2008; Blanchet et al. 2000) and losing the 'taste' for their traditional foods (Power 2008).

The objective of the youth project was to determine if TK in the form of Elder stories in a DVD format is an effective means of transferring TK among youth. Local Elders were interviewed about TF and selected stories were formatted to DVD. Information from the interviews was used to construct a pre and post survey. The questionnaire was self administered to high school youth before and after the DVD was viewed. To determine if there was a significant increase in TK gained from the DVD 'course' pre and post scores were analyzed

using independent and paired t-tests. The survey was also designed to capture knowledge attitudes and beliefs (KABs) of youth and their emerging relationship with country food. Both outcomes will be useful to determine if country food promotion is an acceptable method of health promotion in this group.

6.2 Elder Stories

Interview questions for Elders were designed with the steering committee to capture TK about country food; ten semi structured questions were agreed upon as a template for interviews. Initial questions focused on hunting, harvesting and preparation of food. Other questions inquired about which traditional foods (TF) were eaten by which sex; what foods were avoided; spiritual practices concerning food; and what was eaten for medicinal purposes.

Informed consent was obtained before interviews were conducted. Elders were chosen by availability and willingness to participate and a total of 21 were interviewed; all interviews were held between May and September 2006. Interviews took place at the Elder's residence and ranged in length from twenty to forty five minutes. Male Elders were interviewed by a male member of the steering committee; female Elders were interviewed by a local female and all interviews were conducted in Inuktitut. Elders were interviewed by someone of the same sex to ensure that any questions relating to gender issues could be discussed openly. During the interview process questions would be repeated to the Elder if not initially answered. Elders were also given an opportunity to talk freely about the topic of country food and TK at the end of the interview.

Original interviews were recorded on a hand held cassette recorder and transferred from cassette tape to MP3 using a Marantz PMD 660 Portable Solid State Recorder.

The Inuktitut dialect varies from region to region; to ensure that transcriptions were accurate a former resident of Pangnirtung was hired to transcribe the interviews. Content analysis was used to derive themes from the stories. Content analysis is a qualitative technique that is used to “provide knowledge and understanding of the phenomenon under study” as defined by Downe-Wambolt (1992). Hsieh and Shannon (2005) further describe the conventional form of content analysis as reading then re-reading transcripts and assigning codes to text that addresses the phenomenon under study. Through this process the following 8 themes were found:

- 1) TFs and how they differ from market foods (MFs);
- 2) differences in what part of the animal was eaten by men and what part was eaten by women;
- 3) TFs that serve remedies;
- 4) TF and faith/Christianity;
- 5) old/obsolete traditions;
- 6) what part of the animal is not eaten and why;
- 7) environmental changes (climate change);
- 8) animal parts that served a utilitarian purpose.

6.3 Sharing Elder Stories with Youth

The interviews were on average forty minutes long, it was therefore important to find a vehicle to keep the interest of the youth. CINE and the steering committee decided to create a DVD to share the stories as it is a format that youth are comfortable with, since most households in the community own television sets. It was also considered engaging to have a visual portion with the voices of the Elders. DVD is also beneficial as it allows subtitles for non-Inuktitut speakers.

The majority of themes 1 to 3 were covered in depth within five Elder interviews; it was decided to use these five key interviews and the first three themes for production of the pilot DVD course. The DVD would consist of three segments, each theme corresponding to a segment of the DVD. For production of the DVD all information pertaining to the three themes were gathered throughout the five interviews. If information was not consistent among the interviews it was left out, flagged and given to the Elders and the steering committee to follow up. Using only five interviews allowed for a reasonable amount of information to be shared with the youth which helped maximize the information in the interviews.

Selected segments of the interviews were captured using the time the Elder started and stopped speaking (in and out times). Audacity Audio-Editor and Recorder Software Version 1.2.6 was used to retrieve and splice together interview segments based on in and out times. A continuous story from the five Elders was thereby composed and comprised the audio portion of the DVD. The length of the segments was 19:00, 17:54 and 14:51 minutes respectively.

Once the three audio files and corresponding subtitles were composed, they were compared once more by another bilingual Inuktitut speaker to ensure the audio correctly corresponded to the subtitles. Using a second translator also served as a final opportunity to ensure the original transcriptions to English were accurate. Corresponding English subtitles were composed in Microsoft Word 2003.

Two corrections to the subtitles were found and made through this process. Both corrections involved a missing question and corresponding answer not included in the original transcript. Once these questions and answers were added to the subtitle document, the audio files and subtitles were formatted to DVD.

The visual portion of the DVD consisted of pictures of Pangnirtung, other northern communities, and country food. The name of the DVD “Niqivut Nukivut”, translated as “Our Food Our Strength”, was proposed by a member of the steering committee and approved by the rest of the steering committee and CINE.

6.4 Questionnaire

Information was gathered from the transcribed interviews and true and false questions were constructed for the knowledge survey.

Twenty eight questions were composed in English and given to the steering committee to ensure the questions and answers were correct and to ensure English translations were correct. Four questions were changed with minor changes to the wording as per the steering committee’s suggestions. Accuracy of questions and how they related to the answers were reviewed by the steering committee to ensure they corresponded correctly with the interviews. A local youth read the questionnaire to ensure the questions could be comprehended by the age group.

To determine KABs about TF and MF a five point Likert scale ranging from strongly disagree to strongly agree was constructed. Fourteen questions were developed from the themes in the DVD, themes about traditional knowledge, as well as on trends found in the health survey in 2006. For internal validity of the Likert survey one question was reworded and used twice, if these answers did not correspond the Likert section of the singular survey would not be included in the results. Likert responses were interpreted according to general trends.

6.4.1 Qualitative Analysis

Qualitative analysis of the DVD and interviews was determined by the following open ended questions on the second survey:

- What did you like about the DVD?
- What would you change about the DVD?
- How do you feel about learning traditional knowledge from the Elders?
- What would make it easier for you to eat more country food?

These questions served two purposes, to determine changes that should be incorporated into a future DVD and to ensure future intervention messages are tailored to youth in this community. Second, these questions facilitate probing the KABs of the youth in relation to Elders, TF and TK.

6.4.2 Market and Traditional Food Indicators

Indicator MFs and TF consumption was used to assess key aspects of the youth diet to compare with the previous health survey conducted in the community. To determine TF consumption both surveys asked if country food was eaten the previous day. There was also opportunity to list the foods eaten. This was followed by a question asking what MF was consumed the day before, fruit and vegetable consumption from the previous day was also collected. All questions were followed by the opportunity to list foods consumed.

Finally, hunting patterns and frequency were assessed. This information would be used to determine the extent of hunting practices among high school aged youth in the community as a sign of traditional values among the youth.

