

## RESEARCH PAPER

**Socioeconomic indicators and frequency of traditional food, junk food, and fruit and vegetable consumption amongst Inuit adults in the Canadian Arctic**B. N. Hopping,\* E. Erber,\* E. Mead,\* T. Sheehy,<sup>†</sup> C. Roache<sup>‡</sup> & S. Sharma<sup>§</sup>

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Inuit, traditional foods, fruit and vegetables, non-nutrient-dense foods, socioeconomic indicators, traditional foods.

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doi:10.1111/j.1365-277X.2010.01100.x

**Abstract**

**Background:** Increasing consumption of non-nutrient-dense foods (NNDF), decreasing consumption of traditional foods (TF) and low consumption of fruit and vegetables (FV) may contribute to increasing chronic disease rates amongst Inuit. The present study aimed to assess the daily frequency and socioeconomic and demographic factors influencing consumption of TF, FV and NNDF amongst Inuit adults in Nunavut, Canada.

**Methods:** Using a cross-sectional study design and random household sampling in three communities in Nunavut, a food frequency questionnaire developed for the population was used to assess frequency of NNDF, TF and FV consumption amongst Inuit adults. Socioeconomic status (SES) was assessed by education level, ownership of items in working condition, and whether or not people in the household were employed or on income support. Mean frequencies of daily consumption were compared across gender and age groups, and associations with socioeconomic indicators were analysed using logistic regression.

**Results:** Two hundred and eleven participants (36 men, 175 women; mean (standard deviation) ages 42.1 (15.0) and 42.2 (13.2) years, respectively; response rate 69–93%) completed the study. Mean frequencies of consumption for NNDF, TF and FV were 6.3, 1.9 and 1.6 times per day, respectively. On average, participants  $\leq 50$  years consumed NNDF ( $P = 0.003$ ) and FV ( $P = 0.01$ ) more frequently and TF ( $P = 0.01$ ) less frequently than participants  $> 50$  years. Education was positively associated with FV consumption and negatively associated with TF consumption. Households on income support were more likely to consume TF and NNDF.

**Conclusions:** These results support the hypothesis that the nutrition transition taking place amongst Inuit in Nunavut results in elevated consumption of NNDF compared with TF and FV.

**Introduction**

In the Canadian Arctic, changes in climate, acculturation and high costs associated with subsistence activities are contributing to a changing diet and lifestyle amongst Inuit (Kuhnlein *et al.*, 2004; Lambden *et al.*, 2006; Richmond & Ross, 2009). Non-nutrient-dense foods (NNDF) are increasingly selected as alternatives to traditional

foods (TF), whilst fruit and vegetables (FV) are still rarely consumed (Wein, 1995; Kuhnlein *et al.*, 1996; Wein *et al.*, 1996; Bjerregaard *et al.*, 2004; Curtis *et al.*, 2005; Erber *et al.*, 2010). In addition, the relatively low cost of NNDF contributes substantially to the high consumption of these foods in low-income populations, such as Inuit in the Canadian Arctic who have an employment rate of only 55% (Drewnowski & Darmon, 2005; Statistics Canada,

2007). Negative health outcomes (e.g. obesity, heart disease, cancer and diabetes) are often associated with consumption of these food items (Wang *et al.*, 2008; Snell-Bergeon *et al.*, 2009).

For communities in Nunavut, a difficult and lengthy transportation process may inhibit regular access to fresh, nutritious shop-bought foods, such as fresh fruit and vegetables, which have been associated with chronic disease prevention (Van Duyn & Pivonka, 2000; Bazzano *et al.*, 2002; World Health Organization, 2002; Steffen, 2006). By the time that a limited supply of these foods does make it to the communities, the price is high, reducing access for many people (Chan *et al.*, 2006).

Inuit health is further threatened by a decline in traditional food consumption. This dietary change has been linked to an increased prevalence of lung, breast and colon cancers, diabetes, and cardiovascular diseases, which were historically rare in this population (Bjerregaard *et al.*, 2004; Friberg & Melbye, 2008).

