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REVIEW

Assessing diet and lifestyle in the Canadian Arctic Inuit and Inuvialuit to inform a nutrition and physical activity intervention programme

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Abstract

Inuit in Nunavut (NU) and Inuvialuit in the Northwest Territories (NWT), Canada, were traditionally nomadic peoples whose culture and lifestyle were founded on hunting and gathering foods from the local environment, primarily land and marine mammals. Lifestyle changes within the last century have brought about a rapid nutrition transition, characterised by decreasing consumption of traditional foods and an associated increase in the consumption of processed, shop-bought foods. This transition may be attributed to a multitude of factors, such as acculturation, overall food access and availability, food insecurity and climate change. Obesity and risk for chronic disease are higher in the Canadian Arctic population compared with the Canadian national average. This present review describes the study population and methodologies used to collect data in order to study the nutrition transition amongst Aboriginal Arctic populations and develop Healthy Foods North (HFN), a novel, multi-institutional and culturally appropriate programme that aims to improve dietary adequacy and reduce risk of chronic disease. Included in this special issue of the *Journal of Human Nutrition and Dietetics* are papers describing dietary intake patterns, physical activity levels, dietary behaviours, chronic disease prevalence and psychosocial factors that potentially mediate behaviour. A further paper describes how these data were utilised to inform and develop Healthy Foods North.

Background

Aboriginal populations of the Canadian Arctic

The Canadian Arctic consists of three territories: Yukon, the Northwest Territories (NWT) and Nunavut (NU) (Fig. 1), where Aboriginal populations make up approximately 25%, 50% and 85% of the total populations, respectively (Statistics Canada, 2007a,b,c, 2008). Canadian Aboriginal groups inhabiting these territories include Inuit and Inuvialuit, First Nations (including Dénė) and Métis (people of mixed First Nations and European ancestry) (Indian and Northern Affairs Canada, 2000; Statistics Canada, 2007a,b,c, 2008). The highest concentration of Canada's Inuit (49%) resides in NU (Statistics Canada, 2007a, 2008). The NWT is home to 10% of the country's Inuit, usually described as Inuvialuit (Statistics Canada, 2007a, 2008). The distinction between Inuit and Inuvialuit will be made whenever possible and appropriate; however, if the distinction is not made, it should be noted that the term Inuit includes Inuvialuit (Indian and Northern Affairs Canada, 2000).

The land, water and wildlife are the foundation of Northern culture and spirituality (Takano, 2005). Inuit in NU and Inuvialuit in the NWT were traditionally nomadic hunter-gatherers consuming subsistence diets consisting of a diverse range of largely protein-based foods gathered locally (e.g. caribou, Arctic hare, seal, fish, ptarmigan, goose, berries) (Draper, 1977; Kuhnlein *et al.*, 2001). Traditional foods have long been the basis of Inuit cultural identity. Food sharing systems have defined Inuit identity by creating and reinforcing social bonds and ensuring the survival of extended family and community members (Condon *et al.*, 1995; Collings *et al.*, 1998).

Epidemiological studies suggest a positive association between meat consumption and chronic disease risk amongst several different ethnic groups (Chiu *et al.*, 2003;

Figure 1 Map of Canadian Inuit regions including the Northwest Territories, Nunavut, Quebec and Labrador (Statistics Canada, 2007a).

Lutsey *et al.*, 2008; Erber *et al.*, 2009). However, the current body of evidence on Inuit and other Aboriginal Arctic groups indicates that these populations are well-adapted to the animal product-rich traditional diet, which has allowed them to thrive in a very harsh environment for thousands of years (Graburn & Strong, 1973). Traditional food preparation and consumption practices have allowed Inuit to obtain many essential vitamins and minerals (e.g. iron, calcium, B vitamins, vitamin D), as well as dietary fibre (from the animals' digestive tract contents), protein and essential fatty acids (Blanchet *et al.*, 2000; Usher, 2002; Canadian Museum of Civilization Corporation, 2003; Kuhnlein *et al.*, 2004). Additionally, hunting, fishing and food gathering practices ensured physical activity was a daily part of traditional life (Adler *et al.*, 1996).

Nutrition transition in the Canadian Arctic: causes and implications

The phrase 'nutrition transition' is characterised by a shift away from a population's traditional eating patterns to those of another culture, in this case the non-Aboriginal, British Canadian culture, or one that is higher in fat and refined carbohydrate, and which has been associated with increasing obesity and other chronic diseases (Popkin, 1993, 1998, 2006; Popkin & Gordon-Larsen, 2004). Within the last 50 years, most Arctic communities have experienced various degrees of a nutrition and lifestyle transition (Receveur *et al.*, 1997; Blanchet *et al.*, 2000; Bjerregaard *et al.*, 2004; Kuhnlein *et al.*, 2004; Batal *et al.*, 2005; Ebbesson *et al.*, 2005; Taylor *et al.*, 2005) as a result of a combination of social, environmental and economic influences.

Inuit face continued pressure to acculturate to the values and practices of non-Aboriginal or so-called 'Western' societies and wage economies (Kirmayer *et al.*, 2003; Boult, 2006). Within the last century, the settlement of Inuit into stationary communities, the introduction of residential school policies, combined with the effects of globalisation (Berry, 2008; Vorobieva & Sutyrin, 2005; Condon *et al.*, 1995), have brought about considerable social change. As a result of increased commercialisation, the non-traditional or 'market' foods have become much more readily available than they were previously. Levels of physical activity are declining as a result of the greater

use of motorised vehicles (e.g. snowmobiles replacing dog sleds) and less engagement in vigorous traditional activities (e.g. hunting, scraping of animal hides for sewing) (Bjerregaard *et al.*, 2002, 2004; Curtis *et al.*, 2005). Food sharing practices are also diminishing (Curtis *et al.*, 2005); numerous studies have described the reduction in hunting, gathering and sharing as key indicators of the acculturation of Arctic peoples (Bjerregaard *et al.*, 2002; Craver, 2004; Mason, 2004; Curtis *et al.*, 2005).

Food security (access, availability, utilisation, stability) has been described as a growing challenge for Aboriginal Arctic populations (Furgal & Seguin, 2006; Damman *et al.*, 2008; Power, 2008), both in the context of traditional food systems and market foods. In one NU community, Ford & Berrang-Ford (2009) reported a high prevalence (64%) of food insecurity, measured by disrupted eating patterns, reduced food intake, weight loss and anxiousness over food sufficiency and shortages. The 2006 Aboriginal Peoples Survey showed that 30% of Inuit children in Canada had experienced hunger (as reported by parents) because the family had run out of food or money (Tait, 2008).

