Chapter 3

Gwich'in traditional food for health: Phase 1

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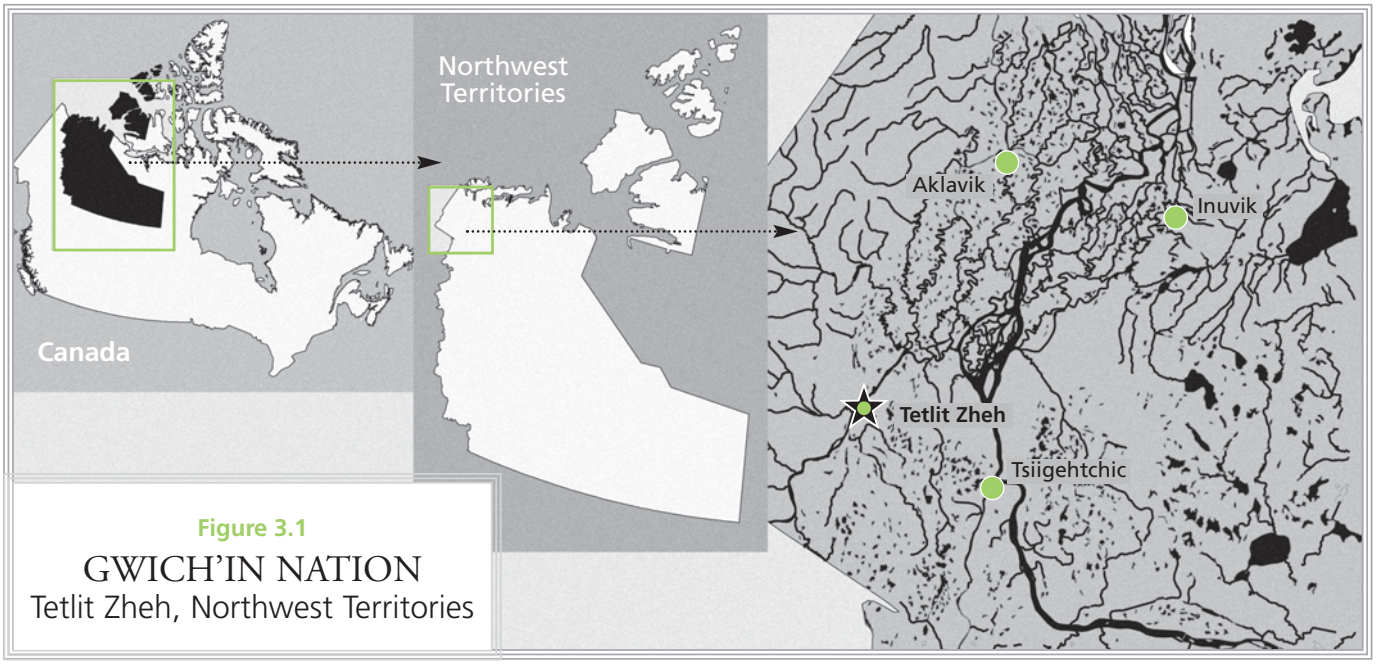

Figure 3.1
GWICH'IN NATION
Tetlit Zheh, Northwest Territories

Data from ESRI Global GIS, 2006.
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> "Caribou blood gives strength and warmth, and it keeps you from getting hungry for a long time."
>
> **Woody Elias, Gwich'in Elder, 2006**

Abstract

The objective of the research described in this chapter is to present the food system and nutrition situation of the Tetlit Gwich'in community, and to understand many of the nutritional and cultural circumstances that lead to planning an intervention to promote health through improved food use.

The Tetlit Gwich'in reside in a First Nation community in the northern Northwest Territories of Canada. Several research studies have taken place in partnership with this community and the Centre for Indigenous Peoples' Nutrition and Environment since the 1990s. As a result, this effort to document the Tetlit Gwich'in food system has been welcomed and considered successful. Within the larger Dene community, the Gwich'in in this region recorded 50 species of traditional animal and plant foods, all of which are wildlife foods, and many parts are edible and enjoyed.

Nevertheless, market foods are available in this Arctic community, and in early 2000 approximately 33 percent of adult energy was derived from traditional Gwich'in food, but children's diets contained much less traditional food (about 6 percent of energy). Caribou and several species of fish were popular in all seasons.

Children's diets were found to contain more than 40 percent of daily energy from fat and sweet foods, but the small amounts of traditional meats and fish ensured adequate protein, iron, zinc, copper and vitamin B_6. Calcium, vitamin D, vitamin A, vitamin E, magnesium and fibre were probably inadequate for both adults and children. Results of anthropometry studies revealed that the incidence of overweight and obesity in adults was more than 50 percent.

Traditional Gwich'in food holds many cultural attributes, and community members were aware of the healthy, low-fat properties of their food. Women responding to interviews (n = 69) said they would like to have more traditional food if it was easier to get. At the same time many said they could not afford to buy all the food they needed from the stores. The community is poised to engage in an intervention that will make more traditional food available, and improve purchasing habits of higher quality market food.