Higher consumption of shop-bought foods, a decline in traditional food intake and limited access to fruit and vegetables all increase the likelihood of nutrient deficiencies and chronic disease in this already high-risk population (Bjerregaard *et al.*, 2004; Kuhnlein *et al.*, 2004; Chan *et al.*, 2006). Although diet is strongly correlated with obesity and other chronic diseases, nutrition research in Nunavut is limited; little is known about the socioeconomic and demographic factors influencing Inuit food consumption. The present study aimed to assess the daily frequency of consumption of traditional foods, fruit and vegetables and non-nutrient-dense, processed foods amongst Inuit adults in three communities in Nunavut, Canada. The associations between frequency of food group consumption and socioeconomic and demographic factors were also investigated.

## Materials and methods

### Recruitment and data collection

Recruitment methods and data collection have been described in detail elsewhere (Sharma, 2010a). In brief, three communities in Nunavut, Canada, were sampled for this cross-sectional study between June and October 2008. Study participants were randomly selected using up-to-date community housing maps; residents <19 years and pregnant/lactating women were excluded as a result of their different nutritional requirements. Written informed consent was obtained from all participants. A validated quantitative food frequency questionnaire (FFQ) developed specifically for the study population was used to collect dietary data (Pakseresh & Sharma, 2010; Sharma *et al.*, 2010b).

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, and the Nunavut Research Institute licensed the study.

### Food groupings

Fruit and vegetables were categorised as: total fruit and vegetables, total fruit (orange, apple, banana, mango, grapes, strawberries, kiwi, peaches and nectarines, blueberries, raspberries, blackberries, fresh fruit salad, fruit cocktail in syrup, frozen fruit and dried fruit), and total vegetables (corn on the cob, corn, carrot, fresh vegetables, frozen vegetables, canned vegetables, canned tomatoes and salad in a bowl). Fruit juices, potatoes and salad in a sandwich were excluded from this analysis; juices consumed in Nunavut are mainly high sugar beverages, such as Kool-Aid™ (Kraft Foods Inc., Northfield, IL, USA) or Tang™ (Kraft Foods Inc., Northfield, IL, USA), and potatoes are mostly processed, such as French fries or hash browns. Study interviewers inconsistently interpreted the FFQ line item 'salad in a sandwich', so the data from this variable are not viable.

Individual traditional food items, defined as those obtained through subsistence practices such as hunting and fishing, were grouped into categories for analysis: land foods (defined as those hunted from the land: caribou, polar bear, muskox and the organs of these animals), sea foods [defined as those hunted or fished from the sea: seal, seal liver, muktuk (whale skin and fat) and various kinds of wild local fish] and sky foods (defined as wild birds and their eggs). Wild berries, although an important traditional food source, were not included in this analysis as a result of the inability to differentiate between wild berries and shop-bought varieties on the food frequency questionnaire.

NNDF included: nondairy coffee whitener, hash browns/potato patties/French fries, gravy, salad dressing including mayonnaise and dips, pizza, ice cream, cakes/muffins, pies, cheesecake, chocolate bars, crisps, crackers, sweet biscuits, sweets, popcorn, granola bars, sweetened drinks, carbonated drinks (regular, not diet), butter/margarine, jam/marmalade and sugar/honey.

### Statistical analysis

The mean (SD) frequencies of daily consumption of these food groups were calculated for all participants combined, as well as by gender and age group (≤50 years, >50 years). In accordance with the Dietary Reference Intakes (Institute of Medicine of the National Academies, 2005), age was initially categorised into four age groups (19–30, 31–50,

51–70 and >70 years). However, the groups were collapsed into two categories as a result of the small sample size. Because dietary intake was not normally distributed even after log transformation, the Wilcoxon rank sum test was used to determine significant differences in mean frequency of daily consumption between gender and age groups. The sample sizes were uneven between gender and age groups, but comparisons are presented for completion; although it should be noted that the relatively small samples of men and participants aged >50 years might not be representative.