Traditional food security in the Arctic is threatened by a number of factors ranging from changing physical and social environments to increasing economic barriers. Anthropogenic effects (by-products of human activity inclusive of climate change, environmental pollution, etc.) are causing radical modifications to the physical environment (e.g. permafrost thaw, vegetation zone changes, reductions in sea ice, greater weather unpredictability), which are predicted to decrease animal-source foods as a result of reductions in animal populations (e.g. caribou herd declines, possible polar bear extinction, decline in seal population), alter migratory and feeding patterns, and increase snowmelt and river break-up (Arctic Climate Impact Assessment, 2004; Duerden, 2004; Guyot *et al.*, 2006). Other barriers to traditional food security include growing concerns of food supply contamination (Kinloch *et al.*, 1992; O' Neil *et al.*, 1997), decreased transfer of cultural knowledge from elders to young people, a decrease in time and energy available for hunting and gathering as a result of participation in the wage economy, a loss of taste for traditional foods because of increased consumption of market foods, lack of a hunter in the household, and increasing costs of hunting and fishing in the face of high poverty rates (Chan *et al.*, 2006; Guyot *et al.*, 2006; Damman *et al.*, 2008; Power, 2008).

High rates of poverty in the Arctic can also affect families' abilities to purchase market foods because these foods are transported to isolated communities year-round via air, significantly inflating costs (Chan *et al.*, 2006; Damman *et al.*, 2008). Often, the most affordable and available market foods are those that are commercially produced and can withstand the long transportation process by sea, such as crisps, carbonated drinks and other processed foods high in fat, salt and sugar. Such foods contribute a large percentage of energy but low levels of micronutrients to the current Inuit diet (Blanchet *et al.*, 2000; Sharma *et al.*, 2009, 2010a).

Studies of other Arctic populations experiencing a similar nutrition transition have described increasing excessive macronutrient (fat, carbohydrate) intake and insufficient intake of many nutrients, namely vitamins A, B_6, C and D, as well as potassium, folate, calcium, magnesium and dietary fibre (Moffatt, 1989, 1991; Thouez *et al.*, 1989; Gilbert *et al.*, 1992; Blanchet *et al.*, 2000; Risica *et al.*, 2000a,b; Schumacher *et al.*, 2003; Ebbesson *et al.*, 2005; Bersamin *et al.*, 2006). Such dietary patterns present the risk of a double burden of under-nutrition and chronic disease (Popkin, 1998; Damman *et al.*, 2008) and may explain patterns of an increasing prevalence of overweight, obesity and chronic disease risk amongst Inuit. Between 1992 and 2004, the prevalence of obesity amongst Inuit increased from 19% to 28% (Anctil, 2008); impaired glucose tolerance and diabetes were also on the rise (Kuhnlein *et al.*, 1996; Young, 1996). Inuit have disproportionately high rates of cancer compared with non-Inuit and other global populations, including the highest incidence of salivary gland and lung cancers and one of the highest rates of nasopharyngeal cancer (Circumpolar Inuit Cancer Review Working Group *et al.*, 2008). Total cardiovascular disease mortality amongst Inuit is higher than in European and North American populations (Bjerregaard *et al.*, 2003), and life expectancy in Inuit-inhabited areas trails the Canadian average by more than 12 years (Wilkins *et al.*, 2008).

The financial burden of chronic diseases across Canada is significant. The direct and indirect costs of cardiovascular disease, the leading cause of death in Canada, was C$20.6 billion in 1998; the cost of cancer, the second leading cause of death, was C$17.9 billion in 2002; and the cost of diabetes, which is highly prevalent in Canada, was C$9.9 billion (Ohinmaa *et al.*, 2004; Statistics Canada, 2005a,b; Patra *et al.*, 2007). The health care system in NU and the NWT is continuously challenged by the cost of health service delivery for such remote and isolated communities. The Government of NU Department of Health and Social Services (DHSS) spends millions of dollars per year on medical travel solely to transport NU residents to southern cities, such as Edmonton, Winnipeg, and Ottawa, for medical assessment and treatment (personal communication NU DHSS, 2010). From a health systems perspective, investing in chronic disease prevention programmes is essential if the territories are to adequately and sustainably manage health care costs in the long term, as well as to maintain a high qual-

ity of life for its populations and reduce pain associated with treatment. Without intervention programmes focused on chronic disease prevention, the young populations of NU (median age 23 years) and the NWT (median age 31 years) (Statistics Canada, 2007b) will likely place increasing strains on the existing healthcare system that will be unsustainable as the population ages.

Healthy Foods North: an approach to reduce chronic disease risk factors amongst Inuit populations

Despite the known benefits of behavioural modifications in reducing the risk of developing chronic diseases (Report of the Joint WHO/FAO Expert Consultation, 2003), to date, there have been no formal intervention programmes designed specifically for Inuit and Inuvialuit to improve diet and increase physical activity. On the basis of dietary intake data (Sharma *et al.*, 2009, 2010a), formative research (Gittelsohn *et al.*, 2010) and using a community participatory process, a novel, integrated, multi-institutional chronic disease prevention programme called Healthy Foods North (HFN) was developed for Inuit and Inuvialuit in the Canadian Arctic (Sharma *et al.*, 2010b). This programme functions at the individual, household, community and institutional levels, and is implemented throughout participating communities. Sites for implementation include food shops, health clinics and offices, as well as at community special events, such as feasts. Community media, such as radio, local television, newspapers and other existing community communication channels, are utilised, such as the Hamlet and local Health or Interagency Committees. Partnerships were developed with all relevant community-based health and well-being organisations, including food retailers, local Hamlets, Aboriginal organisations, government health departments and academia.

The aims of the HFN programme are to reduce risk factors for chronic diseases by working in partnership with communities to develop, implement and evaluate a culturally appropriate, community-based intervention aimed at improving diet, increasing physical activity and providing education regarding healthy lifestyle choices amongst adults (Gittelsohn *et al.*, 2010; Sharma *et al.*, 2010b). A specific objective of the programme is to improve diet by increasing or maintaining traditional food consumption, as well as fruit and vegetable intake, at the same time as decreasing the consumption of processed foods high in sugar and/or fat. An additional objective of HFN is to increase physical activity through the promotion of traditional activities (e.g. hunting and fishing) and community-based programmes, such as walking clubs. Finally, this programme provides a community-based means of monitoring the lifestyle and nutrition transition over time, including environmental (e.g. availability of animal-food sources and healthy shop-bought foods) and socioeconomic factors that are known to influence dietary intake and physical activity.

Study setting

A baseline cross-sectional study of Inuit and Inuvialuit adults took place in six remote Canadian Arctic communities in NU (Communities A, B and C) and the NWT (Communities D, E and F) before the implementation of HFN. Communities were chosen by their respective territorial governments to represent Inuit communities with varying population sizes, socioeconomic status (SES) and degree of acculturation. Two Inuit communities in NU and two Inuvialuit communities in the NWT were selected as intervention communities for the first round of the programme. Two other communities (one in NU and one in the NWT) served as comparison communities and will be involved in a delayed intervention after post-intervention data have been collected in all six study communities.

Nunavut

The territory of NU (population 29 474) is the easternmost of three territories in Arctic Canada and consists of 25 remote communities dispersed over an approximate area of two million square kilometres (NU Bureau of Statistics, 2007). The local languages are Inuinnaqtun and Inuktitut, in addition to English. With a median age of 23 years amongst the total population and 20 years amongst the Aboriginal population (Statistics Canada, 2007b,d), NU has the youngest population of any province or territory in Canada.

