Changing dietary patterns and body mass index over time in Canadian Inuit communities

Nelofar Sheikh 1, Grace M. Egeland 1,2, Louise Johnson-Down 1,2, Harriet V. Kuhnlein 1,2

1 Centre for Indigenous Peoples’ Nutrition and Environment (CINE), McGill University, Ste. Anne de Bellevue, Canada
2 School of Dietetics and Human Nutrition, McGill University, Ste. Anne de Bellevue, Canada

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ABSTRACT

Objectives. The International Polar Year (IPY) Inuit Health Survey provided an opportunity to compare dietary and body mass index (BMI) data with data collected a decade earlier for the same communities.

Study design. A dietary survey included 1,929 randomly selected participants aged 15 years or older, selected from 18 Inuit communities in 1998–1999. The IPY survey included 2,595 randomly selected participants aged 18 years or older, selected from 36 Inuit communities in 2007–2008. Data from the same 18 communities included in both surveys were compared for adults 20 years and older.

Methods. Twenty-four-hour dietary recall data were analysed to assess the percentage of energy from traditional and market foods by sex and age groups. Body mass index (BMI) was assessed to establish the prevalence of obesity by sex and age groups in both surveys.

Results. There was a significant decrease (p≤0.05) in energy contribution from traditional food and a significant increase in market food consumption over time. Sugar-sweetened beverages, chips and pasta all increased as percentages of energy. BMI increased overall for women and for each age stratum evaluated (p<0.05).

Conclusion. The nutrition transition continues in the Canadian Arctic with a concurrent increase in BMI.

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Keywords: Inuit Health Survey, traditional food, market food, body mass index, Indigenous people
INTRODUCTION

Traditional foods are defined as those harvested from the local environment. They contribute to dietary intake and are vital to the nutrition, health and food security of Arctic populations (1). However, an increasing amount and variety of market foods have replaced traditional foods due to a variety of local and external pressures on Indigenous peoples (1–4). For Inuit, societal and environmental changes are “affecting all dimensions of life in the Arctic” (5). The pressures contributing to the decreased use of traditional food involves a variety of factors, including changing environment and ecosystem viability of traditional food species; more unpredictable hunting conditions attributed to climate change; and an increased reliance on paid labour and market economies in which wage earners have reduced opportunity for engaging in hunting and harvesting activities (6–7). The resulting dietary transition raises concerns regarding dietary inadequacy and increased incidence of obesity, as well as obesity-related chronic diseases, psychological distress and low cultural morale (3,8–19). The percentage of men’s daily energy derived from market food was noted as double that from traditional food in some Inuit communities (7). As well, age and sex differences in traditional food intake have been reported in other studies (20); these differences contributed to disparities in nutrient intakes by age (2,20–23). Dietary data collected during the IPY Inuit Health Survey provided an opportunity to evaluate dietary transition, in which we assessed several dietary indicators in 2 cross-sectional surveys spanning a decade in 18 Canadian Arctic Inuit communities.

MATERIAL AND METHODS

Dietary data from 2 surveys were compared. Data collection for the first survey was carried out in 1998–1999 by the Centre for Indigenous Peoples’ Nutrition and Environment (CINE) (hereafter noted as the 1999 survey); and the second survey was carried out by CINE in 2007–2008 as part of the International Polar Year (IPY) Inuit Health Survey (hereafter noted as the 2008 survey). Both surveys used similar methodology for 24-hour dietary data collection and similar food composition databases for market foods sold in Canada as well as for traditional foods. The traditional food composition database included nutrient values primarily determined at CINE. In the 1999 survey, 1,929 participants age 15+ were randomly selected from 18 Inuit communities in 5 regions (Inuvialuit Settlement Region; Nunavut’s Kitikmeot, Kivialiq and Qikiqtaaluk [Baffin] Regions; and Labrador). The 2008 survey included 2,595 randomly selected adults 18 years of age or older and was carried out in 33 coastal and 3 non-coastal communities of Inuvialuit Settlement Region, Nunavut Territory and Nunatsiavut Region (N. Labrador). In both surveys, 24-hour dietary recalls were administrated by trained bilingual interviewers (Inuit language and English). Participants were asked to remember in detail the types and quantities of food they had consumed in the previous 24 hours (midnight to midnight prior to the assessment). Recipes were noted and evaluated for contents as needed. To assist in serving size estimation, 3-dimensional graduated food model kits (Santé Québec, Montreal, Canada) were used to better standardize the 24-hour dietary recalls. Body mass index (BMI, in kg/m^2) was used as
a health indicator (24). In the 1999 survey, self-reported as well as actual measures of height and weight (height in cm and weight with a precision of 100g) were taken. There were no significant differences between the 2 data sets or the resulting BMIs (21). In the 2008 survey, height was measured in centimetres and weight was recorded using a bioelectrical impedance analysis scale (Tanita TBF-300GS with goal setter, Tanita Corporation of America, Inc., Arlington Heights, Illinois). The BMI reading was noted from the Tanita scale printout.