Associations were determined between the SES indicators of education, Material Style of Life (MSL), whether or not anyone in the household was working and whether or not anyone in the household was receiving income support, and higher frequency of intake across different food groups, including total FV, total fruit, total vegetables, total TF, land foods, sea foods and NNDF. Higher frequency was defined as being equal to or above the median daily intake frequency [interquartile range (IQR)] for each food group: 1.2 (1.5) times per day for total fruit and vegetables, 0.7 (1.0) times per day for total fruit, 0.4 (0.7) times per day for total vegetables, 1.8 (1.8) times per day for total traditional foods, 1.0 (1.2) times per day for land foods, 0.6 (0.9) times per day for sea foods and 6.1 (3.0) times per day for NNDF. Because of the very low consumption of sky foods, this group was excluded from analysis. Odds ratios (OR) and 95% confidence intervals (CI) were calculated using logistic regression. The models were adjusted for age (<50 versus >50 years) and gender (male versus female). Because of their high correlations, the proxies of SES were mutually adjusted for each other. Log-likelihood tests showed that addi-

tional adjustment for smoking or body mass index did not improve the model fit.

Data were analysed using SAS statistical software, version 9.1 (SAS Institute, Inc., Cary, NC, USA). All tests and *P*-values were two-sided and considered statistically significant at  $\alpha \leq 0.05$ .

## Results

In total, 211 Inuit adults (36 men and 175 women) participated in the present study. Participants ranged in age from 19–89 years, with a mean (standard deviation (SD)) age of 42.1 (15.0) years for men and 42.2 (13.2) years for women. The response rate was 69–93%, varying by community. For all participants, total FV consumption, total TF consumption and total NNDF consumption were in the range 0.0–7.1 times per day, 0.0–6.2 times per day and 1.0–13.0 times per day, respectively.

### Fruit and vegetables

For all participants combined, mean frequency of total FV consumption was 1.6 times per day, mean intake of fruit alone was 1.0 time per day and mean frequency of total vegetable consumption was 0.6 times per day. Participants  $\leq 50$  years old reported significantly higher mean daily frequency of total FV (1.7 times per day), total fruit (1.0 times per day) and total vegetable (0.6 times per day) consumption than participants >50 years (1.2,  $P = 0.01$ ; 0.8,  $P = 0.04$ ; 0.4,  $P = 0.01$ , respectively). Fruit and vegetable consumption did not differ significantly by gender.

**Table 1** Daily fruit and vegetable, traditional food and non-nutrient-dense food consumption amongst Inuit adults in Nunavut, Canada

Food group	Total ( <i>n</i> = 211)		Men ( <i>n</i> = 36)		Women ( <i>n</i> = 175)		<i>P</i> -value	$\leq 50$ years ( <i>n</i> = 164)		$> 50$ years ( <i>n</i> = 47)		<i>P</i> -value
	Mean	(SD)	Mean	(SD)	Mean	(SD)		Mean	(SD)	Mean	(SD)	
Fruit and vegetables*	1.55	(1.14)	1.71	(1.08)	1.52	(1.15)	0.18	1.65	(1.15)	1.23	(1.06)	<b>0.01</b> <sup>††</sup>
Fruit <sup>†</sup>	0.96	(0.81)	1.10	(0.76)	0.93	(0.82)	0.10	1.01	(0.81)	0.80	(0.79)	<b>0.04</b> <sup>††</sup>
Vegetables <sup>‡</sup>	0.59	(0.57)	0.61	(0.50)	0.59	(0.59)	0.53	0.64	(0.59)	0.43	(0.46)	<b>0.01</b> <sup>††</sup>
Traditional foods	1.91	(1.30)	1.71	(1.21)	1.95	(1.32)	0.31	1.81	(1.34)	2.25	(1.13)	<b>0.01</b> <sup>††</sup>
Traditional foods hunted from the land <sup>§</sup>	1.10	(0.86)	1.09	(0.85)	1.10	(0.87)	0.95	1.11	(0.89)	1.06	(0.75)	0.93
Traditional foods hunted from the sea <sup>¶</sup>	0.77	(0.69)	0.55	(0.54)	0.81	(0.71)	<b>0.04</b> <sup>††</sup>	0.66	(0.66)	1.14	(0.66)	<b>&lt;0.0001</b> <sup>††</sup>
Traditional foods hunted from the sky <sup>**</sup>	0.04	(0.10)	0.06	(0.11)	0.03	(0.10)	<b>0.04</b> <sup>††</sup>	0.03	(0.10)	0.05	(0.11)	<b>0.04</b> <sup>††</sup>
Non-nutrient-dense foods	6.33	(2.28)	6.74	(2.12)	6.24	(2.30)	0.17	6.57	(2.26)	5.47	(2.14)	<b>0.003</b> <sup>††</sup>

