Chapter 1

Back to the future: using traditional food and knowledge to promote a healthy future among Inuit

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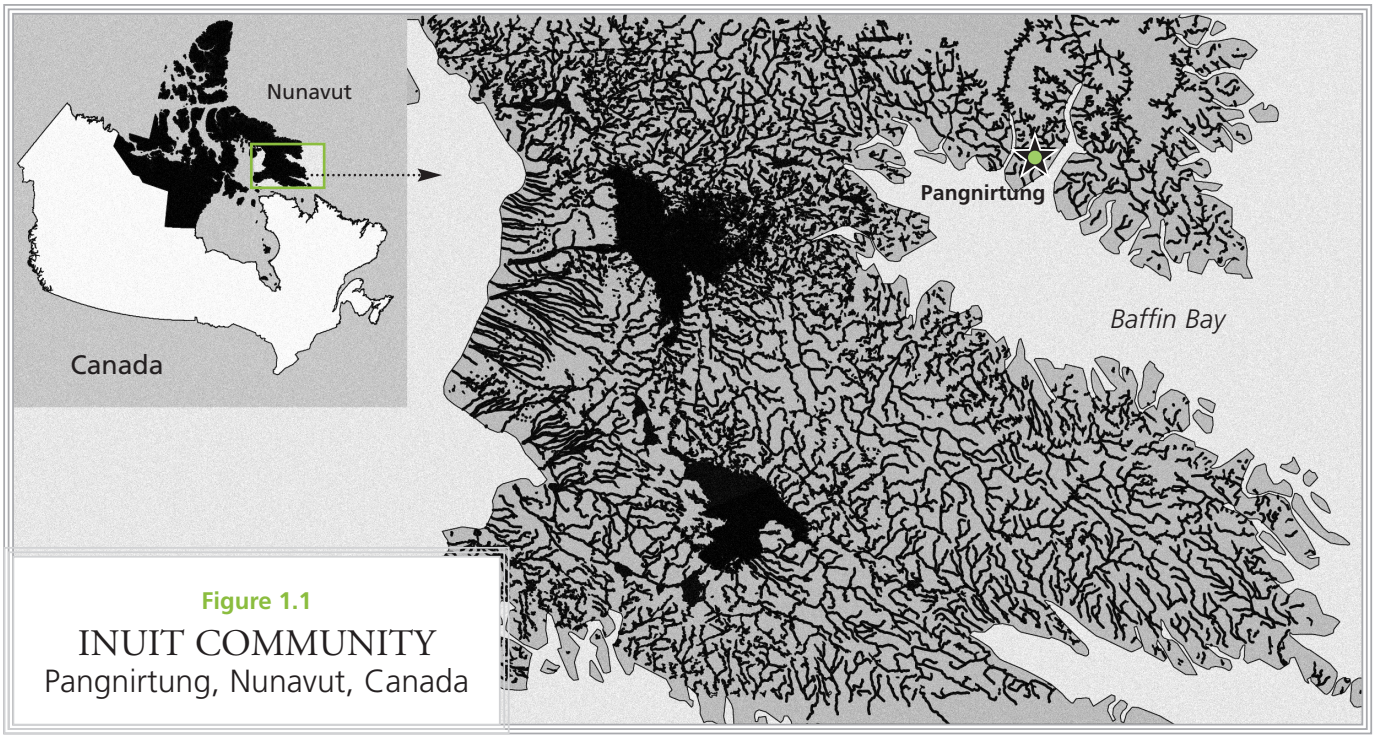

Figure 1.1

INUIT COMMUNITY
Pangnirtung, Nunavut, Canada

Data from ESRI Global GIS, 2006.
Walter Hitschfield
Geographic Information Centre,
McGill University Library.

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Photographic section >> III

"Give thanks to our food, Elders and ancestors daily."

Inuit saying

Abstract

Evidence of nutrition and epidemiologic transition in Inuit communities prompted a case study where traditional knowledge and traditional food is used as a basis for a community health-promotion effort to help improve overall diet quality including healthy market food choices. The current Inuit diet in the Baffin community involves a mix of traditional and market food. Caribou was the most commonly consumed traditional food item. Overall, 41 percent of energy was obtained from traditional food among 62 percent of respondents reporting traditional food consumption within the past 24 hours in the community health screening. Simultaneously, 58 percent of adults reported consuming an average of two cans of carbonated beverages in the past day, amounting to 10 percent of energy intake. Furthermore, the percent of n-3 fatty acids in plasma as a marker of traditional food consumption was inversely related to the percent of *trans*-fat in plasma as a marker of unhealthy market food choices (Spearman *rho* = -.44, p-value ≤.01). The data illustrate that traditional food is replaced by unhealthy market food choices.

A high prevalence of metabolic syndrome was observed (34 percent of 47 non-diabetic participants) using the new International Diabetes Federation criteria. Further, food insecurity was commonly reported, with 48 percent indicating that it was true or sometimes true that they "eat less or skip a meal because there isn't enough money to buy food"; and 28 percent indicating "yes" to "in the last month there was not enough to eat in your house". Fortunately, nearly all respondents (82 percent) indicated that friends and relatives shared their traditional food. The data illustrate that costs of market food items need to be considered in health promotion campaigns, and that traditional food promotion and sharing networks can help mitigate the rapid acculturation and transitions being observed. Finally, using traditional knowledge of indigenous food systems may be an effective way to promote healthy market food choices in an effort to prevent the adverse effects of acculturation.