Introduction

In this report we aim to provide an understanding of the nutritional diversity of food consumed as both traditional and market items and the impact of food on culture and health among the Tetlit Gwich'in of the Northwest Territories (NWT). The Gwich'in people reside in communities in the NWT, northern Yukon Territory and in northern interior Alaska (Gwich'in Council International, 2007). Political organizations represented in Canada are the Dene Nation, the Métis Nation of the NWT and Yukon First Nations. Data reported here are from Gwich'in communities in the NWT (Tsiigehtchic, Aklavik and Tetlit Zheh – originally spelled Teetl'it Zheh) and from Old Crow in the Yukon. Traditional food-systems data from studies in the region conducted with the Dene and Dene/Métis, which include the Gwich'in, are also included to highlight and support basic concepts.

As part of research activities conducted by the Centre for Indigenous Peoples' Nutrition and Environment (CINE), studies with Gwich'in were conducted during the mid-1990s on the benefits and risks of use of Arctic indigenous food. The NWT Gwich'in were part of these studies conducted with 16 communities in the Dene/Métis component of this research that also included Yukon First Nations and Inuit. In early-2000, studies on anthropometry and dietary patterns with Dene/Métis children in three Dene communities in the NWT (including Tetlit Zheh) and two in Yukon

(including Old Crow) were conducted. In 2005, the community of Tetlit Zheh engaged in a dietary improvement intervention study to demonstrate benefits of using local Gwich'in cultural food; results of which are intended to apply to Gwich'in communities in the NWT region; young women (20–40 years of age) and youth (10–15 years of age) were the indicator population subsets upon which measures were taken. Throughout all of these studies, documentation was made of traditional Gwich'in food species and their use, and this forms the basis of this report.

The Tetlit Zheh Gwich'in

The Tetlit Zheh Gwich'in community in the NWT was established in 1840 by the Hudson's Bay Company as a trading post to purchase furs from the Gwich'in and Inuvialuit (Inuit). In 1848, the community was moved 6 km down the Peel River to its present location (Figure 3.1) and was named Fort McPherson after the chief trader of the Hudson's Bay Company, Murdoch McPherson. The traditional name for the community is Tetlit Zheh, after the Gwich'in name for the Peel River (Gwich'in Social and Cultural Institute, 2007). A comprehensive land claims agreement was signed in 1992 with the Governments of Canada and the NWT, with administration for all beneficiaries conducted through the Gwich'in Tribal Council, which is based in Inuvik. In Tetlit Zheh there are two local governments: the Tetlit Gwich'in Council and the Fort McPherson Hamlet Council. The Dempster Highway runs through the community connecting to Inuvik in the north and Dawson in the south.

Geography and environment

The Gwich'in are a nation of Athabascan people who maintained a nomadic hunting, fishing and gathering lifestyle until the mid-1800s, after which communities developed around forts and trading posts established by fur traders. Since the 1960s, residents of Tetlit Zheh are settled year round, but still retain knowledge and access to their food system which comprises 75–100 species of animals, fish and plant food species. The climate of the region is "interior Subarctic" with long, cold winters and short, warm summers. The area is covered with Boreal forest and includes some of the delta of the Mackenzie River (early ethnographic accounts have been summarized by Slobodin [1981]).

The Gwich'in closely identify themselves with the Porcupine caribou (*Rangifer tarandus granti*), culturally regarded as the most important food species, seen to be a source of traditional food energy. This population of migratory barren ground caribou ranges across the Yukon, the NWT and the state of Alaska. A photocensus in 1989 estimated the population size as 178 000 (Russell and McNeil, 2005); the current population estimate is between 110 000 and 115 000 (Porcupine Caribou Management Board, 2007). The herd is named after the Porcupine River, which they cross each spring and autumn.

The region is rural (without farming) and very beautiful. Current environment issues of concern to the community in 2006 were the protection of the Porcupine caribou calving grounds, climate change (Russell and McNeil, 2005), environmental pollution, and development of natural resources including a proposed natural gas pipeline and drilling in the Arctic National Wildlife Refuge (Porcupine Caribou Management Board, 2005). Divided perspectives exist on the proposed multi-billion dollar industry of the Mackenzie Gas Project that may offer employment, but would involve far-reaching social, economic and environmental change for the region (Nuttall, 2006).

Demography and community situation

In 2005, there were 823 residents in Tetlit Zheh, with most having aboriginal ancestry, either Tetlit Gwich'in or Métis. Both Gwich'in and English are spoken in Tetlit Zheh. More than 70 percent were 15 years or older and 38 percent had completed high school or higher education. Thirty-four percent of adults 15 years or older were employed. The average family income (2004) was $CAD 62 138, with 33.3 percent of households in the community having less than $CAD 25 000 annually. Cost of living and food costs in market

stores in Tetlit Zheh were about 50 percent greater than in cities in southern areas of Canada (NWT Bureau of Statistics, 2005). The primary employment in the community was with the public sector (government, education, policing, highway maintenance, recreation, wellness), and there were two general stores, a hotel-restaurant and gas station, and a canvas-tent manufacturing centre and outlet.

Missionaries established a community school in 1900, which became part of the federal school system in 1946. During much of the twentieth century, education was conducted in residential schools operated by the religious sector. The codes of conduct in these schools for Aboriginal children from Tetlit Zheh were harsh, and many suffered abuse. Community members expressed this abuse as being responsible for high rates of alcohol, tobacco and drug use and abuse, and other social ills such as family violence and criminal activity (Auchterlonie, 2005).