Community A is the largest of the three remote communities, with a population of approximately 1500 people (approximately 80% of whom identify themselves as Inuit) (Statistics Canada, 2007b,d; Table 1). Amongst the Aboriginal identity population (median age 23 years), the median family income is approximately C$60 000 (£37 000), which is approximately equal to the national average, although the cost of living is dramatically elevated in Arctic communities compared with the rest of Canada (Statistics Canada, 2007d; Damman *et al.*, 2008). English is commonly spoken in the community, and the local language is regularly spoken by the elders. Community A has a large hotel (plus additional temporary housing), two food shops and two small fast-food restaurants. Community A is a regional centre with a higher proportion of non-Aboriginal residents and greater engagement in the wage economy compared with the other two communities, and therefore is considered the most acculturated of the three NU participant communities.

Table 1 Demographic and baseline characteristics of the three Inuit and three Inuvialuit communities in Nunavut and the Northwest Territories, Canada

Characteristic	Nunavut			Northwest Territories		
	Community A	Community B	Community C	Community D	Community E	Community F
*Demographics**						
Population (*n*)	1500	800	1000	3500	900	400
Inuit population (%)[†,‡]	80	90	90	40	80	90
Median age (years)[‡]	23	19	19	24	26	25
Median family income – all private households (Canadian $)[§]	60 000	45 000	55 000	64 000	37 000	33 000
Employment rate (%)[‡]	55	40	40	60	35	50
Number of grocery shops	2	2	2	3	2	2
Response rate (%)	74	69	93	65–85[–]	65–85[–]	65–85[–]
Food Frequency Questionnaire						
Respondents (*n*)	71	74	66	66	87	77
Gender (%)						
Men	30	9	12	23	22	27
Women	70	91	88	77	78	73
Median age (years)	42	40	40	46	46	39
Adult Impact Questionnaire						
Respondents (*n*)	94	90	82	64	86	78
Gender (%)						
Men	31	13	13	22	22	26
Women	69	87	87	78	78	74
Median age (years)	40	40	38	46	45	39
International Physical Activity Questionnaire						
Respondents (*n*)	81	67	70	53	66	77
Gender (%)						
Men	28	9	13	23	21	29
Women	72	91	87	77	79	71
Median age (years)	42	40	40	47	46	40

*Source: Statistics Canada (2007b,d); values are rounded to protect communities' identity.

[†]Data are from the Aboriginal population (First Nation, Inuit/Inuvialuit, Métis).

[‡]Approximately half of Communuty D's Aboriginal population is Inuit/Inuvialuit, whereas almost all of the Aboriginal populations in the other communities are Inuit/Inuvialuit.

[§]1 Canadian $ = 0.61 GBP as of 17 February 2010.

[–]Response rates are approximate as a result of incomplete records.

Community B is the smallest of the three NU communities in this study, with a population of approximately 800 people (approximately 90% Inuit) (Statistics Canada, 2007b,d; Table 1). Amongst the Aboriginal population (median age 19 years), the median family income is approximately C$45 000 (£27 000), and the employment rate is only 40% (Statistics Canada, 2007d). Community B has one hotel and two food shops. Traditional activities, such as hunting, remain a part of daily life in the community, and the local language is commonly spoken.

Community C has a population of approximately 1000 people (approximately 90% Inuit) (Statistics Canada, 2007b,d; Table 1). Amongst the Aboriginal identity population (median age 19 years), the median family income is approximately C$55 000 (£34 000), and the employment rate is approximately 40% (Statistics Canada, 2007d). Community C has maintained many traditional activities, although great distances must be travelled to access traditional foods. The local language is widely spoken. Community C has one hotel, one fast food restaurant and two food shops.

The Northwest Territories

The NWT (population 41 464) is located between the territories of Yukon and NU and lies to the north of British Columbia, Alberta and Saskatchewan (Statistics Canada, 2007b). It has an area of over one million square kilometres and 33 geographically dispersed communities (Statistics Canada, 2007b). Almost half of the population lives in the capital city, Yellowknife, another one quarter lives in regional centres, and the remaining population is spread amongst 28 remote communities with a size in the range of 70 – 1900 residents (NWT Health and Social Services, 2005). The median age of the entire NWT population is 31 years;

the median age of the Aboriginal identity population is 26 years (Statistics Canada, 2007b,d).

Community D is the largest of the three NWT communities in this study and is semi-remote, with road access available for nine months each year. The population is approximately 3500, and approximately 40% of the total population identifies itself as Inuit (Inuvialuit) (Statistics Canada, 2007b,d). Amongst the Aboriginal identity population (median age 24 years), the employment rate is 60%, and the median income is approximately C$64 000 (£39 000) (Statistics Canada, 2007b,d; Table 1). There are three food shops, three convenience shops and a recreation complex.

Community E has relatively more traditional activities than Community D and two food shops. This remote community has a population of approximately 900 people; approximately 80% of the population self-identify as Inuit (Inuvialuit) (Statistics Canada, 2007b,d). Amongst the Aboriginal identity population (median age 26 years), the employment rate is approximately 35%, and the median income is approximately C$37 000 (£23 000) (Statistics Canada, 2007b,d). Hunting, trapping and gathering remain important activities and provide food sources to many families. The community is accessible by air all year round, and an ice road is accessible for four months.

Community F is the smallest of the three NWT communities; this remote community has approximately 400 inhabitants and approximately 90% of them identify as Inuit (Inuvialuit), with a median age of 25 years (Statistics Canada, 2007b,d). Amongst the Aboriginal population, the employment rate is approximately 50%, and the median income of the population is approximately C$33 000 (£20 000) (Statistics Canada, 2007b,d). The economy is supported by arts and crafts along with trapping, hunting and fishing. Community F has two food shops but is not accessible by ice road; therefore, the cost of food transportation, which is primarily via airfreight, is higher than the other two communities.

Although most of these six communities are accessible by plane only or ice road at certain times, during a brief period in the summer when the surrounding ice melts, ships and barges deliver shipments of foods and other goods via the waterways. Barges travel a great distance from Hay River, Canada, and sealift ships from Montreal, Canada, which permits them to visit each community for only a brief time, if at all. Foods transported by sea are nonperishable with long shelf lives (i.e. canned goods, carbonated drinks, dried goods, potato crisps), which is necessary to survive the lengthy process of packing and transportation. However, perishable food is transported by airfreight throughout the year, greatly elevating food costs. Perishables such as fresh and frozen fruit and vegetables, as well as dairy products, can only be transported by air and are susceptible to damage in transit, particularly from extremely cold temperatures during winter months.

Formative research component

The formative research phase of this programme provided information that would guide development of the HFN intervention (Gittelsohn *et al.*, 2010) as well as data collection instruments for use in measuring the intervention's impact (Sharma *et al.*, 2009, 2010a). Qualitative and quantitative data were collected on diet, attitudes and practices regarding food. In-depth interviews were conducted with community members, local health staff, shop owners, elders, community leaders and others. Amongst several key findings, the importance of protecting traditional food systems and encouraging traditional food consumption was repeatedly mentioned by informants (Gittelsohn *et al.*, 2010). This initial qualitative phase of the formative research was followed by a series of structured 24-h dietary recalls to assess the main foods contributing to energy, fat and sugar intake, as well as other macro- and micronutrients in the overall diet. One of the findings of the formative research component was the low levels of intake of many key nutrients, such as dietary fibre, vitamin A, vitamin E, total folate and calcium (Sharma *et al.*, 2009, 2010a). This led the intervention to focus on both under- and over-nutrition.