Introduction

Rapid changes spanning all dimensions of life are occurring throughout Inuit communities. Key concepts integral to promoting Inuit health and well-being include maintaining cultural identity, positive family dynamics, social support, spirituality, and environmental integrity. Traditional food (called country food among Inuit), features prominently at the centre of Inuit identity and well-being. The hunting, harvesting and sharing of country food ensured survival and provided social cohesion, as they continue to do. The climate and landscape certainly fostered an Inuit spirit of thriving in the face of adversity that is rooted in strong collaboration and a sense of commitment to one's community. With this strength and resiliency, Inuit are now facing new challenges associated with climate change and environmental degradation, market economies, globalization, acculturation, and nutrition transition – all with far-reaching societal and health implications.

Inuit country food is a rich source of antioxidants, omega-3 fatty acids, monounsaturated fatty acids, protein, and micronutrients (see www.mcgill.ca/cine/resources/nutrient). The dietary composition of country food likely provides invaluable health benefits, as suggested by early observations of the heart-healthy Inuit diet (Bang, Dyerberg and Nielsen, 1971; Bang and Dyerberg, 1972; Dyerberg and Bang, 1978), which inspired decades of nutrition research on the role of fatty acids in health. Today, chronic conditions are emerging that have historically been lower among Inuit than among southern populations (Bjerregaard and Young, 1998). The emerging health patterns likely

reflect a response to transition in all facets of life, of which nutrition transition is only one component. Work toward protecting the environment and its ecosystems from further degradation and finding ways to ensure availability of and access to country food will undoubtedly feature prominently in strategies to promote Inuit health and thriving.

Purpose of study

The purpose of the Inuit community case study in Pangnirtung is to utilize traditional knowledge, Inuit story telling, and country food to promote the health and well-being of community members. The study highlights the importance of Inuit culture and country food and the integrity of the Arctic ecosystem for the promotion of Indigenous Peoples' health. The current report discusses two projects. The first was the Baffin component of a five-Inuit region dietary and traditional food-use survey, and the second project is the community health promotion project in which selected results of a baseline adult assessment are reported.

Participatory research

The Baffin component of the five Inuit region dietary survey was developed through participatory processes initiated in 1997 and 1998 by the Centre for Indigenous Peoples' Nutrition and Environment (CINE). Initially, a total of 39 communities sent representatives to workshops to discuss research methods and to identify participating communities. For the community case study reported here, participatory processes were also followed (WHO and CINE, 2003). Comments and feedback were also requested of the Inuit Tapiriit Kanatami (ITK), which is a member of the CINE Governing Board, the Government of Nunavut Health and Social Services Department, and Nunavut Tunngavik Incorporated. Approvals for the community health screening were obtained from the McGill Ethics Review Committee, the Nunavut Research Institute, and the community. A community and CINE research agreement was developed and approved by the Hamlet Council. A community steering committee guided and helped in all aspects of the fieldwork and ensured appropriate and accurate translations of consent forms and questionnaires into Inuktitut. Informed consent was obtained from each participant. The steering committee is self-directed and active in hiring staff and supervising the ongoing work in the community.

Overall description of research site and Indigenous People

Geographic and environmental characteristics

The Territory of Nunavut was formed in 1993, and represents an Inuit self-ruled territory, the name meaning "our land" in Inuktitut (see www.gov.nu.ca/Nunavut). The Baffin Region of Nunavut is the most traditional of Canadian Inuit regions and is home to approximately 12 700 Inuit. The community of Pangnirtung, home to 1 300 Inuit, is situated on a beautiful fjord in South Eastern Baffin in Cumberland Sound (Figure 1.1). The name of Pangnirtung denotes a place of plenty, translating as the place "abundant of bull caribou". By northern standards, Pangnirtung remains a privileged community in terms of access to traditional food. In addition to subsistence food harvests, the local economy is fuelled by commercial fishing and processing at Pangnirtung Fisheries, where Arctic char, shrimp, and Baffin turbot (Greenland halibut) are harvested, then shipped internationally (see http://www.gov.nu.ca/Nunavut/English/about/communities.shtml).

The local economy is also supported by the territorial government sector as it is home to the Baffin region's Government of Nunavut administrative offices. The hamlet municipality is also an employer, and the community is well known for the number and quality of artists in print-making, woven tapestries, and carving. There is some seasonal tourism, which employs local guides as the community is situated near the scenic Auyuittuq National Park.

Cultural characteristics and historical perspectives

Inuit enjoy a rich history of story-telling and subsistence harvesting. They historically travelled in small family

groups to ensure year-round access to subsistence species. The Canadian government policies led to forced settlements in the 1950s and families continued to move in to settlements from semi-nomadic existence through the 1970s. The rapid changes from traditional hunting and nomadic life to modern amenities in settlements to the formation of a self-rule government in 1993 illustrate the rapid changes occurring in Northern Canada and the adaptive nature of Inuit.

General description of the food system

Dietary surveys have found that food security is a primary concern throughout Northern Canada (Lawn and Harvey, 2001; Lawn and Langer, 1994) and that five out of six households were food insecure in one Inuit community (Lawn and Harvey, 2001). Also, in the earlier CINE surveys, which included the five Inuit regions, food security concerns were commonly expressed by respondents. More than 50 percent of women respondents in Nunavut and Labrador reported not being able to buy all needed food from the store. Further, many Inuit (up to 45 percent within age groups) reported that they could not afford to go hunting or fishing (Lambden *et al.*, 2006). In a recent market food costs survey, the weekly cost of a food basket for a family of four residing in a remote Baffin community was $CAD265 compared to $CAD144 in Montreal (see www.ainc-ianc.gc.ca/ps/nap/air/fruijui/nfb/nfbbafnuna_e.html). In the context of food insecurity, nutrient-dense country food is replaced by abundantly available and low-cost refined carbohydrates. The Inuit dietary survey conducted by CINE demonstrated that days with country food provided more protein and micronutrients than days without country food, and that carbohydrate intake, particularly refined carbohydrates, increased on days without country food (Kuhnlein *et al.*, 2004; Kuhnlein *et al.*, 2000). Also as younger generations consume less country food, dietary intakes of key micronutrients are more likely to be suboptimal among younger than older Inuit as demonstrated by the striking differences in retinol intake by age in the five Canadian Inuit regions surveyed by CINE in 1998 (Egeland *et al.*, 2004).