Culture

The traditional diet is based on large animals, primarily caribou and moose, although Dall sheep and bear were also eaten in the past. Small mammals include rabbit, beaver, muskrat, squirrel, porcupine, etc. Fish are important with whitefish, char, trout, loche, and inconnu being most dominant in the traditional diet. Birds include migratory ducks, geese and swan as well as ptarmigan and spruce hen. Plants of several kinds are harvested for food and medicine (Andre and Fehr, 2002; Murray *et al.*, 2005). The Gwich'in have traditional cultural values which require the full use of all edible parts of animals and plants, taking only what is needed, and sharing within the community. Careful attention is given to the protection and preservation of animal and plant species. For example, in spring when migratory birds land, only male birds are harvested. Children are taught these values at an early age and are expected to pass this knowledge to the next generation. Elders are very important in the community and form an Elders' Council who focus on community harmony. They work with issues of language, traditional knowledge and lifestyles.

Volunteer activities support many cultural functions (Auchterlonie, 2005), and provide a means to promote healthy communities. For example, an annual music festival is held in the summer of each year bringing in musicians and local talent, in an alcohol- and drug-free environment. Volunteers contribute organization, meals, beverages, etc., for these carnival festivities and other annual events. Community feasts, canoe races, hockey, curling, and snowshoeing are promoted as family and community events.

Patterns of acculturation for the Gwich'in have progressed steadily since establishment of the community. Today the food system includes both traditional Gwich'in food as well as market food. Dietary studies have shown that the latter contributed the majority of energy for both adults (average of more than 60 percent) and children (over 90 percent) as described in the following sections.

Research methods

Research agreements

Three research agreements have been made with the Tetlit Zheh Gwich'in and CINE. The first agreement was for the project in cooperation with the Dene Nation and the Métis Nation of the Northwest Territories, and negotiated with the community using a format originating with the Dene Nation (Masuzumi and Quirk, 1993). CINE researchers collaborated with the community to conduct the food use and dietary research and to prepare a research report (Receveur *et al.*, 1996). The second agreement was in the context of the children's research project with five Dene communities and followed a similar format with each participating community. The research agreement for the intervention study was prepared only with Tetlit Zheh using the format now universally recognized for its process with participatory research (Sims and Kuhnlein, 2003). For all studies, data were archived at the offices of the Dene Nation in Yellowknife and at CINE, McGill University, in Montreal. The community was provided with research summaries, hard copies and electronic forms of the data.

Research process

Implementation of the first project was conducted in four stages with each of 16 Dene/Métis communities, representing about 18 000 Dene/Métis in the region. Stage I was conducted from May to October 1993, and consisted of community consultation, development of the food list, and pilot projects to test interview instruments. Stage II, conducted in 1994, consisted of interviews (24-hour recalls and traditional food frequency) and food sample collection during two seasons: the season of highest traditional food use (October–November) and the season of lowest traditional food use (March–April). Stage III, conducted in January to September 1995, consisted of data management and analysis, and Stage IV, conducted in October 1995 to September 1996, was the reporting period. Dietary assessment interviews with Gwich'in were conducted in Tetlit Zheh, Tsiigehtchic and Aklavik in 1994. These data provided the Dene and Gwich'in food lists, frequency and seasonality of traditional food use and market food use, perceptions of traditional food and food security, and understanding of dietary adequacy (Kuhnlein *et al.*, 2007; Kuhnlein and Receveur, 2007; Kuhnlein *et al.*, 2004; Lambden and Kuhnlein, 2007; Lambden *et al.*, 2006; Receveur *et al.*, 1997; Receveur *et al.*, 1996).

The second project on children's food use and anthropometry, and factors influencing mothers' food choices for family provisioning, was conducted during two seasons: November 2000–January 2001 and August–October 2001. All children 10–12 years of age (n = 114) and their mothers (n = 69) in five Dene/Métis and Yukon communities (Fort McPherson, Tulita, Fort Resolution, Old Crow and Carcross) were invited and encouraged to participate. Dietary 24-hour recall interviews were conducted and anthropometric measurements were taken. Results were returned to communities by researchers and Gwich'in project assistants in March 2001 (Nakano *et al.*, 2005a; Nakano *et al.*, 2005b).

The third project to develop an intervention to improve nutrition and health with emphasis on locally available traditional food is currently (2006–2009) in process. Baseline data were collected in February 2006, and selected preliminary data are reported here.

Results

Food species diversity in the Gwich'in traditional food system

Within the entire Dene territory 101 species of wildlife animals and plants were found to form the traditional food system (Kuhnlein *et al.*, 2001). Within the Gwich'in area of the Northern NWT, 50 species were noted in frequency interviews (Table 3.1). This food list includes species reported used for all Gwich'in communities, and includes the scientific names, common names and local language names, as well as seasonality in Tetlit Zheh. Animal and fish species dominated the traditional diet, with several parts of the animals being used as food.