Two-day community workshops were conducted in each of the four intervention communities (Gittelsohn *et al.*, 2010). Participants included community members, local leaders, government health workers and grocery shop staff. The workshops aimed to generate a list of target foods for the intervention, as well as specific behaviours and messages to promote and venues and approaches for the delivery of intervention components.

Data collection methodology

Before the HFN intervention programme implementation, baseline data were collected. Data collection tools included Quantitative Food Frequency Questionnaires (QFFQ) developed specifically for the Inuit and Inuvialuit study populations (Sharma *et al.*, 2009, 2010a), 24-h dietary recalls (for QFFQ validation), the short-form of the International Physical Activity Questionnaires (IPAQ) (IPAQ Research Committee, 2005), including questions on height and weight, and Adult Impact Questionnaires (AIQ), which included questions to assess food-related psychosocial constructs and behaviours. Questionnaires were administered between June and October 2008 in the three NU communities and between July 2007 and July 2008 in the three NWT communities. In total, 211 and 235 QFFQs, 266 and 233 AIQs, and 218 and 196 IPAQs were collected in NU and

the NWT, respectively. In the NWT, five QFFQs and five AIQs were excluded from the analysis because more than 15% of the questions were missing. No exclusions were necessary for NU. In NU, the response rates were 74%, 69% and 93% for Communities A, B and C, respectively. In the NWT, estimated response rates were 65 – 85%[1].

Study participants were randomly selected using up-to-date community housing maps provided by the local government. This method ensured sampling from areas with varied proximity to food shops. One person per household was targeted for recruitment, namely the main food shopper and/or preparer for the household, and these were mainly women. Residents <19 years (children) and pregnant/lactating women were excluded as a result of their different nutritional requirements and possible changes in dietary habits and energy expenditure unrelated to the intervention programme. If no one eligible was available at the first visit, interviewers visited the household up to seven times, after which the household was marked as unavailable. Study participants were familiarised with the purpose of the study and the instruments, and, upon agreeing to participate, a signed consent form (available in English and the local languages) was obtained.

Data were collected by Community Health Representatives, other community members (including a local dietitian) and US and Canadian university students. All field workers were trained by the Principal Investigator in administration of the questionnaires according to the manual of procedures developed for each. For participants whose primary language was not English, either an interviewer fluent in the local language conducted the survey or an interpreter was used. The surveys were available in English only and were not previously translated, so the interviewer/interpreter translated during the interview with prior training by the investigators to ensure standardisation. The field worker primarily interviewed participants in their homes, and the majority of interviews were conducted in English.

Power calculations were conducted on a pilot sample of 87 individuals using a two-sided critical value of 0.05, a critical value for 80% power, and intra-class correlation coefficient value of 0.0001. A sample size of 150 individuals in each territory (50 per community) was computed to explore the minimum detectable difference between 3.7% and 4.1% for kJ from fat, 12.5 – 14.0 grams per 4184 kJ (1000 kcal) for total sugar, 0.28 – 0.32 log grams for total dietary fibre intake, and 0.17 – 0.19 servings for food frequency, depending on drop-out. These minimum detectable differences represent an effect size of 0.34 – 0.38.

[1]Response rates are approximate as a result of incomplete records.

Institutional Review Board approval was obtained from the Committee on Human Studies at the University of Hawaii and the Office of Human Research Ethics at the University of North Carolina at Chapel Hill as well as the Beaufort Delta Health and Social Services Authority Ethics Review Committee. The NU Research Institute and the Aurora Research Institute in the NWT licensed this study. Participants were remunerated for their time with gift cards to the local shops.

Quantitative Food Frequency Questionnaire

A culturally appropriate QFFQ was previously developed specifically for these Inuit and Inuvialuit populations, using an established methodology to assess usual dietary intake in the previous 30 days (Sharma ***et al.***, 2009, 2010a). The NU QFFQ contains 150 food items (12 breads and cereals; 65 meat, fish and poultry; 12 dairy; one nondairy creamer product 13 fruit; 19 vegetables; 14 desserts and snacks; nine beverages; two sugar and sweetener products; three alcoholic drinks), 39 of which were traditional foods. NWT's QFFQ includes 142 food items (nine breads and cereals; 41 meats including traditional meat items; seven soups or stews; 13 fish; nine dairy products; two nondairy creamer products; two sugar and sweetener products; 11 fruit; 11 vegetables; four starchy products; 15 desserts and snacks; nine beverages; three alcoholic drinks; six condiments, stuffing, and gravy), 38 of which were traditional foods.

Participants were asked to report the frequency of consumption over a 30-day period choosing from eight categories, which ranged from 'never' to 'two or more times per day'. This special issue of the ***Journal of Human Nutrition and Dietetics*** focuses only on mean daily frequencies of consumption to determine dietary patterns in NU and the NWT. Analyses of QFFQ portion sizes and nutrients are beyond the scope of the articles.

24-h dietary recalls for Quantitative Food Frequency Questionnaire validation

Additional participants were recruited from Communities B (NU) and E (NWT) to complete three 24-h dietary recalls, which were used to validate the QFFQs and to assess dietary adequacy. In total, 76 Inuit from NU and 63 Inuvialuit from the NWT were recruited. The response rate was 69% in NU and 79% in the NWT. Participants completed one recall per day on three nonconsecutive days. For each participant, two recalls captured weekday consumption, and one captured a weekend day. Using the multiple pass method, the interviewer asked systematic questions to assist the participants in recalling all foods and drinks consumed in the preceding 24-h. Specific types of foods or drinks, brand names, cooking

methods, food sources and time of consumption were recorded. Furthermore, any additions, such as sugar in coffee or butter on bread, were probed for by the interviewer. To help the participant in estimating amounts consumed, a range of three-dimensional food models (NASCO, Fort Atkinson, WI, USA), packages of commonly consumed shop-bought foods, standard units (e.g. slice of bread) and local household utensils (cups, bowls or plates) were used. At the end of the interview, the interviewer asked the participant an additional list of questions to capture easily forgotten items, such as snacks or sweets, and checked the recall data for completeness.

Most of the foods reported in the recalls were weighed by a trained field coordinator using an electronic Aquatronic Baker's Dream Scale (Salter Houseware, Tonbridge, Kent, UK). Foods reported in food models or household utensils were weighed whenever possible, and similar foods were used as substitutions when the food itself could not be obtained. The average of the portion weight was calculated using ten consecutive weightings of the same food item from different sources. Portion weights were obtained for each food model and household utensil. For food items with no portion weight available from the field site, the Canadian Nutrient File (CNF) database (10th edition; Health Canada Nutrient Research Division, 2007) – or the USDA database for commercial food products (USDA SR 20 Search and What's In The Foods You Eat Search Tool, 3.0; USDA, 2007) if the CNF did not contain the item – was used to estimate the weight of food and drink items as accurately as possible. Seventeen recipes for nine different traditional dishes were collected locally using a standard protocol; each ingredient was recorded and weighed before cooking, and the final weight of the dish was recorded to measure any moisture loss during cooking. This was only performed in NU; thus, recipes may have differed in NU and the NWT.