The prevalence of overweight and obesity has risen throughout Canada (Statistics Canada and Shields, 2005; Statistics Canada, 2001). Likewise, overweight and obesity is occurring in Inuit communities in Canada (Kuhnlein *et al.*, 2004). In developing countries, nutrition transition has been associated with both under and over-nutrition being noted within the same communities and even the same households (Popkin, 2002). Likewise, both overweight and obesity and sub-optimal nutrient intakes co-occur in Inuit communities and households (Kuhnlein *et al.*, 2004).

In addition to costs, language is a barrier to healthy food choices. During story-telling interviews with Inuit living with diabetes, English food labelling and signs at the grocery store were identified as important factors that hindered the identification of healthy food choices by unilingual Inuktitut adults (Bird *et al.*, 2008).

On a positive note, the Hunters and Trappers Association, and individual hunters within Inuit communities, provide support networks for the sharing of country food with Elders and others who are not able to hunt. Community feasts and informal gatherings provide another avenue for traditional food sharing and the social networks that enhance food security.

Overall health status

Given the different jurisdictions in which Inuit live, available data regarding the leading causes of mortality and morbidity among Inuit represent fragmented information over time and geographic locations. Nonetheless, the picture that emerges from infancy to adulthood is that Inuit suffer from disparities in health and longevity from that of other Canadians (Jenkins *et al.*, 2003; Statistics Canada, 2001). Nonetheless, a key feature of Inuit health is the importance of social networks. In a recent analyses of Statistics Canada Aboriginal Peoples' Survey, social support featured prominently as a key determinant of thriving health among Inuit (Richmond, Ross and Egeland, 2007). Social networks and cohesion often involved the traditional food system (sharing in hunting and harvesting, in preparation of food, in making traditional garments and in community feasts) and

represent another avenue in which traditional food systems can indirectly promote health and well-being among Indigenous Peoples.

In terms of the health care system in remote and northern communities, there are many challenges. Two primary challenges are the high employee turnover rate in Nunavut and the lack of Inuit-speaking nurses (Archibald and Grey, 2000; Ellerton *et al.*, 1999). Community health representatives help bridge the cultural and linguistic gap between health care providers and community members, and are the backbone of public health and health care delivery in northern Inuit communities.

Methodology

Background on Baffin food systems and food-use patterns

As part of the large five Inuit region CINE study noted earlier, baseline assessments in Baffin included: 1) deriving estimates of traditional (country) and market food intake, 2) completion of a nutrient and contaminant database, 3) defining the benefits of traditional food in terms of nutritional, socioeconomic, and cultural significance, and 4) defining levels of dietary exposures to contaminants. Details regarding the methodologies and findings have been presented elsewhere (Kuhnlein *et al.*, 2000; Kuhnlein *et al.*, 2004; Kuhnlein *et al.*, 2005). Data gleaned from these activities, particularly from the Baffin region, provide a necessary background for the development of the Inuit community case study under way in Pangnirtung.

Pangnirtung community health promotion project

Through discussions with representatives of the Inuit Tapiriit Kanatami, the parent organization for Canadian Inuit, CINE investigators became aware of a community member interested in facilitating work to combat the adverse health effects associated with the rapid changes occurring in northern Inuit communities. An invitation was extended to CINE investigators and community meetings were held. During community brainstorming sessions and follow-up meetings, community members and community health representatives identified the following needed activities:

1. An adult health screening to generate individual and community awareness.
2. A youth active living and healthy eating survey.
3. Story-telling interviews with Inuit living with diabetes to inform health-care service policy development.
4. Story-telling with Elders regarding their traditional knowledge (Inuit Qaujimajatuqangit regarding the role of country food in health, including spiritual, mental and physical health).
5. Utilization of all of the above information in the development of a culturally appropriate community-based health promotion intervention.
6. A follow-up survey of adults and youth to determine whether the intervention was successful in reducing health risks and improving nutrition.

The long-term goal of the community project is to develop a model intervention that can be adapted to other Inuit communities. To date, the first four community activities have been completed. The initial story-telling activities and selected results of the adult health survey are presented elsewhere (Charbonneau-Roberts *et al.*, 2007; Bird *et al.*, 2008). The current chapter focuses on a description of the traditional Inuit food system, extent of reliance upon traditional food, food security, and data regarding nutrition and epidemiologic transition from the regional Baffin survey and the adult screening conducted in Pangnirtung.