Caribou was found to be the most popular traditional food, with barrenland and woodland caribou harvested, as well as moose. Many parts of the large mammals were consumed regularly: flesh, blood, bone marrow, heart, tongue, head, kidney, liver, brain, fat, and stomach, etc. Organs and parts of smaller animals were also consumed in addition to meat: liver, brain, ribs, etc. Of fish, the most popular were whitefish, inconnu, Arctic char, loche and trout. In addition to the fish flesh, other parts consumed included the skin, eggs, intestine, head, liver, and for some species the fins and tail. Birds were also important, and seasonally present. Again, eggs and organ meats were regularly consumed (gizzard, heart, liver, kidney, eggs, etc.) (Receveur *et al.*, 1996). In general, most meats can be stored frozen or dried, with favourite dried foods being caribou, moose and fish. Meats were always cooked with common methods being roasting, boiling, stewing or cooking on a barbeque fire. An exception is the use of raw muktuk of beluga by some community members who may share a heritage with Inuvialuit.

Plants were also important, with berries (including cranberries, blueberries, cloudberries, raspberries, gooseberries, currants, crowberries) very popular in season, and frozen or jarred for use during the winter.

Table 3.1 Gwich'in traditional food

	Scientific name	*English / common name*	*Local name*	*Seasonality in Tetlit Zheh**
	Land Mammals			
1	*Alces alces*	Moose	dinjik	Fall–Winter (November–March) Summer–Fall (August–September)
2	*Castor canadensis*	Beaver	tsee'	Spring (April–May) Fall–Winter (November–March)
3	*Erethizon dorsatum*	Porcupine	ts'it	Summer–Fall (July–September)
4	*Lepus americanus*	Rabbit, snowshoe hare	geh	Fall–Winter (September–March)
5	*Ondatra zibethicus*	Muskrat	dzan	Spring (March)
6	*Ovis dalli*	Dall sheep	divii	Summer–Fall (August–November)
7	*Rangifer tarandus granti*	Caribou, barrenground	chuu choo vadzaih	Fall–Winter (November–March) Fall (September)
8	*Ursus americanus*	Bear, black	shoh	Summer–Fall (August–September)
9	*Ursus arctos*	Bear, grizzly	shih	Summer–Fall (August–September)
	Fish, Seafood and Sea Mammals			
1	*Coregonus artedii*	Cisco, lake herring	treeluk	Summer–Fall (July–November)
2	*Coregonus clupeaformis*	Whitefish, lake	luk dagaii, luk zheii	Summer–Fall (July–November)
3	*Coregonus nasus*	Whitefish, broad	luk dagaii, luk zheii	Summer–Fall (July–November)
4	*Delphinus leucas*	Whale, beluga	kaleeluk	–
5	*Lota lota*	Loche, burbot	chehluk	Fall (September–November)
6	*Prosopium cylindraceum*	Whitefish, round	luk dagaii, luk zheii	Summer–Fall (July–November)
7	*Salvelinus alpinus*	Arctic char, Arctic salmon	dhik'ii	Summer–Fall (August–November)
8	*Salvelinus namaycush*	Trout, lake	vit	Fall (September)
9	*Stenodus leucichthys*	Inconnu, connie, coney	sruh	Summer–Fall (July–November)
10	*Thymallus arcticus*	Arctic grayling, bluefish	shriijaa	Fall (September–October)
	Birds			
1	*Anas acuta*	Duck, pintail	naak'oh jidigaii	Spring (May–June) Fall (September–October)
2	*Anas americana*	Duck, whistling, American widgeon	–	Spring (May–June) Fall (September–October)
3	*Anas platyrhynchos*	Duck, mallard	neet'aii	Spring (May–June) Fall (September–October)
4	*Aythya valisineria*	Duck, canvasback	entsihyden	Spring (May–June) Fall (September–October)
5	*Branta canadensis*	Goose, Canada	kheh	Spring (May–June) Fall (September–October)
6	*Chen caerulescens*	Goose, snow, wavies	gugeh	Spring (April–May), Fall (September)
7	*Clangula hyemalis*	Duck, squaw, oldsquaw	a'aanlak	–
8	*Cygnus buccinator*	Swan, trumpeter	daazraii	Summer (June) Fall (September)
9	*Cygnus columbianus*	Swan, tundra	daazraii	Summer (June) Fall (September)
10	*Dendragapus canadensis*	Grouse, spruce, spruce partdrige	daih	Jaunuary–December
11	*Lagopus lagopus*	Ptarmigan, willow	daagoo	January–December

Continued

Table 3.1 *(continued)* **Gwich'in traditional food**

	Scientific name	*English / common name*	*Local name*	*Seasonality in Tetlit Zheh**
12	*Lagopus mutus*	Ptarmigan, rock	daagoo	January–December
13	*Melanitta fusca*	Duck, black, scoter, white-winged	njaa	Summer (June–July), Fall (October)
14	*Melanitta perspicillata*	Duck, black, scoter, surf	deetree'aa	Summer (June–July), Fall (October)
15	*Mergus merganser*	Merganser, common	–	–
16	*Mergus serrator*	Merganser, red–breasted	–	–
	Plants & Berries			
1	*Empetrum nigrum*	Blackberry	dineech'uh	Summer (July–August)
2	*Ledum groenlandicum; L. palustre*	Labrador tea	lidu muskit	January–December
3	*Polygonum alaskum*	Wild rhubarb	tsii'gyuu	Summer (June)
4	*Rheum rhaponticum*	Wild rhubarb	tsii'gyuu	Summer (June)
5	*Rubus idaeus*	Raspberry	ts'au nakal'	Summer (July–August)
6	*Ribes hudsonianum*	Currant, black	deetree' ják	Summer (July–August)
7	*Ribes oxyacanthoides*	Gooseberry, Canada, green	–	–
8	*Ribes triste*	Currant, red	nee'uu	Summer (July–August)
9	*Rosa acicularis*	Rosehip	nichih	Summer–Fall (August–September)
10	*Rubus chamaemorus*	Cloudberry, knuckleberry	nakal	Summer (July–August)
11	*Vaccinium membranaceum*	Blueberry, high	jak naalyuu	Summer (July–August)
12	*Vaccinium myrtilloides*	Blueberry, low	jak zheii	–
13	*Vaccinium oxycoccus*	Cranberry, bog	natl'at	Fall (September)
14	*Vaccinium vitis-idaea*	Cranberry, lowbush	natl'at	Fall (September)
15	*Viburnum edule*	Cranberry, highbush	natl'at	Fall (September)