Adult Impact Questionnaire

The purpose of the AIQ was to collect data on the socioeconomic and psychosocial factors that may predict dietary behaviours. It was developed from similar instruments used in previous intervention trials (Gittelsohn *et al.*, 2006; Ho *et al.*, 2008) and on the basis of the participatory community workshops held during the formative phase of HFN (Gittelsohn *et al.*, 2010). The instrument was finalised after pilot-testing with local community members. Validity was primarily assessed using face validity with community stakeholders (i.e. Community Health Representatives and interviewers) and investigators, and reliability was assessed using the entire sample to calculate Cronbach's α for the socioeconomic, psychosocial and behavioural scales (described below; Bland & Altman, 1997). The AIQ collected information on demographics and indicators of SES, including levels of education, the number of employed residents in the participant's household, and the number of residents on income support in the participant's household. In addition, a Material Style of Life (MSL) scale was an additive scale developed as a proxy for SES (Gittelsohn *et al.*, 2006). The scale assessed whether anyone in the participant's household owned a series of 20 items of varying costs in working condition (e.g. fishing net, boat, television, snowmobile). For each item owned, participants were given a score of one. Scores for NU and the NWT were in the range 0 – 19, with a mean (SD) of 10.2 (4.5) and 10.7 (4.6), respectively, and had a high internal reliability, which was determined using Cronbach's α ($\alpha = 0.83$ and $\alpha = 0.84$, respectively; Bland & Altman, 1997). For further analysis, the MSL scale was categorised into tertiles for values £7 (low), 8 – 12 (intermediate) and >12 (high), and the educational construct was categorised into tertiles for a low [none to some junior high school (HS) completed], intermediate (junior HS completed to HS completed), and high (some college to university completed) level of education. The household's number of employed residents and number of residents on income support were dichotomised into categories of 0 versus ‡1 resident.

The AIQ also asked questions to determine the participants' level of engagement in the dietary behaviours of interest in the 30-day recall period, which were the frequency of acquiring healthy foods and unhealthy foods (identified by the workshop participants as 'problem' foods and their accessible healthier alternatives) and the healthiness of commonly used food preparation methods. On the basis of the Theory of Planned Behaviour and the Social Cognitive Theory, the instrument also collected information to assess the psychosocial constructs that may determine dietary behaviours, which are the participants' level of knowledge about healthy foods and dietary practices, confidence in their own ability to successfully perform healthy dietary behaviours (i.e. self-efficacy) and intentions to perform those healthy dietary behaviours in the future. Appendix S1 describes the MSL, psychosocial and behavioural scales in greater detail; Appendix S2 contains sample questions for the knowledge, self-efficacy and intention questions.

International Physical Activity Questionnaire

Physical activity was assessed using the short-form of the IPAQ including questions on height and weight (Craig *et al.*, 2003). Participants reported the time they had spent being physically active in the previous seven days, including activities carried out at work and as a part of house work, as well as outside activities, such as for

transportation, recreation, exercise or sport. Questions included time spent in vigorous physical activity, moderate intensity physical activity, time spent walking and time spent sitting. For each category, participants were asked how many days during the previous week they engaged in an activity level, as well as how much time was spent at each level on average per day. To make it more culturally appropriate, the IPAQ was modified to include relevant examples such as hunting and fishing.

Heights and weights were measured in duplicate and recorded on an additional anthropometry form. Heights were measured to the nearest centimetre using a stadiometre, and weights were measured to the nearest one-tenth of a pound using a digital scale. Before being measured, participants were asked to remove shoes and heavy outer clothing (such as jackets). Weight was adjusted for clothing: two pounds (1 kg) for light clothing, 3.5 pounds (1.5 kg) for medium-weight clothing and five pounds (2 kg) for heavy clothing. If the participant declined to be measured, self-reported measurements were recorded. Only 2% of participants in NU and 27% in the NWT refused to have their height measured and self-reported the values instead, whilst 2% of participants in NU and 17% in the NWT self-reported their weight.

The subsequent papers presented in this special issue of the *Journal of Human Nutrition and Dietetics* present baseline data that emerged in the six Canadian Arctic communities: (i) Impact of the changing food environment on the dietary practices of an Inuit population in Arctic Canada (Mead *et al.*, 2010a); (ii) Dietary adequacy of Inuit in the Canadian Arctic (Hopping *et al.*, 2010a); (iii) Assessment of dietary adequacy in a remote Inuvialuit population (Erber *et al.*, 2010a); (iv) Socioeconomic indicators and frequency of traditional food, junk food and fruit and vegetable consumption amongst Inuit adults in the Canadian Arctic (Hopping *et al.*, 2010b); (v) Food patterns and socioeconomic indicators of food consumption amongst Inuvialuit in the Canadian Arctic (Erber *et al.*, 2010b); (vi) Validation of a quantitative food frequency questionnaire for Inuit population in Nunavut (NU), Canada (Pakseresht & Sharma, 2010a); (vii) Validation of a culturally appropriate quantitative food frequency questionnaire for Inuvialuit population in the Northwest Territories (NWT), Canada (Pakseresht & Sharma, 2010b); (viii) Healthy food intentions and higher socioeconomic status are associated with healthier food choices in an Inuit population (Mead *et al.*, 2010b); (ix) Important psychosocial factors to target in nutrition interventions to improve diet in Inuvialuit communities in the Canadian Arctic (Mead *et al.*, 2010c); (x) High levels of physical activity and obesity co-exist amongst Inuit adults in Arctic Canada (Hopping *et al.*, 2010c); (xi) Inuvialuit adults in the Canadian Arctic have a high body mass index and self-reported physical activity (Hopping *et al.*, 2010d); (xii) Prevalence and risk factors for self-reported chronic disease amongst Inuvialuit populations (Erber *et al.*, 2010c); and (xiii) Awareness of chronic disease diagnosis amongst family members is associated with healthy dietary knowledge but not behaviour amongst Inuit in Arctic Canada (Pakseresht *et al.*, 2010c). The final paper provides an overview of the community-based, multi-institutional Healthy Foods North nutrition and physical activity programme that was developed to address the nutritional and health needs identified in this special issue of the *Journal of Human Nutrition and Dietetics* (Sharma *et al.*, 2010b).

Conflict of interests, sources of funding and authorship

The author declares she has no conflicts of interest. The project was supported by American Diabetes Association Clinical Research award 1-08-CR-57, Government of NU Department of Health and Social Services, Government of Northwest Territories Department of Health and Social Services, Health Canada, Public Health Agency of Canada, and the NU and Northwest Territories Public Health Association. SS developed the conception and design of the study and drafted the manuscript.

References

Adler, A.I., Boyko, E.J., Schraer, C.D. & Murphy, N.J. (1996) The negative association between traditional physical activities and the prevalence of glucose intolerance in Alaska Natives. *Diabetic Med.* 13, 555 – 560.