Community adult health screening

The adult health survey took place during eight working days in May 2005, with preparations including translations of questionnaire items and review of appropriateness and relevance of all assessments. For the adult health screening, volunteers were recruited through community radio announcements and information sessions where bilingual community research assistants explained the screening, informed consent forms, and its importance to community members. The health-screening data included 24-hour dietary recalls, market and traditional food frequency questionnaires, food security, a health and demographic status questionnaire, a physical activity

Table 1.1 Baffin Inuit traditional foods *(79 species/varieties)*

	Scientific name	*English / common name*	*Local name*	*Seasonality **
	Fish and seafood			
1	*Aeginella longicornis*	Shrimp, longhorn-skeleton	–	–
2	*Artediellus atlanticus*	Sculpin, Atlantic hookear	–	January–October
3	*Artediellus uncinatus*	Sculpin, other species	–	January–October
4	*Bentheogennema borealis* (2 var.)	Shrimp, Northern blunt-tailed, sculpin, pallid	–	–
5	*Bentheogennema borealis*	–	–	January–October
6	*Boreogadus saida*	Cod, Arctic	–	January–May, October–December
7	*Caprella laeviuscula*	Shrimp, smooth-skeleton	–	–
8	*Chionoecetes opilio*	Crab, snow	–	–
9	*Coregonus clupeaformis*	Whitefish, lake	–	–
10	*Coregonus nasus*	Whitefish, broad	–	–
11	*Coregonus* sp.	Cisco	–	–
12	*Cottunculus microps*	Sculpin, snowflake hookear	–	January–October
13	*Cottunculus thomsoni*	Sculpin polar	–	January–October
14	*Eleginus gracilis*	Cod, saffron	–	January–May, October–December
15	*Ensis directus*	Clam, razor	–	July–August
16	*Gastropoda* sp.	Snail	–	–
17	*Gymnocanthus tricuspis*	Sculpin Arctic staghorn	–	January–October
18	*Hippoglossus hippoglossus*	Halibut, Atlantic flounder (American plaice) halibut, winter flounder	–	–
19	*Microgadus tomcod*	Cod, tom	–	January–May, October–December
20	*Mya arenaria*	Clam, softshell	–	July–August
21	*Myoxocephalus*	Sculpin, fourhorn	–	January–October
22	*Mytilus edulis*	Mussel	–	January–October
23	*Placopecten magellanicus*	Scallop, sea	–	July–August
24	*Quadricornis*	Sculpin Northern blunt tailed	–	January–October
25	*Reinhardtius hippoglossoides*	Turbot, Greenland halibut	–	–
26	*Salvelinus alpinus* sp.	Char, Arctic (trout, saltwater trout, redfish)	iqluppik	January–December
27	*Salvelinus alpinus* sp.	Char, landlocked	–	January–December
28	*Salvelinus fontinalis*	Trout, lake, brook	–	May–October
29	*Salvenilus namaycush*	Trout, speckled, sea	–	–
30	*Stenodus leucichthys*	Connie/coney (inconnu)	–	–
31	*Strongylocentrotus* sp.	Sea urchin	–	July–August
32	–	Code lake	–	January–May, October–December
33	–	Code salt	–	August
	Sea mammals			
1	*Balaena mysticetus*	Bowhead whale	arvitt	–
2	*Delphinapterus leucas*	Beluga whale (white whale)	oilalugat	August–September
3	*Erignathus barbatus*	Bearded seal	ugyuk	January–December
4	*Mirounga angustirostris*	Elephant seal	–	–

Continued

Table 1.1 *(continued)* **Baffin Inuit traditional foods** *(79 species/varieties)*

	Scientific name	*English / common name*	*Local name*	*Seasonality **
5	*Monodon monoceros*	Narwhal	oilalugat tugaliit	May–September
6	*Odobenus rosmarus*	Walrus	aiviq	March–September
7	*Phoca groenlandica*	Harp seal	–	May–September
8	*Phoca hispida*	Ringed seal (jar seal)	nattiq	January–December
	Land mammals			
1	*Lepus americanus*	Rabbit, snowshoe hare	–	–
2	*Lepus arcticus*	Rabbit, Arctic hare	ukalik	January–July, September–December
3	*Ovibos moschatus*	Muskox	umingmak	March–May, October
4	*Rangifer tarandus* ssp. *arcticus*, *caribou*, *granti*, *groenlandicus*, *pearyi*, *tarandus*	Caribou	tuktu	January–December
5	*Ursus maritimus, Thalarctos maritimus*	Polar bear	nanuq	–
	Game and birds			
1	*Alca torda*	Seabirds, razorbill auk (turre)	–	–
2	*Anas acuta*	Pintail	–	–
3	*Branta bernicla*	Goose, brant Atlantic, black	nirliq	June–September
4	*Branta canadensis*	Goose, Canada	uluagullik	May–August
5	*Cepphus grylle*	Seabirds, black guillemot (pigeon)	pitsiulaaq	July–August
6	*Chen caerulescens caerulescens*	Goose, snow (wavies)	kanguq	May–Sept
7	*Clangula hyemalis*	Diving ducks, squaw duck (oldsquaw, hound diver)	kivgaluk	July–August
8	*Gavia adamsii*	Fish-eating birds, yellow-billed loon	–	June–September
9	*Gavia arctica*	Fish-eating birds, Arctic loon	–	June–September
10	*Gavia immer*	Fish-eating birds, common loon	–	–
11	*Gavia stellata*	Fish-eating birds, red-throated loon (wobby)	–	–
12	*Lagopus lagopus*	Ptarmigan, willow (white partridge, brooker)	–	–
13	*Lagopus mutus*	Ptarmigan, rock	–	January–June, September–December
14	*Larus argentatus*	Gulls and terns, herring gull (seagull)	–	June
15	*Mergus merganser*	Fish-eating birds, common merganser (pie duck)	oarsauq	–
16	*Somateria mollissima*	Diving ducks, common eider (shore duck)	mitiq	May–September
17	*Somateria spectabilis*	Diving ducks, king eider	oingalik	May–September
18	*Sterna paradisaea*	Gulls and terns, Arctic tern	imiqqtailat	June–July
19	*Uria aalge*	Seabirds, common (thin-billed murre, turre, tinker)	–	–
20	*Uria lomvia*	Seabirds, brunnich's (thick-billed murre, tinker)	aqpak	May–September
	Vegetables and berries			
1	*Agarum turneri Lessoniaceae* family (*Rhodymenia* sp., *Laminaria* sp. among others)	Seaweed/kelp	–	January–December
2	*Daucus carota*	Carrot root	–	June–August
3	*Empetrum nigrum*	Crowberries (blackberry)	pownuk	August–September
4	*Oxalis oregana*	Sorrel, wood	–	June–September