– No data.
* List obtained from the Dene/Métis survey (Receveur *et al.*, 1996) of adults in three Gwich'in communities: Tetlit Zheh, Tsiigehtchic and Aklavik. Data from Tetlit Zheh were collected in autumn, 1994.

Berries can be included in muffins, cakes or made into jelly or syrup; they can also be mashed and pounded with meat or fish into pemmican. Murray *et al.* (2005) estimated 7 670 litres of the most common berries (cloudberries, blueberries, currants) were harvested by Tetlit Zheh households in the summer of 2000. Labrador tea (muskeg tea) can be harvested during most of the year, with tea being made from the leaves, stems, and flowers (in spring). For a complete list of berries and other plants used by the Gwich'in, refer to Andre and Fehr (2002).

Several unique Gwich'in foods and their preparation techniques are presented with nutrient composition data in Table 3.2. Sample sizes and variance in values are found in the published papers presented in the footnotes. It is clear that the diversity of species and their organs and other parts created a highly nutritious traditional diet. When combining these highly nutritious foods with the physical effort needed for traditional food harvest, processing and cooking, the Gwich'in have the potential to be very healthy people.

Contemporary traditional food contributions to daily dietary nutrients

Of all 16 Dene/Métis communities where adult recalls were taken, Tetlit Zheh had the highest community average of daily energy supplied by traditional food (33 percent) (Receveur *et al.*, 1997) – often large daily portions (up to 600 g) of wildlife were consumed by individuals. In the children's survey, the Gwich'in

Table 3.2 Nutrient composition of Gwich'in traditional food

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
Land Mammals																	
Caribou, bone marrow, cooked[a,b]	49.2	404	1689	8.9	40.9	0.0	0.98	0.99†	0.33†	142	bdl†	bdl	0.00c	4.95	6.10	6.90	0.98
Caribou, fat, cooked*	12.7†	757	3164	4.0†	82.3†	0.1†	0.04†	1.32†	0.77†	31.9†	3.20†	0.68†	0.00c	0.00†	4.47†	1.74†	0.36†
Caribou, flesh, baked[b,e,f,h]	65.6	142	594	30.1	2.4	0.0	1.29	0.51	0.14	bdl	bdl†	0.54†	0.55†	4.95†	5.40	4.59	5.69
Caribou, flesh, dried[a,b,e,f,g,h,i]	28.5	293	1225	60.8	4.9	1.1	2.62	0.68	0.11	3.67	bdl†	0.35	0.50†	9.50†	14.6	11.2	9.02
Caribou, heart, boiled[a,b]	66.7	145	606	28.3	3.6	0.0	1.46	0.55†	0.11†	8.88	1.10†	0.34	1.76†	4.29†	5.28	8.80	2.31
Caribou, kidney, cooked[c,j]	65.1	181	757	24.6	9.2	0.0	1.11	1.78	0.15	106	0.88†	0.09	7.24	81.7	12.2	5.50	3.89
Caribou, liver, baked[a,e,f,h,j]	65.5	150	627	24.6	3.5	5.0	1.54	0.77	0.22	24689	1.10†	19.8	23.2†	231†	4.40	35.9	4.84
Moose, blood, raw[e,f,h]	79	92	385	21.0	0.5	0.0	0.81	bdl	0.00	bdl	0.00c	0.15†	0.98†	11.8†	2.10	62.0	0.20
Moose, flesh, baked[b,e,f,h]	60	167	698	35.9	1.5	1.0	0.41	0.33	0.10	0.00	0.00†	0.55†	0.55†	4.95†	4.18	4.07	7.48
Muskrat, flesh, raw[e,f,h]	68	139	581	25.2	4.2	0.0	1.15	1.65	0.77	bdl	0.00c	0.79†	3.00†	14.7†	20.0	10.8	2.56
Rabbit, flesh, boiled[a,b,e,f,h,j]	66.9	141	589	29.5	2.4	0.3	0.99	0.64	0.04	12.3	0.00c	0.89	0.00†	8.90	35.0	5.72	2.75
Fish, Seafood and Sea Mammals																	
Arctic char, flesh, boiled[g,i]	69	151	631	26.1	5.2	0.0	1.69	1.32	1.10	88.5	26.8†	0.22†	0.90†	43.2†	30.0	0.49	0.63
Inconnu, flesh, baked[e,f,h]	74	117	489	22.0	3.2	0.0	1.20	0.77	0.55	0.00	13.4†	0.22	0.90†	43.2†	20.0	0.40	0.40
Inconnu, flesh, smoked/dried[e,f,h]	18	408	1705	57.0	20.0	0.0	3.20	2.45	2.00	76.0	10.4†	2.858†	0.00†	21.9†	40.0	4.00	1.00
Loche, flesh, baked[e,f,h]	76	97	405	22.0	1.0	0.0	1.10	0.43	0.33	8.00	0.44	0.0	0.00†	1.00†	35.0	0.55	0.77
Loche, liver, baked[e,f,h]	38	459	1919	12.0	43.0	6.1	1.30	4.40†	2.97†	3000	331†	0.66†	8.70†	1.00†	2.60	1.60	1.32
Trout, lake, flesh, cooked[e,f,h]	70	146	610	22.2	5.9	0.5	0.90	0.63	0.50	61.0	20.5†	0.17†	1.80†	43.2†	22.2	0.64	0.60
Whitefish, eggs, baked[e,f,h]	50.6	269	1124	25.6	15.7	6.4	1.69	3.19	2.42	bdl	11.3†	3.52†	49.6†	187†	39.1	1.65	3.96
Whitefish, flesh, baked[b,e,f,h]	72.6	126	527	22.4	4.0	0.4	1.04	0.77	0.45	8.6	2.80†	1.76†	2.15†	2.75†	14.3	0.33	0.44
Whitefish, flesh, smoked/dried[e,f,h,i]	14.9	385	1609	67.0	13.0	0.0	4.00	1.43	0.88	19.0	10.45	2.86†	0.00	21.9	61.3	2.53	1.43