6.5 Study Sample

The pilot intervention was school based at the high school population in Pangnirtung and occurred in May 2008 for two days over the span of two weeks. Informed consent was obtained from guardians and parents of all participating students. The DVD questionnaires were self administered to students before and after the DVD viewing. The pre-DVD questionnaire was given to the students and the first two segments of the DVD were played one week; the following week the last segment was played and the post questionnaire was self-administered.

Twenty eight TK questions from the interviews were included on both surveys to assess if TK from the DVD changed; qualitative questions about the DVD and about KABs towards country food were on the second survey only.

6.6 Analysis

Scores of the true/false individual knowledge surveys were summed at one point per question. If a question was not answered it was assumed that the student did not know the answer and a mark of zero was assigned. Group scores before and after were assessed using an independent t-test to determine if there was a significant difference at $p < 0.05$. For those who took both the before and after survey, scores were calculated in the same way and a paired t-test was used to determine if a significant difference in TK occurred ($p < 0.05$).

Qualitative analysis from the open ended questions was analyzed using content analysis (Hseih and Shannon 2005) for themes about TF and Elder knowledge. All comments that directly answered the questions were coded and defined as themes. For the Likert scale, general trends were interpreted and reported.

6.7 Results

The pilot DVD intervention was administered to the high school population in May 2008. However, the number of students attending high school was small. May is a common time for community members to go camping and hunting out of town, partly explaining the drop in enrollment. The entire high school population was over a hundred in September to approximately 25 students in May of 2008. Therefore 19 students took the pre survey and 24 took the post survey.

Due to the small sample size only the knowledge surveys and the open ended questions were analyzed to satisfy the secondary objectives of this thesis: determining if Elder stories in a DVD format can be used to transfer TK among youth and to determine KAB's around TF and TK.

6.7.1 Knowledge Survey

After the surveys were conducted four questions that were not understood by students were removed from the analysis, leaving the knowledge survey out of 24. One student failed to identify a gender in the pre survey and out of the remaining 19 students, six were male, representing 32% of the sample. Girls made up the remaining 68%. This was similar to the post survey, as 8 boys represented 32% of those who took part in the study. Ages ranged from 15 to 21 years in the pre survey and 15 to 23 in the post survey after exclusion of a 38 year old student. The average age for the pre survey was 16.2 years (± 1.4), for the post survey the average age was 16.6 years (± 1.9).

Table 6.1 shows mean pre and post DVD scores. The mean score for those that took part in both surveys ($n=10$) increased from 13.8 ± 3.0 (57.5%) to 15.8 ± 2.9 (65.8%), which was statistically significant at $p < 0.05$. The same trend was found when assessing mean scores between all who completed the first survey ($n=19$) and all who completed the second survey ($n=24$) at $p < 0.01$. These

results indicate that the Elder interviews on DVD were successful in transferring TK to youth in the community.

6.7.2 KABs and TF

Table 6.2 reveals themes and quotations from open ended questions obtained from the second survey. Main themes were as follows: country food traditions; learning TK from Elders; TF being healthier than MF; learning from Elders; and TF availability.

6.7.2.1 Country Food Traditions

Specific aspects of TK around TF were appreciated by the students, one student stated she enjoying hearing about the foods that were traditionally used for illness and what parts of the animal were eaten. Another stated he liked to hear “which part of traditional meat is good to eat.” Interestingly, one student wrote that the school curriculum does not teach this type of TK. These responses suggest that youth in the community are open to learning about TF. Further, although stated by one participant, youth may not be satisfied with the traditional knowledge surrounding country foods they are receiving at school, further that they are not given enough of an opportunity to learn TK about TF. More importantly, statements indicate that there is a desire among this population to learn more about country foods and traditional ways.

6.7.2.2 Learning from Elders

Four students wrote they liked that the Elders “had their own stories” and one directly stated she liked being ‘taught by Elders’, once again indicating students have respect for Elders. This reaction also indicates a willingness to learn from Elders.

6.7.2.3 Learning TK from Elders

One student stated that she liked learning because Elders “have a lot to teach.” This response, among others, indicates that Elder knowledge is an untapped resource for knowledge acquisition for community youth. These statements also demonstrate that local history is held by Elders, illustrating the essential role the Elders play in tying the community to its history and culture.

It should be noted that historically the Inuit way of learning occurred by observation more than directly stating what is traditionally performed, which may explain why youth and Elders may not be specifically conversing about traditional knowledge. Traditional life has changed and although some old ways may be obsolete with the introduction of western technologies, responses indicate Inuit culture is still valuable to a generation that is growing up in a westernized Arctic.

6.7.2.4 Health Benefits

Country food was also identified as being healthier than qallunaaq food (white man’s food) by two students, indicating that there is knowledge that TF is healthy among the population. TF promotion in this community may therefore be an acceptable intervention strategy for youth.

6.7.2.5 Increasing TF availability

Students identified hunting and being out on the land as beneficial to obtaining country food. One student also noted that having hunting equipment would make it easier to obtain country food. Multiple students defined living with Elders or visiting grandparents as beneficial to eating more traditional foods. Therefore, Elders are not only a tie to culture but are also a direct link to country food accessibility. Elders generally prefer traditional foods and so there are more

country foods available in households with Elders. Hence, Elders are identified by the youth as a direct tie to country foods.

Food security must also be considered for a possible explanation as to why more country foods are not consumed among youth (Chan et al. 2006). One student stated that country food is 'always there', however food insecurity is variable as was confirmed when one parent mentioned that "to be honest, there is not much country food." It should be noted that country food availability also varies by season and by year. In this particular community, for example, caribou were not found close to the community in the summer of 2008 compared to previous years.

6.8 Conclusion

Elder stories on DVD were successful in transferring TK to youth who partook in the survey. Although the sample size was small, significant results indicate that Elder stories and TK are worthy of exploration for health promotion activities in this community. Qualitative analysis further indicated that Elders are an untapped resource for increasing TK and promoting TF. Moreover, one paramount benefit of utilizing Elders for health promotion is facilitation of relationships between Elders and youth in the community, which may be beneficial in this community.

It should be noted that results warrant expanded qualitative and quantitative research in this community and others as the sample size was small. However, using TK in conjunction with other health promotion activities also creates a culturally relevant intervention strategy. Culture is a paramount factor that should be used to promote health in Inuit cultures; this was found to be true in a study among Inuit adults (McShane et al. 2006). This qualitative analysis indicates this may also be valid in a youth population. Elders are a vital and integral part of this community and remain an essential tie to culture and

traditional ways and TF. Hence, Elder knowledge as an intervention strategy is worthy of an expanded future intervention in this community.