Continued

Table 1.1 *(continued)* **Baffin Inuit traditional foods** *(79 species/varieties)*

	Scientific name	*English / common name*	*Local name*	*Seasonality **
5	*Oxyria digyna*	Sorrel, mountain	–	June–September
6	*Rubus Chamaemorus*	Bakeapple (cloudberry)	–	–
7	*Salix arctica*	Willow	uqaujuk	July–September
8	*Saxifraga oppositifolia*	Saxifrage, purple	–	July–September
9	*Saxifraga* sp.	Saxifrage, red	–	June–August
10	*Taraxacum lacerum*	Dandelion	–	–
11	*Vaccinium myrtillus*	Blueberries, dwarf bilberry	–	August–September
12	*Vaccinium oxycoccus*	Cranberries, bog	–	June, September–October
13	*Vaccinium uliginosum*	Blueberries, bog bilberry	–	August–September
14	*Vaccinium vitis-idaea*	Cranberries, low bush (rock, mountain, red, partridge)	–	June, September–October
15	*Viburnum edule*	Cranberries, high bush (squash berry)	–	June, September–October

Note: Searched on the Internet. Some species that are mentioned here might be not only for Baffin but for other Inuit regions.
* Information retrieved from Harvest calendars obtained in four out of the five Baffin communities surveyed in 1998/99.
– No data.

assessment and anthropometric measures. In addition, a fasting venous blood sample was taken in the morning after an overnight fast of at least eight hours, and a two-hour 75 gram OGTT was administered. Details of the fasting serum lipid, glucose and insulin measures are described elsewhere (Charbonneau-Roberts *et al.*, 2007). In addition, plasma fatty acids (as a marker of recent dietary fat intake) were analysed using a Varian 100 m capillary column – Select CB for analyses of fatty acid methyl esters (FAMEs) (Varian 3400 CX Gas Chromatograph, Varian Inc., Palo Alto, CA). Individual FAMEs were quantified and multiplied by a conversion factor for converting FAMEs to their corresponding fatty acids as reported by the Association of Official Analytical Chemists (AOAC) method 996.06D. Fatty acids are expressed as a percentage of total fatty acids present.

In total, 52 adults participated in the health screening, which represented one in ten adults and one in ten community households. The ages of adult participants ranged from 19–77 years of age, with a mean age of 45 years (SD = 17). The majority of participants were women (77.1 percent).

Results

Background of Baffin food systems and use patterns

The background Inuit survey work in the Baffin region identified numerous species of fish and shellfish, marine and land mammals, birds, plants and berries, and season of harvest for the traditional food system (Table 1.1). Seventy-nine species were identified, with English and Inuktitut names. It is evident that a rich diversity of wildlife foods are available year-round in the Baffin food system.

A table of nutrient composition of selected Baffin Inuit foods illustrates the rich nutrient qualities of the Baffin food system (Table 1.2). The food system provides an excellent source of micronutrients such as vitamin A, D, and C, iron, folate, and zinc, all of which enabled Inuit to survive with little or no access to fruit and vegetables. Historically, the nutrients in narwhal, seal, caribou, and beluga when consumed regularly and in ample quantities likely yielded all necessary nutrients for all Inuit.

For adults, caribou ranked highest as the most liked and appreciated country food species. For children, adults responded that children most often disliked seal

Table 1.2 Nutrient composition of important and unique Baffin Inuit traditional food *(per 100 g edible portion, raw)*