Anctil, M. (2008) *Survey Highlights. Nunavik Inuit Health Survey 2004, Qanuippitaa? How are we?* Quebec: Institut National de santé publique du Québec (INSPQ) & Nunavik Regional Board of Health and Social Services (NRBHSS). Available at http://www.inspq.qc.ca/pdf/publications/774_ESISurveyHighlights.pdf (accessed on 23 October 2009).

Arctic Climate Impact Assessment (2004) Impacts of a warming climate: Arctic climate impact assessment. Available at http://amap.no/acia/ (accessed on 14 October 2009).

Batal, M., Gray-Donald, K., Kuhnlein, H.V. & Receveur, O. (2005) Estimation of traditional food intake in indigenous communities in Denendeh and the Yukon. *Int. J. Circumpolar Health* 64, 46 – 54.

Berry, J.W. (2008) Globalisation and acculturation. *Int. J. Intercult. Relat.* 32, 328 – 336.

Bersamin, A., Luick, B.R., Ruppert, E., Stern, J.S. & Zidenberg-Cherr, S. (2006) Diet quality among Yup'ik Eskimos living in rural communities is low: the Center for Alaska Native Health Research Pilot Study. *J. Am. Diet. Assoc.* 106, 1055 – 1063.

Bjerregaard, P., Jorgensen, M.E., Andersen, S., Mulvad, G., Borch-Johnsen, K. & Greenland Population Study (2002) Decreasing overweight and central fat patterning with Westernization among the Inuit in Greenland and Inuit migrants. *Int. J. Obes.* 26, 1503 – 1510.

Bjerregaard, P., Young, T.K. & Hegele, R.A. (2003) Low incidence of cardiovascular disease among the Inuit – what is the evidence? *Atherosclerosis* 166, 351 – 357.

Bjerregaard, P., Young, T.K., Dewailly, E. & Ebbesson, S.O. (2004) Indigenous health in the Arctic: an overview of the circumpolar Inuit population. *Scand. J. Public Health* 32, 390 – 395.

Blanchet, C., Dewailly, E., Ayotte, P., Bruneau, S., Receveur, O. & Holub, B.J. (2000) Contribution of selected traditional and market foods to the diet of Nunavik Inuit women. *Can. J. Diet. Pract. Res.* 61, 50 – 59.

Bland, J.M. & Altman, D.G. (1997) Statistics notes: Cronbach's alpha. *Br. Med. J.* 314, 572.

Boult, D. (2006) *The Inuit Way: a Guide to Inuit Culture*. Ottawa: Pauktuutit Inuit Women of Canada. Available at http://www.pauktuutit.ca/pdf/publications/pauktuutit/InuitWay_e.pdf (accessed on 5 October 2009).

Canadian Museum of Civilization Corporation (2003) Fact Sheet. Across Time and Tundra: the Inuvialuit of the Canadian Arctic. Available at http://www.civilization.ca/media/docs/fsinuv02e.html (accessed on 7 September 2008).

Chan, H.M., Fediuk, K., Hamilton, S., Rostas, L., Caughey, A., Kuhnlein, H., Egeland, G. & Loring, E. (2006) Food security in Nunavut, Canada: barriers and recommendations. *Int. J. Circumpolar Health* 65, 416 – 431.

Chiu, B.C.-H., Ji, B.-T., Dai, Q., Gridley, G., McLaughlin, J.K., Gao, Y.-T., Fraumeni, J.F. & Chow, W.-H. (2003) Dietary factors and risk of colon cancer in Shanghai, China. *Cancer Epidem. Biomarkers Prev.* 12, 201 – 208.

Circumpolar Inuit Cancer Review Working Group, Kelly, J., Lanier, A., Santos, M., Healey, S., Louchini, R., Friborg, J., Young, K. & Ng, C. (2008) Cancer among the circumpolar Inuit, 1989 – 2003. II. Patterns and trends. *Int. J. Circumpolar Health* 67, 408 – 420.

Collings, P., Wenzel, G. & Condon, R. (1998) Modern food sharing networks and community integration in the central Canadian Arctic. *Arctic* 51, 301 – 314.

Condon, R., Collings, P. & Wenzel, G. (1995) The best part of life: subsistence hunting, ethnicity, and economic adaptation among young adult Inuit males. *Arctic Med. Res.* 48, 31 – 46.

Craig, C.L., Marshall, A.L., Sjöström, M., Bauman, A.E., Booth, M.L., Ainsworth, B.E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J.F. & Oja, P. (2003) International physical activity questionnaire: 12-country reliability and validity. *Med. Sci. Sports Exerc.* 35, 1381 – 1395.

Craver, A. (2004) Domestic function and Inupiaq households. *Int. J. Circumpolar Health* 63(Suppl. 1), S49 – S52.

Curtis, T., Kvernmo, S. & Bjerregaard, P. (2005) Changing living conditions, life style and health. *Int. J. Circumpolar Health* 64, 442 – 450.

Damman, S., Eide, W.B. & Kuhnlein, H.V. (2008) Indigenous peoples' nutrition transition in a right to food perspective. *Food Policy* 33, 135 – 155.

Draper, H.H. (1977) The Aboriginal Eskimo diet in modern perspective. *Am. Anthropol.* 79, 309 – 316.

Duerden, F. (2004) Translating climate change impacts at the community level. *Arctic* 57, 204 – 212.

Ebbesson, S.O., Adler, A.I., Risica, P.M., Ebbesson, L.O., Yeh, J.L., Go, O.T., Doolittle, W., Ehlert, G., Swenson, M. & Robbins, D.C. (2005) Cardiovascular disease and risk factors in three Alaskan Eskimo populations: the Alaska-Siberia project. *Int. J. Circumpolar Health* 64, 365 – 386.

Erber, E., Hopping, B.N., Grandinetti, A., Park, S.Y., Kolonel, L.N. & Maskarinec, G. (2009) Dietary patterns and risk for diabetes: the Multiethnic Cohort. *Diabetes Care* 33, 532 – 538.

Erber, E., Hopping, B.N., Beck, L., Sheehy, T., De Roose, E. & Sharma, S. (2010a) Assessment of dietary adequacy in a remote Inuvialuit population. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 35 – 42.

Erber, E., Beck, L., Hopping, B.N., Sheehy, T., De Roose, E. & Sharma, S. (2010b) Food patterns and socioeconomic indicators of food consumption amongst Inuvialuit in the Canadian Arctic. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 59 – 66.

Erber, E., Beck, L., De Roose, E. & Sharma, S. (2010c) Prevalence and risk factors for self-reported chronic disease amongst Inuvialuit populations. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 43 – 50.

Ford, J. & Berrang-Ford, L. (2009) Food security in Igloolik, Nunavut: an exploratory study. *Polar Rec.* 45, 225 – 236.

Furgal, C. & Seguin, J. (2006) Climate change, health, and vulnerability in Canadian northern Aboriginal communities. *Environ. Health Perspect.* 114, 1964 – 1970.

Gilbert, T.J., Percy, C.A., Sugarman, J.R., Benson, L. & Percy, C. (1992) Obesity among Navajo adolescents. Relationship to dietary intake and blood pressure. *AMA Am. J. Dis. Child.* 146, 289 – 295.