Table 6.1 Mean knowledge survey scores out of 24, before and after watching the pilot DVD.

T-Test	Pre DVD Mean (SD)	Post DVD Mean (SD)	P-value
Independent	13.8 (3.0) (n=19)	15.8 (2.9) (n=24)	0.02
Paired	13.3 (2.5) (n=10)	15.5 (2.5) (n=10)	<0.01

Table 6.2 Themes from open ended questions in the second knowledge survey, after the pilot DVD was viewed.

Theme	Quotations
Country Food Traditions	• it was great to know which part of traditional meat is good to eat • it taught me more about the parts that are usually eaten and what's good to treat illnesses • I would really want to learn more about traditional knowledge from our Elders
Learning Traditional Knowledge from Elders	• I like learning about our traditional knowledge and I wanna learn more • Its great, I got to know more about the past • I like to learn more about traditional knowledge from our Elders • I would really want to learn more about traditional knowledge from our Elders
Traditional Food (TF) Healthier than MF	• It's a lot healthy then qallunaaq [white man's] food • Give us healthy
TF Availability	• If I go [to] my grandparents more often • If I had a boat in the summer • If more people went out hunting • Go hunting a lot more • Go out on the land more
Learning from Elders	• I liked the way Elders had their own stories • the Elders telling us about our tradition • the thing I liked about the DVD was how the Elders taught us • I like it because it's the tradition and culture we can learn from, our Elders they know better • some of the Elders has passed away and I really liked the voices of them • it was great to hear our Elders stories • was how the Elders taught us • our Elders knows what they've been through and teach us a lot more about our culture • I like learning because Elders have a lot to teach

7. Bridge

Despite a small sample size, the pilot intervention was successful in demonstrating that Elder knowledge can be transferred to youth through stories. Preliminary qualitative analyses also indicate a willingness to learn TK from Elders; and respect for TK and TF. The importance of having a culturally relevant intervention was important to the steering committee, and this pilot will serve as a basis for similar initiatives. The integration of consumption patterns, nutrient status and qualitative data about TK and TF can serve as a firm foundation to guide interventions involving TF and MF for youth in Pangnirtung.

8. Conclusion

8.1 Summary of Results

Consumption patterns among youth in Pangnirtung indicate that a variety of TF's are available in the community. Although TF use is frequent, it only contributed 11.9% to total energy from those who reported consumption. However, girls who consumed TF had significantly higher iron and vitamin A intake and both sexes had significantly higher protein intake than those who did not consume TF in the past day. Hence even a relatively small contribution of TF improved nutrient intake, demonstrating the nutrient dense nature of country food and presenting it as a tool for future health promotion activities. Further, nutrients such as vitamins A, E and D, all of which are probably inadequate among youth, are readily available in a variety of TFs. Therefore, promoting TF to youth in the community is a potential vehicle to improve compromised nutrient status where it exists.

Among MFs, sweetened beverage consumption illustrated the most worrisome habit as it contributed a large amount of excess energy to the diet. Youth on average drink one litre of pop per day, and fruit juice contributed almost 75% to 'vegetable and fruit' servings consumed. Milk consumption was also low, resulting in compromised calcium intake. These findings indicate that improving beverage consumption habits such as decreasing sweetened beverage consumption and including more water and milk would be beneficial to youth in a future intervention. Also, finding traditional ways of improving calcium intake such as promoting stews and soups cooked with bones could help improve calcium intake.

Anthropometric measurements showed that 34.6% of the population surveyed was overweight, according to CDC guidelines, indicating that overweight is emerging in this community.

Promotion of healthy MF, water consumption and country food would be beneficial to improving nutrient status and decreasing energy intake among youth in Pangnirtung.

Recorded Elder stories about TF were successful in transferring TK to youth in the community indicating they are receptive to learning TK from Elders. Qualitative analyses further indicated that youth respect Elders and value Elder knowledge. The inclusion of Elder knowledge and TK in future interventions could prove to be a successful means of promoting health to youth in this community. This project also facilitated ties among youth and Elders and promoted Inuit culture which in turn systemically promotes Inuit identity and therefore TF.

8.2 Future Research

Joint use of qualitative and quantitative assessment techniques provided a unique understanding of dietary behaviors and an explanation of knowledge and behaviors of youth in regard to country food.

Tradition and heritage are important determinants of health for Inuit (Royal Commission on Aboriginal People, 1996) and the integration of culturally relevant health promotion materials is beneficial as it creates an Inuit specific context. Elder story telling in particular is an appropriate vehicle as it was traditionally used to share knowledge with younger generations. Elders further serve an important role in Inuit communities as they possess and share TK.

Future steps to the participatory project include the following:

1. Revising the pilot DVD and evaluating the improved version among a larger sample of youth and young adults.

2. Documenting the many health promotion activities initiated in the community since the baseline youth survey (diabetes fair, the Co-op healthy food campaign, youth physical activity hip-hop program).
3. Completing the presentation of Elder stories in radio and DVD format with healthy eating and physical activity messages.
4. Evaluating whether there are improved dietary and physical activity habits through a follow-up health survey

Finally, if successful, the educational materials can be shared with the other Inuit communities and can stimulate development of similar initiatives in other communities.

9. Bibliography

Adelson N. The Embodiment of Inequity: Health Disparities in Aboriginal Canada. *Can J Public Health*. 2005;96:S45-S62.

Archibald L, Grey R. Evaluation of a model of health care delivery in Inuit regions. Submitted to Health Transition Fund, Sept 8, 2000.

Ballew C, Kuester S, Gillespie C. Beverage Choices Affect Adequacy of Children' Nutrient Intakes. *Arch Pediatr Adolesc Med*. 2000;154(11):1148-1152.

Bang HO, Dyberg J. & Nielsen AB. 1971. Plasma lipid and lipoprotein pattern in Greenlandic West Coast Eskimos. *Lancet*. 1971;1(7710):1143-1145.

Bang HO, Dyberg J. Plasma-lipids and lipoproteins in Greenlandic West Coast Eskimos. *Acta Medica Scandinavica*. 1972;192(1-2): 85-94.

Barrett-Connor E. Nutrition epidemiology: how do we know what they ate? *Am J Clin Nutr*. 1991;54:1823-1878.

Berkes F. *Sacred Ecology: Traditional Ecological Knowledge and Management Systems*. Philadelphia: Taylor and Francis; 1999.

Bernard L, Lavallee C, Gray-Donald K, et al. Overweight in Cree school children and adolescents associated with diet, low physical activity, and high television viewing. *J Am Diet Assoc*. 1995;95(7):800-802.