Food items	*Moisture*	*Energy*		*Protein*	*Fat*	*CHO*	*Ash*	*PUFA*	*Omega 3*	*Vitamin A RAE*	*Vitamin D*	*Vitamin E*	*Vitamin C*	*Folate*	*Calcium*	*Iron*	*Zinc*
	g	*kcal*	*kJ*	*g*	*g*	*g*	*g*	*g*	*g*	*µg*	*µg*	*mg*	*mg*	*µg*	*mg*	*mg*	*mg*
Fish and seafood																	
Char, Arctic, flesh, raw	77.37	105	439	19.03	2.65	0.00	1.17	0.85	0.730	18.93	29.77	0.19	1.23	–	12.07	0.46	0.36
Land mammals																	
Bear, Polar, flesh, raw	74.27	120	502	21.72	3.11	0.29	1.13	0.53	0.350	234.64	0.00	0.59	–	7.08	3.74	4.34	5.50
Caribou, Barrenland, flesh, raw	71.98	133	556	23.53	3.63	1.20	1.2	0.55	–	71.84	0.00	0.19	0.98	11.75	4.51	4.98	3.19
Hare, Arctic, flesh, raw	74.46	104	435	21.85	1.26	1.21	1.18	0.50	0.075	39.19	0.00	390.33	0.00	11.87	33.83	4.33	1.78
Muskox, flesh, dried/jerky	28.48	301	1 258	60.82	4.95	1.12	2.6	0.68	–	3.67	0.00	0.35	0.50	9.50	14.64	11.21	9.02
Muskox, flesh, raw	76.62	111	464	17.77	4.40	0.00	1.2	–	–	17.05	–	0.00	–	–	3.25	4.53	2.36
Marine/sea mammals																	
Beluga, blubber, raw	22.38	640	2 675	10.02	66.24	0.00	0.1	5.35	4.325	1700	–	–	–	–	2.33	0.52	0.16
Narwhal, blubber, raw	10.26	754	3 152	5.26	82.63	0.00	0.01	4.42	3.600	1826	9.95	31.01	0.00	0.00	3.00	0.80	0.36
Narwal, flesh, dried	17.00	425	1 777	77.0	11.00	0.00	3.80	0.30	0.250	4.00	0.0	560.79	1.14	54.83	11.0	70.0	7.0
Narwhal, muktuk, skin, raw	71.39	132	552	22.01	4.23	1.85	0.96	0.45	0.325	286.9	0.00	1.46	31.51	0.00	5.29	0.31	7.7
Seal, ringed, blubber, raw	4.21	820	3 428	2.24	88.64	2.65	0.04	15.70	14.50	508.22	1.55	694.44	0.00	0.00	1.35	2.00	0.30
Seal, ringed, flesh, raw	70.28	128	535	26.16	1.99	0.42	1.23	0.38	0.250	90.70	0.03	0.07	1.55	15.10	20.69	19.10	2.10
Walrus, flesh, aged	67.35	171	715	25.09	6.95	0.00	1.07	0.70	0.600	28.14	0.00	0.08	0.85	7.90	5.79	19.60	5.42
Seaweed and berries																	
Blackberries, raw	87.86	50	209	0.41	0.98	10.91	0.23	0.05	0.025	11.00	0.00	1.17	2.41	0.00	4.87	0.24	0.07
Blueberries, raw	86.41	62	259	0.76	0.97	12.97	0.3	0.05	–	3.00	0.00	0.57	25.93	42.50	15.43	0.30	0.18
Seaweed, stems & leaves, raw	81.00	73	305	81.00	4.06	2.19	4.1	0.20	–	6.00	0.00	1.49	16.37	235.95	200.12	1.99	0.34

CHO Carbohydrate.
– No data.
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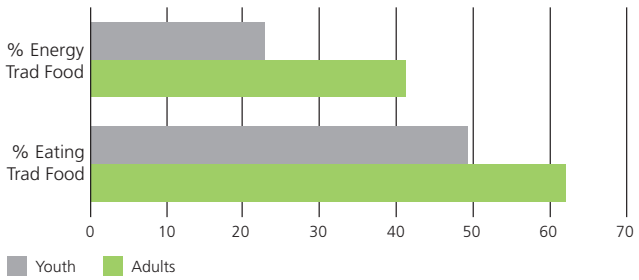
and walrus meat and liver, and fish. By far, the top contributor to protein in the Baffin adult diet in the 1998–1999 survey was from caribou meat (20.8 percent of energy in the autumn and 32.6 percent of energy in the late winter). This was followed by ringed seal meat and Arctic char, which contributed 17 percent and 7.4 percent of energy as protein, respectively in the autumn and 11.5 and 10.4 percent of energy as protein in the late-winter. Traditional food was also a top contributor to micronutrients, with ringed seal contributing to 42.6 percent of iron consumed in the autumn, and 35.4 percent of iron consumed in late winter, while caribou contributed 24.6 percent of the zinc intake in the autumn and 36.9 percent of zinc intake in the late winter. In contrast, the top contributors to carbohydrate intake were from table sugar, soft drinks, and bannock (18.1 percent, 11.8 percent, 10.3 percent, respectively in the autumn; and 13 percent, 10.9 percent and 9.2 percent respectively in the late-winter). Market and traditional food items contributed to vitamin C (12.9 percent from orange juice and 10.5 percent from narwhal *maktaaq* in the autumn and 16.6 percent and 15.3 percent respectively in the late-winter). Leading contributors to folate intake included bannock, spaghetti, and bread following the introduction of fortification of flour in Canada.

Traditional food and diet quality

Overall, 31 percent of total energy came from traditional food sources in the Baffin region during the 1998–1999 CINE survey among 69 percent consuming traditional food in the past day. In contrast, in Pangnirtung (2005–2006), 41 percent of energy came from traditional food among 62 percent of adults consuming any traditional food in the past day (Figure 1.2). The data indicate the current-day importance of the Inuit traditional food system.

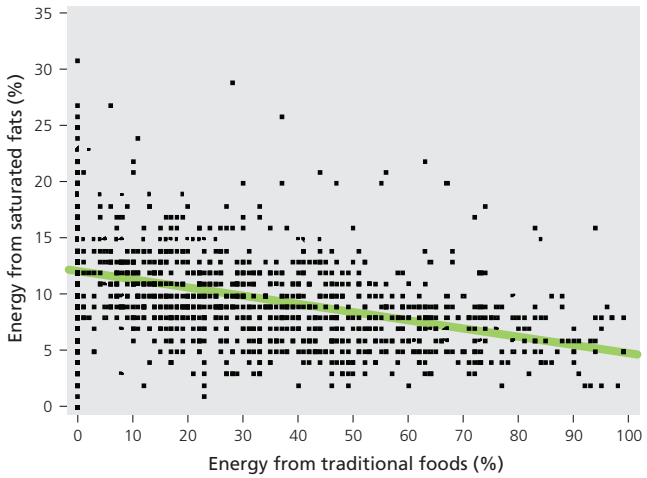
In addition to the cultural and nutrient value of traditional food, country food replaced market food items that pose health risks. For example, the percent of energy from traditional food was inversely related to the percent of energy from saturated fat in all five Inuit regions combined (Figure 1.3) – results were similar in the Baffin region when examined separately. When no traditional food was consumed, the average percent of energy as saturated fat was twice (12 percent) that of when the majority of energy was from traditional food (6 percent). Similarly, in Pangnirtung's adult health survey, traditional food intake as a percent of energy was positively correlated to plasma *n*-3 fatty acids (Spearman *rho* = 0.58, p <.001) and inversely correlated to plasma *trans*-fats (Spearman *rho* = -.44; p <.01) as percent of total fatty acids in plasma. As *n*-3 fatty acids increased (as a marker of the degree of recent country food intake) the percent of fatty acids

Figure 1.2 Percent youths and adults consuming traditional food and percent energy from traditional food



Source: Pangnirtung Adult and Youth Survey, 2005–2006.