Continued

Table 3.2 *(continued)* **Nutrient composition of Gwich'in traditional food**

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*
Birds																	
Duck, flesh, boiled[a,b,f,g,h,i]	63	151	631	28.5	3.0	0.6	–	0.63	0.55	26.39	0.00c	0.12	1.27	25.8	50.8	10.61	2.85
Goose, Canada, flesh, boiled[d]	52.4	236	986	33.9	11.2	0.0	0.70	1.54	0.11	31.0†	0.00†	1.43	1.27†	25.9	6.09	9.03	3.96
Swan, flesh, cooked*	63†	180†	752	30.1†	5.7†	0.0†	1.00†	0.77†	0.33†	0.00†	0.00†	0.11†	0.11†	19.8†	6.05†	8.03†	2.53†
Berries																	
Blackberries, raw[b,c,e,g,,j,i]	87.6	57	238	0.4	1.0	11.6	0.26	0.05	0.03	11.0†	0.00c	1.17†	2.41	0.00	5.54	0.25	0.08
Blueberries, raw[b,c,e,j]	85	62	259	0.7	1.0	13.0	0.25	0.05†	0.03†	3.00†	0.00c	0.57†	26.2	42.5	15.0	0.32	0.22
Cloudberries, raw[e,h,j]	84	50	209	2.0	1.0	9.5	0.51	0.00	0.00	3.00†	0.00c	1.20†	130†	19.5†	16.2	0.41	39.1
Cranberries, raw[b,c,e,j]	83	74	309	0.7	1.2	15.2	0.31	0.0†	0.0†	3.00†	0.00c	1.21†	3.88	19.5	17.2	0.33	0.22

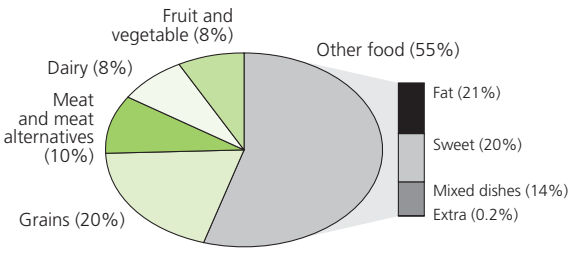
a Kuhnlein, H.V. *et al.* 2006.
b Kuhnlein, H.V. *et al.* 2002.
c Fediuk, K. *et al.* 2002.
d Belinski, D. L. & Kuhnlein, H.V. 2000.
e Kuhnlein, H.V. *et al.* 1994.
f Morrison, N. & Kuhnlein, H.V. 1993.
g Kuhnlein, H.V. & Soueida, R. 1992.
h Appavoo, D. *et al.* 1991.
i Kuhnlein, H.V. *et al.* 1991.
* All values substituted by one other food item.
† Imputed value from similar tissue or literature.
bdl Below detection limit.
– No data.

Table 3.3 Twenty most consumed market foods as identified by 24-hour recalls in the Dene/Métis and food choice surveys, Gwich'in communities only