Bird SM, Wiles JK, Okalik L, et al. Living with diabetes on Baffin Island: Inuit storytellers share their experiences. *Can J Public Health*. 2008;99 (1):17-21.

Bjerregaard PY, Young TK. *The Circumpolar Inuit: health of a population in transition*. Copenhagen, Munksgaard. 288 pp.

Black AE, Goldberg GR, Jebb SA, et al. Critical evaluation of energy intake data using fundamental principles of energy physiology: 2. Evaluating the results of published surveys. *Eur J Clin Nutr*. 1991;45:583-599.

Blanchet C, Dewailly E, Ayotte P, et al. Contribution of selected traditional and market foods to the diet of Nunavik Inuit women. *Can J Diet Pract Res*. 2000;61(2):50-59.

Canadian Institutes of Health Research. Health research needs north of 60: northern town hall meetings, September 2001. January 25, 2002. [Online] [Accessed October 2008]. Available from http://www.cihr-irsc.gc.ca/e/pdf_14828.htm.

Centre for Indigenous Peoples' Nutrition and Environment: Assessment of dietary benefit / risk in Inuit communities. Edited by: Environment CIPN. Ottawa, Centre for Indigenous Peoples' Nutrition and Environment; 2000:-377.

Chan HM, Fediuk K, Hamilton S, et al. Food security in Nunavut, Canada: Barriers and recommendations. *Int J Circumpolar Health*. 2006;65(5):416-431.

Charbonneau-Roberts G, Young TK, Egeland GE. Inuit anthropometry and insulin resistance. *Int J Circumpolar Health*. 2007;66(2):129-3.

Contento I, Balch GI, Bronner YL, et al. Nutrition education for school-aged children. *J Nutr Educ*. 1995; 27:298-311.

Counil E, Dewailly E, Bjerregaard P, et al. Trans-polar-fat: all Inuit are not equal. *Brit J Nutr*. 2008;100(4):703-706.

Davis S, Going S, Helitzer D, et al. Pathways: a culturally appropriate obesity-prevention program for American Indian schoolchildren. *Am J Clin Nutr*. 1999;69(4):796S-802S

Dawson PC. Unfriendly Architecture: Using Observations of Inuit Spatial Behavior to Design Culturally Sustaining Houses in Arctic Canada. *Housing Stud*. 2008;23(1):111-128.

Drewnowski A, Popkin BM. The nutrition transition: New trends in the Global Diet. *Nut Rev*. 1997;55(2):31-43.

Despres C, Beuter A, Richer F, et al. Neuromotor functions in Inuit preschool children exposed to Pb, PCBs, and Hg. *Neurotoxicol Teratol*. 2005;27:245-57.

Donnelly J, Jacobsen D, Whatley J, et al. Nutrition and physical activity program to attenuate obesity and promote physical and metabolic fitness in elementary school children. *Obesity Res*. 1996;4(3):229-43.

Downe-Wamboldt B. Content analysis: Method, applications, and issues. *Health Care Women Int*. 1992;13:313-321.

Dyberg J. Coronary heart disease in Greenland Inuit: a paradox. Implications for Western Diet Patterns. *Arctic Med Res*. 1989;48(2):47-54.

Dyberg J, Bang HO, Stoffersen E, et al. Eicosapentaenoic Acid and Prevention of Thrombosis and Atherosclerosis. *Lancet*. 1978;312(8081):117-119.

Ebbeling CB, Feldman HA, Osganian SK, et al. Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: A randomized, controlled pilot study. *Pediatrics*. 2006;117(3):673-680.

Ebbesson SOK, Schraer CD, Risica PM, et al. Diabetes and impaired glucose tolerance in three Alaskan Eskimo populations: The Alaska-Siberia Project. *Diabetes Care*. 1998;21(4):563-569.

Egeland G, Charbonneau-Roberts G, Kuluguqtuq J, et al. Back to the Future: Using Traditional Food and Knowledge to Promote a Healthy Future among Inuit. FAO, *in press*.

Egeland GM, Berti P, Soueida R, et al. Age differences in vitamin A intake among Canadian Inuit. *Can J Public Health*. 2004; 95(6):465-469.

Egeland GM, Charbonneau G, Kilabuk J. Pangnirtung Initiative in Health Promotion: Executive Summary for the Hamlet Council. 2006.

Food and Agriculture Organization of the United Nations. The Special Programme for Food Security. [cited 2008 June 17]. Available from: <http://www.fao.org/spfs/en>.

French S, Stables G. Environmental interventions to promote vegetable and fruit consumption among youth in school settings. *Prev Med*. 2003;37:593-610.

Gilman A, McAllister K, Wigle, et al. Health and enironmental indicators for children and youth in the circumpolar arctic. *Epidemiology*. 2005;16(5) :S144-S145.

Grondin J, Proulx JF, Bruneau S, et al. Sante publique et environnement au Nunavik. *Etudes/Inuit/Studies*. 1994;18(1-2):225-251.

Guyot M, Dickson C, Paci C, et al. Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities. *Int J Circumpolar Health*. 2006;65(5):403-415.

Hazuda HP, Haffner SM, Stern MP, et al. Effects of acculturation and socioeconomic status on obesity and diabetes in Mexican Americans: the San Antonio Heart Study. *Am J Epidemiol*. 1988;128:1289-1301.

Healey GK, Meadows LM. Tradition and Culture: An Important Determinant of Inuit Women's Health. *J Aborig Health*. 2008;4(1):25-33.

Hirai A, Hamazaki T, Terano T, et al. Eicosaphentaenoic acid and platelet function in Japanese. *Lancet*. 1980;2:1132.

Ho LS, Gittelsohn J, Rimal R, et al. An Integrated Multi-Institutional Diabetes Prevention Program Improves Knowledge and Healthy Food Acquisition in Northwestern Ontario First Nations. *Health Educ Behav*. 2008;35:561-573.

Hsieh HF, Shannon SE. Three Approaches to Content Analysis. *Qual Health Res.* 2005;15(9):1277-1288.

Howarth NC, Saltzman E, Roberts SB. Dietary fiber and weight regulation. *Nutr Rev.* 2001;59(5):129-139.

Hovelsrud GK, McKenna M, Huntington HP. Marine Mammal harvests and other interactions with humans. *Ecol Appl.* 2008;18(2):S135-S147.

Indian and Northern Affairs Canada. Nutrition and Food Security in Kugaaruk, Nunavut. Ottawa: Minister of Public Works and Government Services Canada, 2003.

Indian and Northern Affairs Canada. Nutrition and Food Security in Kangiqsujaq, Nunavik. Ottawa: Minister of Public Works and Government Services Canada, 2004.