Figure 1.3 Relationship between traditional food consumption and saturated fat intake (as % of energy), 5 Inuit regions *(n = 1,624)*

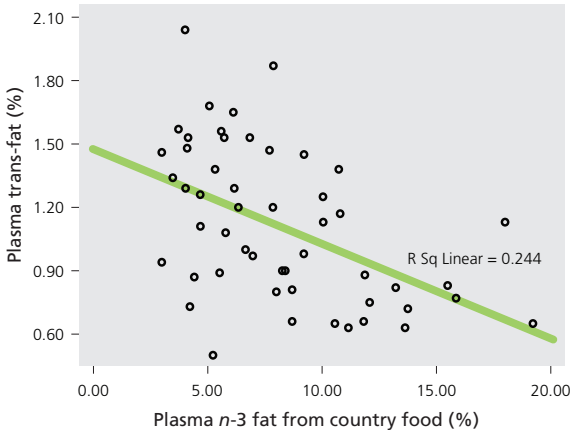


Source: CINE Dietary Survey, 1998–1999.

as *trans*-fat decreased (Figure 1.4, *rho* = -0.53; p <.001). These data illustrate the multiple nutritional exposures that are simultaneously influenced by the loss of traditional food in the contemporary Inuit diet.

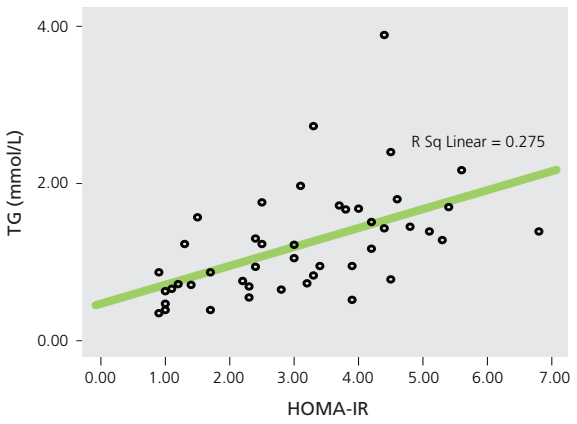
While country food remained an important source of nutrients and energy for the Inuit, the Pangnirtung survey of adults indicated a high prevalence of carbonated beverage consumption: 86 percent reported consuming carbonated beverages in the past year and 58 percent of adults reported drinking carbonated beverages in the past day, with an average consumption of two cans (12 fluid ounces each) per day (which contributed to nearly 10 percent of energy intake/day among consumers). While Inuit historically received their carbohydrates from the glycogen of raw meat and blood, and from plants, berries, and caribou stomach contents, overall historical carbohydrate intake was relatively low. Against this relatively recent dietary context, the current exposures to high amounts of refined carbohydrates are alarming and will undoubtedly have implications for excess energy intake and subsequent increases in obesity and obesity-related health complications.

Figure 1.4 Relationship between *n*-3 fatty acids and trans-fatty acids as percent of total fatty acids in plasma



Source: Pangnirtung Adult Survey, Baffin region, 2005.

Figure 1.5 HOMA-insulin resistance predicts fasting triglycerides (TG) in non-diabetic participants



Source: Pangnirtung Adult Survey, Baffin Community Health Screening, 2005.

Food security

Responses to food security questions indicated that in this relatively well-off community by northern Inuit standards, food insecurity remained an issue. A total of 80 percent of adults surveyed in Pangnirtung reported that it was often true or sometimes true that "we worry that our food will run out before we get money to buy more". Sixty percent reported that it was often true or sometimes true that "we can't afford to eat healthy meals". Forty-eight percent indicated that it was true or sometimes true that "I eat less or skip a meal because there isn't enough money to buy food". Fifty-two percent indicated that it is often true or sometimes true that "there is no 'country food' to eat when I want it", and 28 percent indicated "yes" that they agreed with the statement that "in the last month there was not enough to eat in your house". Fortunately, nearly all respondents (82 percent) indicated that friends and relatives shared their country food.

Nutritional status assessed by anthropometry

Overweight and obesity prevalence among the randomly selected Inuit participating in the 1998–1999 Baffin survey indicated that 36 percent of men and 38 percent of women were overweight (BMI 25–29.9), and that 37 percent of women and 18 percent of men were obese (BMI ≥ 30). It is anticipated, however, that these figures may overestimate to some degree obesity and

overweight among Inuit, given that BMI overestimates adiposity in individuals with a long torso relative to standing height (Charbonneau-Roberts *et al.*, 2005; Norgan, 1994). However, BMI does not capture the extent of visceral adiposity. Among the adults in the Pangnirtung survey, a high prevalence of central fat patterning was observed and all measures of obesity were identified as strong predictors of insulin resistance (Charbonneau-Roberts *et al.*, 2007). The findings are noteworthy in that they suggest the emergence of obesity among Inuit will have health consequences contrary to previous research which has suggested that obesity is not as metabolically active among Inuit as it is in non-Inuit comparison populations (Young, 1996; Jorgensen *et al.*, 2002).