D/M survey, adults only (195 recalls)	*Average grams/day*	*FC survey, children only/ 10 to 12yrs (222 recalls)*	*Average grams/day*
Coffee, brewed	816	Powdered drinks (fortified and non-fortified)	193
Tea, brewed	622	Soft drinks	121
Powdered drinks	135	Milk, 2% fat	98
Potatoes	71	Fruit drinks	32
Soup, chicken noodle	65	Soup, chicken noodle	30
Soft drinks	55	Macaroni/cheese	26
Bread, white	52	Bread, white	21
Milk, 2% fat	42	Potatoes	19
Rice	41	Spaghetti in tomato sauce w/cheese	16
Macaroni/cheese	41	Orange juice canned	15
Bannock	36	Pizza	15
Oats	32	Oats	15
Sugar	31	French fries	14
Eggs	31	Chicken	13
Soup, tomato	28	Tea, brewed	13
Chicken	26	Orange juice, frozen	13
Spaghetti	22	Spaghetti w/meatballs and tomato sauce	11
Beef hamburger	20	Apple	11
Fruit drinks	19	Soup, vegetable beef	11
Soup, vegetable beef	18	Hotdogs	11

communities of Old Crow and Tetlit Zheh had the highest community averages of traditional food use (10.7 percent and 5.9 percent, respectively) (Nakano *et al.*, 2005b). Analysis of adult diets from Gwich'in communities showed that caribou (various parts) was the most important food source of daily energy, protein, vitamin A, iron, and zinc, and within the top ten contributors of fatty acids (saturated and unsaturated). Although children's diets had much less traditional food as a percentage of daily energy, caribou was still within the top ten contributors to intake of energy, protein, iron and zinc. In considering food contributions to energy from the 24 hour data, the majority of energy was provided by market food. More detailed observation of the types of market food consumed by adults in Tetlit Zheh, Tsiigehtchic and Aklavik (n = 195 recalls) during the 1994 research, and of all Dene/Métis children in the 2000/–2001 survey (n = 222 recalls), showed the kinds of market food contributing to dietary energy for both men and women (Table 3.3). The top 20 frequently consumed foods were highly processed and least-cost foods, with major emphasis on sugars and carbohydrates.

Figure 3.2 Market food (MF) groups as percent of total energy from MF consumed by Dene/Métis and Yukon children *(n = 222)*



Source: Nakano *et al.*, 2005b.

Further analysis of Dene/Métis children's diets showed more than 40 percent of energy being contributed by fat and sweet foods (Figure 3.2). High intakes of sucrose (18–19 percent of energy) and total sugars (25–26 percent of energy) were contributed by sugar added to beverages, powdered drinks, commercial cereals, commercial cakes, fruit drinks, cookies, candy and other sweets. It is therefore clear that use of market food in large measure decreases nutrient density of Gwich'in diets and especially that of children. Nevertheless, use of traditional, cultural foods ensured that both adults and children have adequate intakes of protein, iron, zinc, copper and vitamin B_6. In contrast, contemporary intakes of calcium, vitamin D, vitamin A, vitamin E, magnesium, and fibre were limited and probably inadequate (Kuhnlein*et al.*, 2006; Kuhnlein *et al.*, 2007; Nakano *et al.*, 2005a, 2005b).

Cultural attributes of traditional food

Exploring the cultural attributes of Gwich'in traditional food took place during all three surveys. In the 1993–1994 study of adults, a series of interview questions addressed agreement on whether harvesting and using traditional food by the family contributed important cultural attributes. More than 85 percent (n = 59) of Gwich'in respondents agreed that these practices around traditional food provided physical fitness and good health, favourite outdoor recreation, healthy food, as well as keeping people "in tune with" nature, favours sharing in the community, saves money, is an essential part of culture, is a way for adults to display responsibility for children, brings respect from others, builds pride and confidence, provides education on the natural environment, contributes to children's education, provides survival skills, provides food-preparation skills, and is an opportunity for children to learn patience and other personality qualities (Kuhnlein *et al.*, 2001). Further, adults were well aware of the healthy, low-fat qualities of their traditional food, and that it was fresh and additive/pesticide free while being of comparatively low cost. Adults also recognized that the purchase of market food was convenient and provided variety to the diet (Lambden *et al.*, 2006).

During the study of children in 2000–2001, mothers (n = 69) were asked for their reasons for selecting traditional and market foods for the family. The most frequent responses for selecting traditional food were that it was considered healthier than store-bought meat, it tastes better and it is less expensive. Mothers also responded that they would serve more traditional food if it was easier to get, and if they were less concerned about environmental contaminants. The major barriers to having more traditional food were the time and costs for hunting, fishing and gathering, but that having a hunter/fisher in the family, and sharing with family and friends, all help in having traditional food. Regarding women's perceptions of why children eat less wild meats and fish than adults, replies centred on the fact that children spend more time in town, and both women and children have less opportunity to harvest and prepare traditional food.

Infant-feeding practices

At the time of this study, breastfeeding was promoted and in practice by about 70 percent of mothers of infants in Tetlit Zheh (Tena Blake, personal communication, 2007). Formerly, breastfeeding was exclusive during infancy with first introduced foods being meat-based. Examples of these foods are meat and fish broth, pre-masticated meat and fish and other table food. Teething aids were bones (ribs) of mammals, rabbit, and other animals (McDonald and Vittrekwa, personal communication, 2006).