\*Excluding fruit juice, potatoes and stir-fry vegetables in meat dishes.

<sup>†</sup>Excluding fruit juice.

<sup>‡</sup>Excluding potatoes and stir-fry vegetables in meat dishes.

<sup>§</sup>Including caribou, muskox, polar bear and their organs.

<sup>¶</sup>Including seal, muktuk (whale skin and fat) and several types of local fish.

\*\*Including wild birds and their eggs.

<sup>††</sup>Statistically significant at  $\alpha \leq 0.05$ .

### Traditional foods

Combined mean daily frequency of traditional food consumption was 1.9 times per day (Table 1). Land foods were consumed most frequently (1.1 times per day), followed by sea foods (0.8 times per day) and sky foods (0.0 times per day). Women consumed sea foods significantly more frequently (0.8 versus 0.6 times per day;  $P = 0.04$ ), whilst men consumed sky foods more frequently (0.1 versus 0.0 times per day;  $P = 0.04$ ). Participants >50 years consumed total traditional foods significantly more frequently than those ≤50 years ( $P = 0.01$ ); participants >50 years consumed traditional foods 2.3 times per day, whilst those ≤50 years old consumed these foods 1.8 times per day, on average. The older age group consumed significantly more frequently total foods from the sea ( $P < 0.0001$ ) and total foods from the sky ( $P = 0.04$ ).

### Non-nutrient-dense foods

NNDF consumption averaged 6.3 times per day for all participants combined, which was more than three times the average daily intake of fruit and vegetables and traditional foods. Men and women reported similar NNDF consumption (6.7 versus 6.2, respectively). Participants ≤50 years old consumed significantly more NNDF than

older participants (6.6 times per day versus 5.5 times per day,  $P = 0.003$ ; Table 1).

### Socioeconomic status indicators

In the logistic regression models, few socioeconomic status (SES) indicators were significantly associated with high frequency of fruit and vegetable consumption (Table 2). Participants who reported having completed at least some college/trade school consumed vegetables more frequently than those with less than junior high school education, with borderline statistical significance (OR = 2.40; 95% CI = 1.00–5.76). Compared with participants living in households in which no one was employed, participants living with employed residents were twice as likely to consume vegetables significantly more frequently than 0.4 times per day (OR = 2.19; 95% CI = 1.03–4.66). MSL score and proportion of people in the household on income support were not significantly associated with fruit and vegetable consumption.