Epidemiologic transition

Among adult participants in the Pangnirtung Health screening, evidence of an epidemiologic transition was observed. While no new diabetic cases were identified through the screening, five participants had pre-existing Type 2 DM, which was confirmed by medications prescribed and used. After excluding the pre-existing cases of Type 2 DM, a high prevalence of lipid abnormalities were noted: 61.7 percent (29/47) had low HDL-cholesterol (chol) according to new gender-specific International Diabetes Federation (IDF) criteria (IDF, 2005); 19 percent (9/47) had high LDL-chol (>3.4 mmol/l); 34 percent (16/47) had a high total chol to HDL-chol ratio (>5.0), and 19 percent (9/47) had a high triglyceride level (>1.7 mmol/l). In addition, a total of 34 percent (n = 16) of those without pre-existing diabetes met the IDF criteria of metabolic syndrome, which requires the presence of central obesity with two additional metabolic syndrome risk factors (IDF, 2005).

In linear regression analyses, the homeostasis model assessment for insulin resistance (HOMA-IR) developed by Mathews and colleagues (1985) and fasting insulin were inversely related to HDL-chol and accounted for a large percent of the variance in HDL-chol (22 percent and 20 percent, respectively). HOMA-IR remained a significant predictor of HDL-chol in additional analyses adjusting for age and gender. Similar findings were observed for triglycerides in regard to insulin indices. HOMA-IR and fasting insulin were positively related to triglyceride levels when considered separately in age and gender adjusted linear regression analyses ($p < .01$), with HOMA-IR accounting for 27.5 percent and fasting insulin accounting for 19.8 percent of the variance in triglycerides (Figure 1.5). Similarly, the insulin sensitivity index (ISI 0,120) developed by Gutt and colleagues (2004) significantly predicted systolic blood pressure.

The current results are noteworthy in that insulin resistance as measured by HOMA-IR, fasting insulin, and the ISI 0,120 were identified as important underlying determinants of dyslipidemia and systolic blood pressure among the health-screening participants in the Baffin community. Insulin resistance is now considered the underlying common mechanism explaining the co-existence of Type 2 DM and atherosclerotic cardiovascular disease. Also, as dyslipidemia has been noted to precede the development of Type 2 DM in normoglycemic populations followed over time (McPhillips, Barrett-Connor and Wingard, 1990; Mykkanen *et al.*, 1993), the high prevalence of participants with dyslipidemia is of concern. In Finland, those with an HDL-chol less than 1.0 mmol/l had a 2.1 fold (95 percent CI = 1.2-3.6) increase and those with triglyceride levels greater than 2.5 mmol/l had a 2.7 fold increase (95 percent CI = 1.5-4.6) in developing Type 2 DM over a 3.5 year period (Mykkanen *et al.*, 1993). Also, among 1 847 normoglycemic men and women in Rancho Bernardo, California, Type 2 DM increased with every quartile of baseline triglyceride levels (McPhillips, Barrett-Connor and Wingard, 1990). Furthermore, insulin sensitivity was inversely related to incident cardiovascular events in Framingham offspring (Rutter *et al.*, 2005).

Intervention strategies and future plans

Prompted by the findings of the survey, the community embarked (in 2006–2007) upon an intervention strategy that was designed by and with the community of Pangnirtung and respects the traditional knowledge

principles of Inuit Qaujimajatuqangit (IQ) as a framework for the proposed intervention. The activities suggested are:

1 Document traditional knowledge of country food and its spiritual and health-giving attributes and use this knowledge to promote country food use and healthy market food choices in the community.
2 Engage in radio drama and story-telling in Inuktitut to provide entertainment and information regarding the health-giving attributes of country food and healthy market food choices.
3 Coordinate local radio programmes with grocery store initiatives to increase healthy food choices.

The Pangnirtung Health Screening and Promotion Committee requires that the interventions be fun, and involve the community radio, schools and grocery stores. The activities should be cost effective and be able to be implemented across all Inuit regions. Radio programmes will be taped and those that are successful (as evidenced by grocery store sales data) could be utilized in other communities. Radio is a common means of communication in northern communities and may prove to be an effective public health intervention tool for marketing social change/behaviour. For youth, a youth-led initiative is likely be the best approach.

Summary and future policy considerations

The current data provide evidence of nutrition transition and they provide an early warning for the emergence of cardiovascular disease and Type 2 DM in this Inuit community. These data add to the accumulating evidence suggesting that Inuit are losing the protection that spared them from the epidemic in Type 2 DM that emerged among Canadian First Nations and American Indians decades ago (Brassard *et al.*, 1993). The findings are relevant in that interventions at the early stages of insulin resistance are more likely to be successful than after the development of Type 2 DM (McAuley *et al.*, 2001).

While traditional food features prominently in the modern-day Inuit diet, the total diet is a mixed diet high in market food carbohydrates, particularly refined carbohydrates. Also, consumption of traditional food items is being replaced by market food sources of *trans*-fat as evidenced by the striking inverse relationship of these fatty acids in plasma. Programmes and policies are needed to improve food security, encourage healthy market food choices and to promote locally available traditional food in an effort to mitigate the nutrition and epidemiologic transition.

Similarly, the work done in Pangnirtung stimulated interest in a Canadian-wide Inuit Health Survey with International Polar Year funding and in international collaborations to conduct an International Inuit Cohort study to inform policy to help prevent the nutrition and epidemiologic transition. Finally, global policies to prevent further environmental degradation, food chain contamination, and global warming are needed to promote long-term ecosystem and human health ●

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