Institute of Aboriginal Peoples' Health. Annual Report, 2002-2003. Ottawa: Institute of Aboriginal Peoples' Health, Canadian Institutes of Health Research, 2003. Available on-line at: http://www.cihr-hrsc.gc.ca/e/pdf_24826.htm.

Institute of Medicine. Dietary Reference Intakes: Applications in Dietary Assessment. Washington, DC: National Academy Press; 2000.

Inuit Tapiriit Kanatami. [cited 2008 September]. Available from: <http://www.itk.ca/publications/5000YearHeritage.pdf>.

Jarrett RJ. Epidemiology and public health aspects of non-insulin dependent diabetes mellitus. *Epidemiol Rev.* 1989;11:151-171.

Kelder SH, Perry CL, Klepp KI et al. Longitudinal tracking of adolescent smoking, physical activity and food choice behaviors. *Am J Public Health.* 1994; 84:1121-1126.

Kuhnlein HV, Soueida R. Use and nutrient composition of traditional baffin inuit foods. *J Food Compos Anal.* 1992;5(2):112-126.

Kuhnlein HV, Receveur O, Morrison NE, et al. Dietary nutrients of Sahtu Dene/Metis vary by food source, season, and age. *Ecol Food Nutr.* 1995;34:183-195.

Kuhnlein HV, Soueida R, Receveur O. Dietary nutrient profiles of Canadian Baffin Island Inuit differ by food source, season, and age. *J Am Diet Assoc.* 1996;96(2):155-162.

- Kuhnlein HV, Receveur O. Dietary Change and Traditional Food Systems of Indigenous Peoples. *Annu Rev Nutr.* 1996;16:417-442.
- Kuhnlein HV, Chan HM, Leggee D, et al. Macronutrient, Mineral and Fatty Acid Composition of Canadian Arctic Traditional Food. *J Food Compos Anal.* 2002;15(5):545-566.
- Kuhnlein HV, Receveur O, Soueida R, et al. Arctic indigenous peoples experience the nutrition transition with changing dietary patterns and obesity. *J Nutr.* 2004;134(6):1447-1453.
- Kuhnlein HV, Barthet V, Farren A, et al. Vitamins A, D, and E in Canadian arctic traditional food and adult diets. *J Food Compos Anal.* 2006;19(6-7):495-506.
- Ledrou I, Gervais J. Food Insecurity. *Health Reports.* 2005;16:1-5.
- Lytle LA, Seifert S, Greenstein J et al. How do children's eating patterns and food choices change over time? Results from a cohort tracking study. *Am J Health Promot.* 2000;14:222-228.
- Macaulay A, Paradis G, Potvin L, et al. The Kahnawake Schools Diabetes Prevention Project: intervention, evaluation, and baseline results of a diabetes primary prevention program with a native community in Canada. *Prev Med.* 1997;26(6):779-790.
- Masood M, Chen TC. Calcium, phosphorous and nitrogenous compound contents of chicken broth from broiler breast frames as affected by various acidulants. *J food process preserve.* 1996;20(4):285-294.
- McShane KE, Smylie JK, Hastings PD, et al. Guiding Health promotion Efforts with Urban Inuit. A Community-specific Perspective on Health Information Sources and Dissemination Strategies. *Can J Pub Health.* 2006;97:296-299.
- Meyer KA, Kushi LH, Jacobs DR, et al. Carbohydrates, dietary fiber, and incident type 2 diabetes in older women. *Am J Clin Nutr.* 2000;71(4):921-930.
- Mouratoff GJ, Carroll NV, Scott EM. Diabetes mellitus in Eskimos. *JAMA.* 1967;199:107-112.
- Mulvad G, Pedersen HS, Hansen JC, et al. The Inuit diet. Fatty acids and antioxidants, their role in ischemic heart disease, and exposure to organochlorines and heavy metals. An international study. *Arctic Medical Research.* 1996;55(Suppl 1):20-24.
- Myers H, Furgal C. Long-Range Transport of Information: Are Arctic Residents Getting the Message about Contaminants? *Arctic.* 2006;59(1):47-60.

Nakano T, Fediuk K, Kassi et al. Food use of Dene/Metis and Yukon Children. *Int J Circumpolar Health*. 2005a;64(2):137-146.

Nakano T, Fediuk K, Kassi et al. Dietary Nutrients and Anthropometry of Dene/Metis and Yukon Children. *Int J Circumpolar Health*. 2005b;64(2):147-156.

Nicklas TA, Yang SJ, Baranowski T, et al. Eating patterns and obesity in children: The Bogalusa Heart Study. *Am J Prev Med*. 2003;25:9-6.

Ogden CL, Flegal KM, Carroll MD, et al. Prevalence and trends in overweight among US children and adolescents. *J Amer Med Assoc*. 2000;288:1728-1732.

Patandin S, Lanting CL, Mulder PGH, et al. Effects of environmental exposure to polychlorinated biphenyls and dioxins on cognitive abilities in Dutch children at 42 months of age. *J Pediatr*. 1999;134(1):33-41.

Poirier S, Brooke L. Inuit Perceptions of Contaminants and Environmental Knowledge in Salluit, Nunavut. *Arct Anthropol*. 2000;37(2):78-91.

Porterfield SP, Hendry LB. Impact of PCBs on thyroid hormone directed brain development. *Toxicol Ind Health*. 1998;14(1/2):103-120.

Potvin L, Desrosiers S, Trifonopoulos M, et al. Anthropometric characteristics of Mohawk children aged 6 to 11 years: a population perspective. *J Am Diet Assoc*. 1999;99(8):955-961.

Power EM. Conceptualizing Food Security for Aboriginal People in Canada. *Can J Public Health*. 2008;99(2):95-97.

Reading J, Kmetz A, Gideon V. First Nations Wholistic Policy and Planning Model. Discussion Paper for the World Health Organization Commission on Social Determinants of Health. 2007.

Receveur OM, Boulay M, Kuhnlein HV. Decreasing traditional food use affects diet quality for adult Dene/Metis in 16 communities of the Canadian Northwest Territories. *J Nutr*. 1997;127:2179-86.

Risica PM, Schraer C, Ebbesson SOE, et al. Overweight and obesity among Alaskan Eskimos of the Bering Straits Region: the Alaska Siberia project. *Int J Obesity*. 2000;24(8):939-944.

Royal Commission on Aboriginal Peoples. Report of the Royal Commission on Aboriginal Peoples, Restructuring the Relationship, Volume 2, Part 2. Ottawa: Minister of Supply and Services, 1996.