Anthropometry

Results from anthropometry of children from the five Dene/Métis communities during the children's study in 2000–2001 showed that there are few underweight children in the sample (Table 3.4). All children in the 10–12 year age range were invited to the study, and most children were measured in both seasons. Results showed that over half the children were normal weight, and about one-third were either overweight or obese (Nakano *et al.*, 2005a). Preliminary results from women's (n = 45) anthropometry data in 2006 showed 33 percent

Table 3.4 Percentage of Dene/Métis and Yukon children in underweight[1], normal weight[2], risk of overweight[3] and overweight[4] categories of the 2000 CDC Growth Charts

	Season 1 (n=102)			*Season 2 (n=114)*		
	Girls *(n=62)*	***Boys*** *(n=40)*	***Total*** *(n=102)*	***Girls*** *(n=63)*	***Boys*** *(n=51)*	***Total*** *(n=114)*
Underweight	2	3	2	2	2	2
Normal weight	65	70	67	65	71	68
Risk of overweight	16	8	13	16	10	13
Overweight	18	20	19	18	18	18

1 BMI for age < 5th percentile
2 5th ≤ BMI-for-age < 85th percentile
3 95th > BMI-for-age ≥ 85th percentile
4 BMI for age ≥ 95th percentile
Season 1 = November–January; Season 2 = August–October; most children from season 1 participated in season 2.

as overweight (BMI 26–30) and 47 percent obese (BMI >30). The extent of those overweight and obese children and adults leads to concerns for diseases associated with the nutrition transition – obesity, diabetes, heart disease and certain kinds of cancer – and is one focus of the need for change during the planned intervention.

Food security

A cross-sectional survey of Yukon First Nations, Dene/Métis and Inuit used socio-cultural questionnaires to evaluate women's access to traditional and market foods. In all three regions, including the subset of Gwich'in women, women's food security was found to be affected by affordability of market food and accessibility to hunting and fishing (Lambden *et al.*, 2006). The percentage of respondents who could not afford to buy all their food from the store in Tetlit Zheh was 86 percent (Receveur *et al.*, 1996).

Outlook

Project activities in the intervention with the Tetlit Zheh community have been ongoing or planned subsequent to baseline measures of diet and overall health (January–March 2006). Strategies focus on healthy eating and healthy physical activity. A Gwich'in recipe book based on local foods is being developed using recipes gathered from members of the community. Activities to encourage healthy eating in school-aged children have included the "Drop the Pop NWT Challenge" (Department of Health and Social Services, 2007), where students were challenged to stop drinking pop (carbonated soft drink) for five days, a field trip to pick edible plants, a community fish cookout that encouraged different methods of fish preparation and promotion of the benefits of eating traditional food at an annual health fair. A physical activity programme for women in the community includes group walking in the evenings and courses given by the school physical education teacher. Other activities will be planned with community leaders based on the findings from the studies reported here for implementation during the two-year project.

Throughout food-use research with Dene adults and children, and specifically with the Gwich'in, it is clear that traditional food is critically important to maintain dietary quality and that community members recognize that it is important to make more traditional food available for all families. This will not only improve dietary quality, but also enhance food security and cultural continuity. It is also recognized that improving availability and access to high-quality market food will contribute to positive dietary intakes, and that attention to positive lifestyle and health habits should be fostered to reverse the current trends in overweight and obesity ●

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We recognize the many researchers' contributions to the overall research with Dene/Métis communities.

Team members 1994–1996

For this first study with Dene/Métis, Olivier Receveur, Université de Montréal, Département de Nutrition (formerly of McGill University, Centre for Indigenous Peoples' Nutrition and Environment [CINE]) was the overall data collection supervisor. Marjolaine Boulay, McGill University, was CINE's data and statistical assistant, William Carpenter, Métis Nation (Northwest Territories) was the Environment Manager, and Carole Mills, The Dene Nation, Lands and Environment Department facilitated local arrangements. This project was successful thanks to the support and hard work of community members, staff and volunteers at Dene Community Councils, the Dene

Nation and CINE. The participants of the methodology development workshop that finalized the study design included Charlie Furlong, Roy Doolittle, Mary Lafferty, Pat Larocque, Violet Beaulieu, Martie Kunnizie, Bella T'Seleie, Don Antoine, Antoine Michel, and Barney Masuzumi. Members of the Tetlit Zheh Community Council that supported implementation of the project were Chief Joe Charlie and Richard Wilson. The project coordinator was Laurie Chapman and interviewer was Patricia Stewart. Funding for this project was provided by the Arctic Environmental Strategy (AES), Department of Indian Affairs and Northern Development (DIAND), Hull, Quebec.

Team members 2000–2001

There were several contributors to the second study with children, which was funded by the Northern Contaminants Program of DIAND. Initial arrangements for the five Dene communities were made by Karen Fediuk and Norma Kassi. Within Tetlit Zheh, process and arrangements were facilitated by Liz Wright and Sharon Snowshoe. Data entry was completed by Karen Fediuk and analysis completed by Tomoko Nakano and Rula Soueida at CINE.

Team members 2006

The research, which began in 2006 for this case study, included several community members and researchers. Funding, provided by the Canadian Institutes of Health Research (Institutes of Aboriginal Peoples' Health and Nutrition, Metabolism and Diabetes), was awarded to Harriet Kuhnlein, Olivier Receveur, Laurie Chan and Bill Erasmus. The community contacts for the Council at the time of submitting the proposal were Sharon Snowshoe and Hazel Nerysoo. Those responsible for the project in the Tetlit Zheh community were Margaret McDonald, Elizabeth Vittrekwa, Rhonda Francis and other colleagues in the Tl'oondih Healing Society and in the community. Data preparation for the study, and for this report, was guided by Dina Spigelski, Rula Soueida, Lisa Elvidge, Jill Lambden, Lauren Goodman and Nelofar Athar Sheikh.

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