Compared with participants in the lowest category of education, participants with intermediate and high education levels were 60% less likely to report high consumption of sea foods (OR = 0.41; 95% CI = 0.20–0.82) and land foods (OR = 0.40; 95% CI = 0.17–0.97), respectively (Table 3). In households with at least one employed

**Table 2** Socioeconomic indicators of higher fruit and vegetable consumption amongst Inuit adults in Nunavut, Canada\*

Variable	Category	n <sup>†</sup>	Total fruit and vegetables <sup>‡</sup>	Fruit <sup>§</sup>	Vegetables <sup>¶</sup>
			OR (95% CI)**	OR (95% CI)**	OR (95% CI)**
Education	None – some junior high school	89	1.00	1.00	1.00
	Junior high school completed – high school completed	84	1.04 (0.54–2.01)	1.07 (0.56–2.06)	1.57 (0.81–3.03)
	Some college/trade school – university completed	34	1.62 (0.67–3.90)	0.81 (0.35–1.89)	2.40 (1.00–5.76)
Material style of life scale	≤7	64	1.00	1.00	1.00
	8–12	77	0.99 (0.47–2.12)	1.37 (0.66–2.87)	0.79 (0.37–1.66)
	>12	66	1.30 (0.59–2.86)	1.12 (0.52–2.40)	1.24 (0.57–2.70)
Employed household <sup>††</sup>	No	48	1.00	1.00	1.00
	Yes	158	1.48 (0.70–3.13)	0.99 (0.48–2.06)	<b>2.19 (1.03–4.66)</b> <sup>§§</sup>
Household on income support <sup>‡‡</sup>	No	90	1.00	1.00	1.00
	Yes	116	0.82 (0.44–1.53)	0.85 (0.46–1.57)	0.90 (0.48–1.67)

\*Higher fruit and vegetable consumption was defined as ≥1.2 times per day; higher fruit consumption was defined as ≥0.7 times per day; higher vegetable consumption was defined as ≥0.4 times per day.

<sup>†</sup>Number of participants.

<sup>‡</sup>Excluding fruit juice, potatoes and stir fry vegetables in meat dishes.

<sup>§</sup>Excluding fruit juice.

<sup>¶</sup>Excluding potatoes and stir fry vegetables in meat dishes.

\*\*Odds ratio (OR) and 95% confidence interval (CI) adjusted for age, gender, education, material style of life, percentage of people in household currently working and percentage of people in household currently on income support.

<sup>††</sup>At least one resident in the household is employed versus no residents are employed.

<sup>‡‡</sup>At least one resident in the household is on income support versus no residents are on income support.

<sup>§§</sup>Statistically significant at  $\alpha \leq 0.05$ .

**Table 3** Socioeconomic indicators of higher traditional food consumption frequency amongst Inuit adults in Nunavut, Canada\*

Variable	Category	n <sup>†</sup>	Total traditional foods	Traditional foods hunted from the land <sup>††</sup>	Traditional foods hunted from the sea <sup>‡‡</sup>
			OR (95% CI) <sup>‡</sup>	OR (95% CI) <sup>‡</sup>	OR (95% CI) <sup>‡</sup>
Education	None – some junior high school	89	1.00	1.00	1.00
	Junior high school completed – high school completed	84	0.56 (0.29–1.11)	0.68 (0.35–1.32)	<b>0.41 (0.20–0.82)**</b>
	Some college/trade school – university completed	34	0.46 (0.19–1.12)	<b>0.40 (0.17–0.97)**</b>	0.79 (0.32–1.93)
Material style of life scale	≤7	64	1.00	1.00	1.00
	8 – 12	77	0.74 (0.34–1.59)	0.66 (0.31–1.37)	0.76 (0.33–1.72)
	>12	66	1.16 (0.52–2.58)	1.09 (0.50–2.35)	0.87 (0.37–2.03)
Employed household <sup>§</sup>	No	48	1.00	1.00	1.00
	Yes	158	<b>2.23 (1.03–4.85)**</b>	1.64 (0.78–3.45)	1.76 (0.78–3.99)
Household on income support <sup>¶</sup>	No	90	1.00	1.00	1.00
	Yes	116	<b>2.43 (1.27–4.65)**</b>	<b>1.95 (1.05–3.63)**</b>	<b>2.84 (1.43–5.67)**</b>

\*Higher traditional food consumption was defined as ≥1.8 times per day; higher consumption of total land food was defined as ≥1.0 times per day; higher consumption of total sea food was defined as ≥0.6 times per day.