Gittelsohn, J., Anliker, J.A., Sharma, S., Vastine, A.E., Caballero, B. & Ethelbah, B. (2006) Psychosocial determinants of food purchasing and preparation in American Indian households. *J. Nutr. Educ. Behav.* 38, 163 – 168.

Gittelsohn, J., Roache, C., Kratzmann, M., Reid, R., Ogina, J. & Sharma, S. (2010) Participatory research for chronic disease prevention in Inuit communities. *Am. J. Health Behav.* 34, 453 – 464.

Graburn, N.H.H. & Strong, B.S. (1973) *Circumpolar Peoples: An Anthropological Perspective*. Santa Monica, CA: Goodyear Publishing Company, Inc.

Guyot, M., Dickson, C., Paci, C., Furgal, C. & Chan, H.M. (2006) Local observations of climate change and impacts on traditional food security in two northern Aboriginal communities. *Int. J. Circumpolar Health* 65, 403 – 415.

Health Canada Nutrition Research Division (2007) Canadian Nutrient File. Available at http://www.hc-sc.gc.ca/fn-an/nutrition/fiche-nutri-data/cnf-downloads-telechargement-fcen-eng.php (accessed on 02 August 2010).

Ho, L., Gittelsohn, J., Sharma, S., Cao, X., Treuth, M., Rimal, R., Ford, E. & Harris, S. (2008) Food-related behavior, physical activity, and dietary intake in First Nations – a population at high risk for diabetes. *Ethn. Health* 13, 335 – 349.

Hopping, B.N., Mead, E., Erber, E., Sheehy, T., Roache, C. & Sharma, S. (2010a) Dietary adequacy of Inuit in the Canadian Arctic. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 27 – 34.

Hopping, B.N., Erber, E., Mead, E., Sheehy, T., Roache, C. & Sharma, S. (2010b) Socioeconomic indicators and frequency of traditional food, junk food and fruit and vegetable consumption amongst Inuit adults in the Canadian Arctic. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 51 – 58.

Hopping, B.N., Erber, E., Mead, E., Roache, C. & Sharma, S. (2010c) High levels of physical activity and obesity co-exist amongst Inuit adults in Arctic Canada. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 110 – 114.

Hopping, B.N., Erber, E., Beck, L., De Roose, E. & Sharma, S. (2010d) Inuvialuit adults in the Canadian Arctic have a high body mass index and self-reported physical activity. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 115 – 119.

Indian and Northern Affairs Canada (2000) The North. Available at http://www.ainc-inac.gc.ca/ai/mr/is/info102-eng.pdf (accessed on 29 October 2009).

IPAQ Research Committee (2005). Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ) – short and long forms. Available at http://www.ipaq.ki.se/scoring.htm (accessed on 25 July 2009).

Kinloch, D., Kuhnlein, H. & Muir, D.C. (1992) Inuit foods and diet: a preliminary assessment of benefits and risks. *Sci. Total Environ.* 122, 247 – 278.

Kirmayer, L., Simpson, C. & Cargo, M. (2003) Healing traditions: culture, community and mental health promotion with Canadian Aboriginal peoples. *Australas. Psychiatry* 11, S15 – S23.

Kuhnlein, H.V., Soueida, R. & Receveur, O. (1996) Dietary nutrient profiles of Canadian Baffin Island Inuit differ by food source, season, and age. *J. Am. Diet. Assoc.* 96, 155 – 162.

Kuhnlein, H.V., Receveur, O. & Chan, H.M. (2001) Traditional food systems research with Canadian Indigenous Peoples. *Int. J. Circumpolar Health* 60, 112 – 122.

Kuhnlein, H.V., Receveur, O., Soueida, R. & Egeland, G.M. (2004) Arctic indigenous peoples experience the nutrition transition with changing dietary patterns and obesity. *J. Nutr.* 134, 1447 – 1453.

Lutsey, P.L., Steffen, L.M. & Stevens, J. (2008) Dietary intake and the development of the metabolic syndrome: the Atherosclerosis Risk in Communities study. *Circulation* 117, 754 – 761.

Mason, R. (2004) Overview of the social transition in the North project. *Int. J. Circumpolar Health* 63(Suppl. 1), S5 – S12.

Mead, E., Gittelsohn, J., Kratzmann, M., Roache, C. & Sharma, S. (2010a) Impact of the changing food environment on the dietary practices of an Inuit population in Arctic Canada. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 18 – 26.

Mead, E., Gittelsohn, J., Roache, C. & Sharma, S. (2010b) Healthy food intentions and higher socioeconomic status are associated with healthier food choices in an Inuit population. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 83 – 91.

Mead, E., Gittelsohn, J., De Roose, E. & Sharma, S. (2010c) Important psychosocial factors to target in nutrition interventions to improve diet in Inuvialuit communities in the Canadian Arctic. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 92 – 99.

Moffatt, M.E.K. (1989) Nutritional problems of native Canadian mothers and children. *Can. Fam. Physician* 35, 377 – 382.

Moffatt, M.E.K. (1991) Nutritional deficiencies and native infants. *Can. J. Pediatr.* 20, 5.

Northwest Territories Health and Social Services. (2005) The NWT health status report 2005. Available at http://www.hlthss.gov.nt.ca/pdf/reports/health_care_system/2005/english/nwt_health_status_report_2005.pdf (accessed on 02 April 2009).

Nunavut Bureau of Statistics (2007) Nunavut quick facts. Available at http://www.gov.nu.ca/eia/stats/ (accessed on 27 October 2009).

Ohinmaa, A., Jacobs, P., Simpson, S. & Johnson, J. (2004) The projection of prevalence and cost of diabetes in Canada: 2000-2016. *Can. J. Diab.* 28, 1 – 8.

O' Neil, J.D., Elias, B. & Yassi, A. (1997) Poisoned food: Cultural resistance to the contaminants discourse in Nunavik. *Arctic Anthropol.* 34, 29 – 40.

Pakseresht, M. & Sharma, S. (2010a) Validation of a quantitative food frequency questionnaire for Inuit population in Nunavut, Canada. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 67 – 74.

Pakseresht, M. & Sharma, S. (2010b) Validation of a culturally appropriate quantitative food frequency questionnaire for Inuvialuit population in the Northwest Territories, Canada. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 75 – 82.

Pakseresht, M., Mead, E., Gittelsohn, J., Roache, C. & Sharma, S. (2010c) Awareness of chronic disease diagnosis amongst family members is associated with healthy dietary knowledge but not behaviour amongst Inuit in Arctic Canada. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 100 – 109.

Patra, J., Popova, S., Rehm, J., Bondy, S., Flint, R. & Giesbrecht, N. (2007) *Economic Cost of Chronic Disease in Canada: 1995–2003*. The Ontario Chronic Disease Prevention Alliance and the Ontario Public Health Association. Available at http://www.ocdpa.on.ca/rpt_EconomicCost.gk (accessed on 10 October 2009).

Popkin, B.M. (1993) Nutritional patterns and transition. *Popul. Dev. Rev.* 19, 138 – 157.

Popkin, B.M. (1998) The nutrition transition and its health implications in lower-income countries. *Public Health Nutr.* 1, 5 – 21.