- Saksvig BI, Gittelsohn J, Harris SB et al. A Pilot School-Based Healthy Eating and Physical Activity Intervention Improves Diet, Food Knowledge, and Self-Efficacy for Native Canadian Children. *J Nutr.* 2005;135:2392-2398.
- Scott EM, Griffith IV. Diabetes mellitus in Eskimos. *Metabolism.* 1957; 6:320-25.
- Sellers EAC, Sharma A, Rodd C. Adaptation of Inuit children to a low-calcium diet. *Can Med Assoc J.* 2003;168(9):1141-3.
- Serdula MK, Ivery D, Coates RJ, et al. Do obese children become obese adults? A review of the literature. *Prev Med.* 1993;22:167-177.
- Shields M. Overweight and obesity among children and youth. *Health Rep.* 2006;17:27-42.
- Simons-Morton B, Parcel G, Baranowski T, et al. Promoting physical activity and a healthful diet among children: Results of a school-based intervention study. *Am J Public Health.* 1991;81(8):986-91.
- Skinner K, Hanning RM, Tsuji JS. Barriers and Supports for Health eating and Physical Activity for First nation Youths in Northern Canada. *Int J Circumpolar Health.* 2006;65(2):148-161.
- Saint-Amour D, Roy MS, Bastien C, et al. Alterations of visual evoked potentials in preschool Inuit children exposed to methylmercury and polychlorinated biphenyls from a marine diet. *Neurotoxicology.* 2006;27:567-78.
- Tarasuk V, Beaton G. The nature and individuality of within-subject variation in energy intake. *Am J Clin Nutr.* 1991;54:464-70.
- Thomas JP, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: Cluster randomized controlled trial. *BMJ.* 2000;328:237-1239.
- Troiano RP, Briefel RR, Carroll MD, Bialostosky K. Energy and fat intakes of children and adolescents in the United States: Data from the National Health and Nutrition Examination Surveys. *Am J Clin Nutr.* 2000;72:1343S-353S.
- Van Oostdam J, Donaldson SG, Feeley M, et al. Human health implications of environmental contaminants in Arctic Canada: A review. *Sci Total Environ.* 2005;351:165-246.
- Wein EE. Nutrient intakes of First Nations People in four Yukon communities. *Nutr Res.* 1996;15(8):1105-1119.

Whitaker RC, Wright JA, Pepe MS et al. Predicting obesity in young adulthood from childhood and parental obesity. *New Eng J Med*. 1997;337:869-873.

White DM, Gerlach SG, Loring P, et al. Food and Water Security in a changing Arctic Climate. *Environ Res Lett*. 2007;2(4):1-4.

World Health Organization, Centre for Indigenous Peoples' Nutrition and Environment. *Indigenous peoples and participatory health research*. Geneva. 2003.

Young TK. Contributions to chronic disease prevention and control: studies among the Kivalliq Inuit since 1990. *Int J Circumpolar Health*. 2003;62(4):323-330.

Young TK. Chronic diseases among Canadian Indians: towards an epidemiology of culture change. *Arctic Med Res*. 1988; 47:434-441.

10. APPENDICES

Appendix 10.1: McGill University Ethics Certificate

Appendix 10.2: Northern Research Institute (NRI) Research License

Appendix 10.3: Steering Committee Members

1. Jonah Kilabuk
2. Selina Kisa
3. Johnny Kuluguqtug
4. Markus Wilcke
5. Mary Ann Mike

10.4 Baseline Youth Health Survey Consent/Assent Form

Consent/Assent Form for 10-17 year olds–Baseline Assessment

Community Initiative in Country Food and Healthy Market Food Health Promotion in Pangnirtung

Principal Investigator:	Grace Egeland Ph.D., Centre for Indigenous Peoples' Nutrition and Environment (CINE), McGill University.
Responsible Institution:	CINE, McGill University.
Steering Committee:	Markus Wilcke, Johnny Kuluguqtuq, and Jonah Kilabuk.
Other collaborators:	Looee Okalik, Inuit Tapiriit Kanatami.
Funding Organizations:	Canadian Institutes of Health Research (CIHR).

Introduction: Your child is being asked to take part in a research project. This consent form will give you a general idea of what the Community Initiative Health Promotion Project is about and what your child's participation involves. Please take the time to read the information carefully and make sure that you understand it. A copy of this form will be provided for you to keep.

Background: The present research project is the result of an initial invitation to CINE over a year ago to visit the community to explore and develop health research regarding food choices and diabetes prevention. The present project was developed by and with community members of Pangnirtung.

Purpose: Your child is invited to participate in a study that will help us develop a plan that encourages the use of country food and healthy market food.

The study will gather information on:

- ◆ Diet, physical activity, height and weight measurements, and a finger prick for levels of iron (with females) at baseline and at follow-up of the study.
-

Description of the study:

Your child will be asked to visit the Attagoyuk Ilisavik high school where the community research assistants will interview your child in Inuktitut and/or English.

◆ Face-to-face interview

- The kinds of foods your child normally eat (over the past 24 hours on 2 non-consecutive days and using a Food Frequency questionnaire to assess traditional food and market food choices)
- Physical activity (winter and summer seasons)

◆ Body measurements

- Body weight (for this it will be necessary that you remove your shoes and socks)
- Height

◆ Iron status

- The community research assistant will obtain a very small amount of blood in females by finger prick to measure your child's level of iron.

This interview will take approximately 1 ½ hours.

Right to Refuse Participation: Your decision to be part of the study is completely up to you/your child.

Risks of Participating:

- Your finger can feel tender where the finger prick was taken.
- An infection can happen where the blood is taken; however, this is very rare, and the nurse can easily treat the infection.

Benefits of Participating:

- **In general:** Your child's participation in this study will help develop a health promotion plan that could be put into practice across all Inuit regions and may prove to be an effective way to avoid an increase in diabetes and other chronic diseases.
- **Specifically:** Your child will also receive a prize and his/her name will be put in a draw for a variety of prizes. Overall outcomes will be provided to you in the mail in a letter written in English and Inuktitut. Results will also be presented by a radio program in Inuktitut, which will be taped and copies of the tape will be available at your local community center and health clinic. Also, information will be provided in a visual format at a community presentation.

Confidentiality:

- The interviewers have signed a confidentiality agreement and the data collected is confidential.
- Your child will be given a unique number to keep his/her identity confidential.
- The information will be entered into a computer program. The computer program will not include your child's name; only a number will be given to those analyzing data.
- We will keep a copy of the names of participants at the local health clinic in Pangnirtung and in a locked cabinet in the Centre for Indigenous Peoples' Nutrition and Environment (CINE) director's office so that your results can be returned to the community.
- No personal information will be shared with any community member, organizations or other agencies.
- Only the overall findings (not your child's personal results) will be shared with regional and national Inuit organizations concerned with health.