<sup>†</sup>Number of participants.

<sup>‡</sup>Odds ratio (OR) and 95% confidence interval (CI) adjusted for age, gender, education, material style of life, percentage of people in household currently working and percentage of people in household currently on income support.

<sup>§</sup>At least one resident in the household is employed versus no residents are employed.

<sup>¶</sup>At least one resident in the household is on income support versus no residents are on income support.

\*\*Statistically significant at  $\alpha \leq 0.05$ .

<sup>††</sup>Including caribou, muskox, polar bear and their organs.

<sup>‡‡</sup>Including seal, seal organs, muktuk (whale skin and fat) and several types of fish.

**Table 4** Socioeconomic indicators of higher non-nutrient-dense food consumption amongst Inuit adults in Nunavut, Canada\*

Variable	Category	n <sup>†</sup>	Total non-nutrient-dense foods
			OR (95% CI) <sup>‡</sup>
Education	None – some junior high school	89	1.00
	Junior high school completed – high school completed	84	1.35 (0.70–2.61)
	Some college/trade school – university completed	34	1.79 (0.76–4.20)
Material style of life scale	≤7	64	1.00
	8–12	77	0.99 (0.47–2.06)
	>12	66	1.12 (0.52–2.42)
Employed household <sup>§</sup>	No	48	1.00
	Yes	158	1.93 (0.92–4.04)
Household on income support <sup>¶</sup>	No	90	1.00
	Yes	116	<b>2.00 (1.07–3.73)**</b>

\*Higher consumption of non-nutrient-dense foods was defined as ≥6.1 times per day.

<sup>†</sup>Number of participants.

<sup>‡</sup>Odds ratio (OR) and 95% confidence interval (CI) adjusted for age, gender, education, material style of life, percentage of people in household currently working and percentage of people in household currently on income support.

<sup>§</sup>At least one resident in the household is employed versus no residents are employed.

<sup>¶</sup>At least one resident in the household is on income support versus no residents are on income support.

\*\*Statistically significant at  $\alpha \leq 0.05$ .

resident, participants were more than twice as likely to have higher daily consumption of total traditional foods (OR = 2.23; 95% CI = 1.03–4.85). Compared with households in which no residents received income support,

households on income support were significantly more likely to have high total traditional food intake (OR = 2.43; 95% CI = 1.27–4.65), land food consumption (OR = 1.95; 95% CI = 1.05–3.63) and sea food



consumption (OR = 2.84; 95% CI = 1.43–5.67). MSL score was not significantly associated with any category of traditional food consumption.

Participants in households receiving income support were twice as likely to consume NNDF more than 4.8 times per day compared with residents in households without income support (OR = 2.00; 95% CI = 1.07–3.73). No other SES indicator was significantly associated with NNDF consumption (Table 4).

## Discussion

The present study used a comprehensive food frequency questionnaire developed specifically for Inuit adults in Nunavut, Canada, to assess the frequency of dietary intake in three food group categories, fruit and vegetables, traditional foods and NNDF. The results obtained support the hypothesis that the nutrition transition amongst Inuit in Nunavut is characterised by higher consumption of NNDF and lower consumption of both traditional foods and fruit and vegetables (Sharma *et al.*, 2010b).

Employment and income support were both associated with increased traditional food consumption. Although these results may appear to be contradictory, they are logical in the context of Inuit culture. Employment may increase the financial ability to purchase traditional foods from hunters or through other local networks, and also supports the costs associated with hunting itself; as a result of the introduction of motor vehicles and firearms, which require fuel, ammunition and maintenance, hunting has become a costly endeavour (Lambden *et al.*, 2006). Alternatively, receiving income support implies that there is less time spent working for pay and more time available for hunting and fishing. In communities where hunters must travel great distances to hunt, this could be an important factor in the feasibility of obtaining traditional foods. Education had an inverse relationship with traditional food intake, which may be a result of higher education leading to increased employment and less time spent engaged in traditional activities, such as hunting and fishing. A similar study amongst Inuvialuit in the Northwest Territories also found SES indicators to be predictive of high traditional food and fruit and vegetable intake, although different indicators were associated (Erber *et al.*, 2010).