Popkin, B.M. (2006) Global nutrition dynamics: the world is shifting rapidly toward a diet linked with noncommunicable diseases. *Am. J. Clin. Nutr.* 84, 289 – 298.

Popkin, B.M. & Gordon-Larsen, P. (2004) The nutrition transition: worldwide obesity dynamics and their determinants. *Int. J. Obes.* 28, S2 – S9.

Power, E.M. (2008) Conceptualizing food security of Aboriginal people in Canada. *Can. J. Public Health* 99, 95 – 97.

Receveur, O., Boulay, M. & Kuhnlein, H.V. (1997) Decreasing traditional food use affects diet quality for adult Dene/Metis in 16 communities of the Canadian Northwest Territories. *J. Nutr.* 127, 2179 – 2186.

Report of the Joint WHO/FAO Expert Consultation (2003) Diet, nutrition, and the prevention of chronic diseases. *World Health Organ. Tech. Rep. Ser.* 916, 61 – 104.

Risica, P.M., Schraer, C.D., Ebbesson, S.O., Nobmann, E.D. & Caballero, B.H. (2000a) Overweight and obesity among Alaskan Eskimos of the Bering Straits Region: the Alaska Siberia project. *Int. J. Obes. Relat. Metab. Disord.* 24, 939 – 944.

Risica, P.M., Ebbesson, S.O., Schraer, C.D., Nobmann, E.D. & Caballero, B.H. (2000b) Body fat distribution in Alaskan Eskimos of the Bering Straits region: the Alaskan Siberia Project. *Int. J. Obes. Relat. Metab. Disord.* 24, 171 – 179.

Schumacher, C., Davidson, M. & Ehrsam, G. (2003) Cardiovascular disease among Alaska Natives: a review of the literature. *Int. J. Circumpolar Health* 62, 343 – 362.

Sharma, S., De Roose, E., Cao, X., Pokiak, A., Gittelsohn, J. & Corriveau, A. (2009) Dietary intake in a population undergoing a rapid transition in diet and lifestyle: the Inuvialuit in the Northwest Territories of Arctic Canada. *Can. J. Public Health* 100, 442 – 448.

Sharma, S., Cao, X., Roache, C., Buchan, A., Reid, R. & Gittelsohn, J. (2010a) Assessing dietary intake in a population undergoing a rapid transition in diet and lifestyle: the Arctic Inuit in Nunavut, Canada. *Br. J. Nutr.* 103, 749 – 759.

Sharma, S., Gittelsohn, J., Rosol, R. & Beck, L. (2010b) Addressing the public health burden caused by the nutrition transition through the Healthy Foods North nutrition and lifestyle intervention programme. *J. Hum. Nutr. Diet.* 23(Suppl. 1), 120 – 127.

Statistics Canada (2005a) Ten leading causes of death, by sex and geography, 2005 — Nunavut (table). Leading Causes of Death in Canada, 2005. Statistics Canada Catalogue no. 84-215. Ottawa. Last updated March 31, 2009. Available at http://www.statcan.gc.ca/pub/84-215-x/2009000/tbl-eng.pdf - XWE (accessed on 21 October 2009).

Statistics Canada (2005b) Ten leading causes of death, by sex and geography, 2005 – Northwest Territories (table). Leading Causes of Death in Canada, 2005. Statistics Canada Catalogue no. 84-215. Ottawa. Last updated March 31, 2009. Available at http://www.statcan.gc.ca/pub/84-215-x/2009000/tbl-eng.htm (accessed on 21 October 2009).

Statistics Canada (2007a). Aboriginal Children' s Survey 2006: Inuit Children, 89-634-x 2006, no. 4. Available at http://www.statcan.gc.ca/pub/89-634-x/2008004/figure/6500054-eng.htm (accessed on 10 March 2010).

Statistics Canada (2007b) Northwest Territories and Nunavut (table), 2006 Community Profiles. 2006 Census. Available at http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-591/details/page.cfm?Lang=E&Geo1=PR&Code1=61&Geo2=PR&Code2=62&Data=Count&SearchText=Northwest%20Territories&SearchType=Begins&SearchPR=01&B1=All&Custom= (accessed on 25 February 2010).

Statistics Canada (2007c) Yukon Territory (table), 2006 Community Profiles. 2006 Census. Available at http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/details/Page.cfm?Lang=E&Geo1=PR&Code1=60&Geo2=PR&Code2=01&Data=Count&SearchText=Yukon%20Territory&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=&GeoCode=60 (accessed on 25 February 2009).

Statistics Canada (2007d) *Northwest Territories and Nunavut (table). 2006 Aboriginal Population Profile.* 2006 Census. Statistics Canada Catalogue no. 92-594-XWE. Ottawa. Released January 15, 2008. Available at http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-594/index.cfm?-Lang=E (accessed on 25 February 2009).

Statistics Canada (2008) Aboriginal Peoples in Canada in 2006: Inuit. Statistics Canada Catalogue no. 97-558-XIE2006001. Ottawa. Analysis Series, 2006 Census. Released January 15, 2008. Available at http://www12.statcan.ca/census-recensement/2006/as-sa/97-558/p6-eng.cfm (accessed on 25 September 2009).

Tait, H. (2008) Aboriginal peoples survey, 2006: Inuit health and social conditions. Available at http://www.statcan.gc.ca/pub/89-637-x/89-637-x2008001-eng.pdf (accessed on 10 September 2009).

Takano, T. (2005) Connections with the land: land-skills courses in Igloolik, Nunavut. *Ethnography* 64, 463 – 486.

Taylor, C.A., Keim, K.S. & Gilmore, A.C. (2005) Impact of core and secondary foods on nutritional composition of diets in Native-American women. *J. Am. Diet. Assoc.* 105, 413 – 419.

Thouez, J.P., Rannou, A. & Foggin, P. (1989) The other face of development: native population, health status and indicators of malnutrition – the case of the Cree and Inuit in northern Quebec. *Soc. Sci. Med.* 29, 965 – 974.

USDA Agricultural Research Service (2007) USDA National Nutrient Database for Standard Reference. Available at http://www.nal.usda.gov/fnic/foodcomp/Data/SR20/nutrlist/sr20w306.pdf (accessed on 26 February 2010).

Usher, P.J. (2002) Inuvialuit use of the Beaufort Sea and its resources, 1960 – 2000. *Arctic* 55(Suppl 1), 18 – 28.

Vorobieva, I.V. & Sutyrin, S.F. (2005) Globalization and the Arctic. In: *Encyclopedia of the Arctic*, Vol 2. ed. M. Nuttall, pp.754 – 759. New York, NY: Routledge.

Wilkins, R., Uppal, S., Finès, P., Senécal, S., Guimond, E. & Dion, R. (2008) Life expectancy in the Inuit-inhabited areas of Canada, 1989 to 2003. *Health Rep.* 19, 7 – 19.

Young, T.K. (1996) Obesity among Aboriginal peoples in North America: epidemiological patterns, risk factors and metabolic consequences. In *Progress in Obesity Research 7*. eds A. Angel, H. Anderson, C. Bouchard, D. Lau, L. Leiter & R. Mendelson, pp. 337 – 342. London: John Libby.