Right to withdraw: Your child's participation is entirely voluntary and you or your child can stop being part of the study at any time. There is no penalty for withdrawing from the study. Also, your child is allowed to not respond to any of the questions and can be removed from the database at any time.

Appendix 10.5: Interview Questions for Elders

1. What healthy foods do you eat?
2. As you were growing up what did you learn from your parents and Elders about ways that country food is good for your spirit and health?
3. Which parts of meat were considered food for men and women and why?
 - Seal
 - Caribou
 - Hooded Seal
 - Whale
 - Rabbit
 - Ptarmigan
 - Fish
 - Ocean Ducks (varieties)
 - And others that you can think of?
4. Can you tell me about caribou of how it is good for your body? And which part of caribou meat is good when you're sick? Cooked, Raw and what part of the season?
5. Can you tell me about seal, how it is good for your body? And which part of seal meat is good when you're sick?
6. Can you tell me about seaweed and clams of how it is good for your body?
7. How did our ancestors express gratitude for having a blessed catch of our healthy foods?
8. Can you tell me about plants that grow in our land of which is edible and not edible? Do you know which plant is good for you when you're sick?
9. What are your thoughts about market foods? Do you consider some market foods as healthy? If yes, which ones?
10. According to IQ what did Inuit eat very little or none at all of animals? How did Inuit communicate about food safety?
11. Is there anything outstanding you'd like to share in regards to healthy eating and lifestyles?

Appendix 10.6: DVD Subtitle Excerpt

What about the foods from the sea as kelp, seaweed, clams, do you know how good they are for our health?

The kelps when they seasoned by Fall were used as remedy for stomach aches and diarrhea. We have always used them to settle our stomachs.

Do kelp[s] and seaweed help our bodies?

These foods are seasonal. When we crave for them and have some, they have a way of curing our craving. We are unable to obtain them at mid-winter since we have lived in Panniqtuuq. When we lived in our camps, we relied on seaweeds and kelp when we had food shortages, they were a good source of food when nothing else was available.

Our ancestors, how did they grant thanks upon catching game?

We were always grateful upon a catch. We relied fully on the game. That is what defines us as Inuit and God had created us. Inuit were granted this food living in our part of the world. Us, elders, we remain to eat traditional foods, at least, I do. I find traditional foods more desirable than market foods. Our traditional foods are exceptionally good for our health having grown up on them.

How did they grant thanks upon catching game?

We didn't live carelessly in the days. Today, people seem to live freely although they may not. We may give thanks for the food without saying a word. Back then, we would experience shortage of food and were grateful to God for every catch we had.

Which plants are edible?

I know these well. With the weather cooperating, plants grow healthy if and when we were at caribou hunting grounds, leaves varied then one smaller others bigger. Furry plants are sour. Plants without fur are smaller but are delicious. We ate them as we faced shortages of food at times.

Appendix 10.7: Consent Form for Pilot DVD Intervention

Community Initiative in Country Food and Healthy Market Food Health Promotion in Pangnirtung

Principal Investigator:	Grace Egeland Ph.D., Centre for Indigenous Peoples' Nutrition and Environment (CINE), McGill University.
Responsible Institution:	CINE, McGill University.
Steering Committee:	Markus Wilcke, Johnny Kuluguqtuq, Selina Kisa, Mary Ann Mike, Jennifer Wakegijig and Jonah Kilabuk.
Other collaborators:	Looee Okalik, Inuit Tapiriit Kanatami.
Funding Organizations:	Canadian Institutes of Health Research (CIHR).

Introduction: Your child is being asked to take part in a research project. This consent form will give you a general idea of what the Community Initiative Health Promotion Project is about and what your child's participation involves. Please take the time to read the information carefully and make sure that you understand it.

Background: The present research project is the result of an initial invitation to CINE to visit the community to explore and develop health research regarding food choices and diabetes prevention. The present project was developed by and with community members of Pangnirtung.

Purpose: Your child is invited to participate in a study that will share information from local Elder interviews about Traditional Foods and Knowledge through DVD segments.

Description of the study:

Your child is invited to attend sessions during school time where the DVD will be played.

◆ **Knowledge survey**

- Before and after your child watches the DVD a survey asking questions about country food (that are talked about in the DVD) will be completed by your child, there will also be questions about knowledge and attitudes toward country food.

Each survey will take approximately half an hour.

Right to Refuse Participation: Your decision to be part of the study is completely up to you/your child.

Risks of Participating:

- There are no risks associated with this study.

Benefits of Participating:

- **In general:** Your child's participation in this study will help the development of a longer DVD project that will promote country food to youth in Pangnirtung.
- **Specifically:** In addition to receiving information about the nutritious benefits and traditional knowledge of country foods from local Elders your child's name will also be put into a raffle to receive an ipod shuffle when both surveys are completed.

Confidentiality:

- Your child's knowledge scores will be confidential.

Right to withdraw: Your child's participation is entirely voluntary and you or your child can stop being part of the study at any time. There is no penalty for withdrawing from the study. Also, your child is allowed to not respond to any of the questions and can be removed from the database at any time.

Consent**Consent (for parent or legal guardian):**

I have read, or had read to me, the above information before signing the consent form. I agree for my child to participate in the Community Initiative in Country Food and Healthy Market Food Health Promotion in Pangnirtung. My signature means that I have the legal authority to sign for this minor.

You will receive a signed copy of this form to keep.

Name of parent or legal guardian

Signature of parent or legal guardian

Date (y/m/d)

For more information please contact:

Johnny Kuluguqtuq, Phone number: (867) 473-2632

Appendix 10.8: Pilot DVD Intervention Pre-Questionnaire

Survey I

Name: _____

Grade: _____

Sex: Male/Female

Date: _____

Age: _____

Please circle the appropriate answer (Yes or No):

1. I ate Country Food yesterday.
If yes, please list what you ate here.

Yes/No

2. I drank pop yesterday.
If yes, how many cans.

Yes/ No

_____ cans.

3. I bought lunch/a snack yesterday.
If yes, what did you buy and how much?

Yes/No

Ex. ½ of a chocolate bar and 1 hotdog

4. I ate fruits and vegetables yesterday
If yes, which fruits and vegetables and how much?

Yes/No

Ex. 1 orange and 2 apples

5. I have hunted in the last year.
If yes, about how many times did you go hunting?

Yes/No

(Please circle one group below)
0-2 3-5 6-8 9-11

What did you hunt?

True False Questions, please circle the correct answer.