A previous study reported that shop-bought foods contributed 83.5% to total energy intake amongst Inuit in Nunavik and Greenland (Council *et al.*, 2008). Food consumption patterns amongst Inuit have undergone drastic changes in recent years as a result of climate change, acculturation and participation in the wage economy. Previous studies on the same population in Nunavut, as well as other communities in the Canadian Arctic,

showed that shop-bought foods were the greatest contributors to energy, total fat, carbohydrate and sugar intake (Sharma *et al.*, 2009, 2010b; Hopping *et al.*, 2010). Inuit currently use traditional food systems to a lesser degree, whilst reliance on shop-bought foods is increasing (Myers *et al.*, 2004).

This trend can also be seen when comparing food intake by age. The present study revealed that participants older than 50 years consumed traditional foods more frequently than younger participants, whilst NNDF were consumed more frequently by younger participants. Food pattern differences by age have been seen in similar populations (Kuhnlein *et al.*, 2004), and provide further support for the nutrition transition occurring in the Canadian Arctic.

Increased acculturation within the Arctic, and the subsequent nutrition transition, may be linked to the increasing prevalence of chronic disease risk factors amongst Inuit and other Northern populations (Kuhnlein *et al.*, 2004; Batal *et al.*, 2005; Deering *et al.*, 2009). Traditional foods are rich in iron, several B vitamins, and vitamins A and D, as well as protein and polyunsaturated fatty acids (Kuhnlein & Receveur, 2007; Kuhnlein *et al.*, 2007). Several of these nutrients are currently consumed well below recommended levels in Aboriginal populations throughout the Arctic (Kuhnlein *et al.*, 2007; Sharma *et al.*, 2009; Hopping *et al.*, 2010). A low frequency of fruit and vegetable intake has been reported amongst Inuit and other Aboriginal Canadian populations (Lawn & Harvey, 2004; Blanchet & Rochette, 2008). Infrequent consumption of fruit and vegetables and traditional food sources that provide vitamins A and C, folate and fibre explain the low intake of these nutrients in the North (Sharma *et al.*, 2009, 2010b; Hopping *et al.*, 2010).

One of the primary limitations of the present study was the disproportionate sampling of women and participants aged <50 years. The main food preparers, who tend to be younger women in Inuit culture, were targeted for inclusion in the study as a result of their increased knowledge of food and preparation methods, as well as for their role as gatekeepers of household nutrition.

The present study characterised the frequency of food group consumption amongst Inuit adults in three remote communities of Nunavut, Canada, using a comprehensive food frequency questionnaire developed specifically for this population. Several socioeconomic factors were moderately associated with food intake. Employment and income support were positively correlated with high frequency of vegetable and TF consumption, whilst education was inversely associated with frequent TF consumption. A high frequency of NNDF consumption was also more likely in households receiving income support. Significant differences between age groups demonstrated

greater reliance on TF amongst older participants, whilst younger individuals consumed NNDF three times more frequently. These important results provide a basis for understanding the factors affecting food consumption amongst Inuit in the Arctic. The results may also be used to continue monitoring the nutrition transition amongst Canadian Inuit adults, as well as contributing significantly to government policy decision-making in such areas as income support, economic development and hunter support programmes.

### Conflict of interests, sources of funding, and authorship

The authors declare they have no conflicts of interest. The project was supported by American Diabetes Association Clinical Research award 1-08-CR-57, the Government of Nunavut Department of Health and Social Services, and Health Canada. SS developed the conception and design of the study. CR oversaw all field activities. BNH and EE contributed to data analysis, and EM was responsible for data collection. All authors were responsible for data interpretation. BNH drafted the manuscript, and all authors critically reviewed its content and have approved the final version submitted for publication.

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