1. Traditionally, men and women would eat different parts of the seal **True/False**
2. Whale tendons can be used for thread **True/False**
3. Ptarmigan are usually eaten before the feathers turn white **True/False**
4. Traditionally, men and women would eat in different areas of the igloo (if there was space.) **True/False**
5. Traditionally, women would eat closer to the entrance of the igloo or tent.
True/False
6. Traditionally, arctic char heads were mostly eaten by men. **True/False**
7. Traditionally, women usually eat the ribs of the seal. **True/False**
8. Traditionally, women usually eat the seal liver. **True/False**
9. Lemming skin should not be used to treat boils. **True/False**
10. Matsak (of the seal) was traditionally known to be good for health. **True/False**
11. Bearded seal fat can be used like a band aid on cuts. **True/False**
12. Mushroom pollen should not be used to help the bleeding of a cut. **True/False**
13. "Kujapik" was traditionally the call to feast on bearded seal meat. **True/False**
14. "Mikigaq" was the call to feast on bearded seal meat. **True/False**
15. Ptarmigan are not usually eaten in the winter and spring. **True/False**
16. "Kikkajak" was the call to eat seal meat. **True/False**

17. "Uliutin" is a muscle in the seal. **True/False**
18. "Uliutin" can be used as thread. **True/False**
19. The seal heart was shared evenly between women and men. **True/False**
20. Kelp and seaweed is in season in the Fall. **True/False**
21. The aaqsiq is the part of the bearded seal that is in between the rib and spine.
True/False
22. The aaqsiq was usually eaten by women. **True/False**
23. Clams and seaweed cannot be gathered during a full moon. **True/False**
24. In the past when someone was sick, caribou stomach contents would be blended
with snow and served to the sick person. **True/False**
25. Mountain sorrel sap is sweet. **True/False**
26. Whale meal turned white when it was dipped in salt water. **True/False**
27. The bile of the bearded seal is never eaten. **True/False**
28. The skeleton of the Artic hare head is used to play a game. **True/False**

Appendix 10.9: Pilot DVD Intervention Post-Questionnaire

Survey II

Name: _____
Male/Female

Grade: _____

Sex:

Date: _____

Age: _____

Please circle the appropriate answer (Yes or No):

1. I ate Country Food yesterday.
If yes, please list what you ate here.

Yes/No

2. I drank pop yesterday.
If yes, how many cans?

Yes/ No

_____cans.

3. I bought lunch/a snack yesterday.
If yes, what did you buy and how much?

Yes/No

Ex. 1/2 of a chocolate bar and 1 hotdog

4. I ate fruits and vegetables yesterday
If yes, which fruits and vegetables and how much?

Yes/No

Ex. 1 orange and 2 apples

5. I have hunted in the last year.

Yes/No

If yes, about how many times did you go hunting?

(Please circle one group below)

0-2

3-5

6-8

9-11

What did you hunt?

True False Questions, please circle the correct answer.

1. Traditionally, men and women would eat different parts of the seal

True/False

2. Whale tendons can be used for thread **True/False**

3. Ptarmigan are usually eaten before the feathers turn white **True/False**

4. Traditionally, men and women would eat in different areas of the igloo (if there was space.) **True/False**

5. Traditionally, women would eat closer to the entrance of the igloo or tent.

True/False

6. Traditionally, arctic char heads were mostly eaten by men. **True/False**

7. Traditionally, women usually eat the ribs of the seal. **True/False**

8. Traditionally, women usually eat the seal liver. **True/False**

9. Lemming skin should not be used to treat boils. **True/False**

10. Matsak (of the seal) was traditionally known to be good for health.

True/False

11. Bearded seal fat can be used like a band aid on cuts. **True/False**

12. Mushroom pollen should not be used to help the bleeding of a cut.

True/False

13. "Kujapik" was traditionally the call to feast on bearded seal meat.

True/False

14. "Mikigaq" was the call to feast on bearded seal meat. **True/False**

15. Ptarmigan are not usually eaten in the winter and spring. **True/False**

16. "Kikkajak" was the call to eat seal meat. **True/False**

17. "Uliutin" is a muscle in the seal. **True/False**

18. "Uliutin" can be used as thread. **True/False**

19. The seal heart was shared evenly between women and men. **True/False**

20. Kelp and seaweed is in season in the Fall. **True/False**

21. The aaqsiq is the part of the bearded seal that is in between the rib and spine. **True/False**

22. The aaqsiq was usually eaten by women. **True/False**

23. Clams and seaweed cannot be gathered during a full moon. **True/False**

24. In the past when someone was sick, caribou stomach contents would be blended with snow and served to the sick person. **True/False**

25. Mountain sorrel sap is sweet. **True/False**

26. Whale meal turned white when it was dipped in salt water. **True/False**

27. The bile of the bearded seal is never eaten. **True/False**

28. The skeleton of the Arctic hare head is used to play a game. **True/False**

Please answer the following questions:

1. What did you like about the DVD?

2. How would you change the DVD?

3. How do you feel about learning Traditional Knowledge from the Elders?

4. What would make it easier for you to eat more Country Food?

Please circle the number which reflects how you feel about the following statements:

1=strongly disagree
2=disagree
3=neutral
4=agree
5=strongly agree

- | | | | | | |
|--|---|---|---|---|---|
| 1. It is important for me to eat healthy foods. | 1 | 2 | 3 | 4 | 5 |
| 2. I believe Country Food is healthy. | 1 | 2 | 3 | 4 | 5 |
| 3. I enjoy eating Country Food. | 1 | 2 | 3 | 4 | 5 |
| 4. I eat Country Food more than once a week. | 1 | 2 | 3 | 4 | 5 |
| 5. I prefer Country Food to store bought food. | 1 | 2 | 3 | 4 | 5 |
| 6. It is easy for me to find Country Food to eat if I crave it. | 1 | 2 | 3 | 4 | 5 |
| 7. It is easy for my parents to get Country Food from hunters. | 1 | 2 | 3 | 4 | 5 |
| 8. My parents try to encourage me to eat Country Food. | 1 | 2 | 3 | 4 | 5 |
| 9. I would like more information about why Country Food is healthy. | 1 | 2 | 3 | 4 | 5 |
| 10. I would like to eat healthier foods. | 1 | 2 | 3 | 4 | 5 |
| 11. I prefer store bought food to Country Food. | 1 | 2 | 3 | 4 | 5 |
| 12. I try to eat fruits and vegetables every day. | 1 | 2 | 3 | 4 | 5 |
| 13. I want to drink less pop. | 1 | 2 | 3 | 4 | 5 |
| 14. I would like more information on how to eat healthy store bought food. | 1 | 2 | 3 | 4 | 5 |

Appendix 10.10 Co-author Waiver Form