**Survey techniques**
For the 1999 survey, an interview technique was developed in consultation with the Inuit Tapiriit Kanatami (ITK) (formerly the Inuit Tapirisat of Canada [ITC]) and confirmed with the community representatives at initial regional workshops. For the 2008 survey, interview methodology was developed in consultation with regional steering committee members. Both surveys were approved by the McGill University Human Ethics Review Committee and adhered to CINE participatory guidelines (25). Written consent was obtained from the study participants using bilingual forms.

**Statistical analysis**
All analyses were conducted using STATA 11.1 (StataCorp, 4905 Lakeway 103 Drive, College Station, Texas 77845, USA). In the 1999 survey, a total of 1,476 people from 18 communities responded to the 24-hour recall, and 896 of these reported eating traditional foods. Similarly, in the 2008 survey, 955 respondents completed the 24-hour dietary recall and 514 of these reported consuming traditional food. Hence, the majority of statistical analyses were based on the sub-sample of subjects reporting consumption of traditional and market food.

Descriptive recall data were evaluated using Student’s t-test to assess differences in the mean intakes of both traditional and market food between the 2 surveys. BMI data were used to assess the changes by sex and age groups in both surveys. A p-value was considered to be statistically significant at p≤0.05. The 24-hour recall data from both surveys were used to calculate the percentage of energy intake from all traditional and market food and from the top 10 traditional and market foods in decreasing order of consumption by sex and age group. Mean total energy intake was calculated for each participant.

**RESULTS**
In the 1999 survey, 1,476 (76.52%) responded to 24-hour recall; of these, 795 (56.3%) were men and 681 (43.7%) were women. In the 18-community subset of the 36-community IPY Inuit Health Survey, 955 (76.52%) adults aged over 19 responded to the 24-hour recall questionnaire; of these, 372 (37.6%) were men and 599 (62.8%) were women. The comparison of mean age was not possible because the earlier survey reported age-grouping instead of each participant’s individual age.

**24-hour recall data comparison**
A marked decline occurred in the percentage of energy taken from traditional food. The overall percentage of energy from traditional food for all respondents (per capita) in the past 24 hours in the 2008 survey was 16.1% versus 23.4% in 1999 survey (p≤0.05). Similarly, in analyses restricted to those who reported consuming traditional food in the 24-hour recall, the 2008 survey showed a significant drop in the percentage of energy from
traditional food (from 38.4% in 1999 to 30.6%). Figure 1 shows the percentage of energy gained from traditional food by the sex and age group of those who did consume it. Consistently, older adults consumed more energy from traditional food (kcal/day) than did younger adults, and this was seen for both genders (data not shown) (p≤0.05). However, the consumption of traditional food as percentage of total dietary energy significantly declined for all women, (p≤0.05) but not for men, particularly not for men >40 yrs (data not shown). Further, women consumed significantly less energy from traditional food than men did in 2008.

Interestingly, dietary transition has affected certain subgroups of the population more than others. The current comparison of the percentages of energy taken from traditional food show that they have had a more rapid decline (9.4%) among older age groups than younger age groups (8%). Furthermore, the percentage of energy taken from traditional food by women dropped by 11.3%, while for men it dropped only 2.9%.

Figure 2 presents data from those reporting consumption of particular traditional foods in the 24-hour recalls. Data are given for the traditional foods that are most often reported. Between the 2 surveys, beluga increased in the percentage of total energy consumed that it provided, as well as in the percentage of individuals consuming it (from 3.2% up to 8.6%). However, beluga proved to be the exception; the percentages of energy taken from ringed seal, narwhal and caribou declined significantly, with non-significant decreases also noted for other species. Arctic char and caribou were found to be consumed by the greatest percentage of individuals completing the 24-hour recalls, although the 2008 survey reported more individuals consuming Arctic char than in 1999, and less individuals consuming caribou than in 1999.

Comparison of 24-hour recall data indicated
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Figure 2. Percentage of energy contributed from top traditional foods among consumers from 24-hour recalls in the 1999 and 2008 surveys.

Figure 3. Top energy contributors from selected market foods from 24-hour recalls in the 1999 and 2008 surveys.
increased energy contributions from selected market foods as shown in Figure 3. The percentage of energy intake from sweetened beverages (including carbonated, powdered, punches and iced tea) and from pasta showed significant increases (p≤0.05) from 1999 to 2008. On the contrary, the percentage of energy from bannock and potatoes significantly declined among consumers of these foods between the 2 surveys (p≤0.05). Increases in sweets, granulated sugar and chips were also noted but were not significant. Simultaneously, 62% of respondents (594 of 955 respondents) reported consuming sugar-sweetened beverages in 2008 as compared to 55% in 1999. While the percentage of energy taken from bannock was higher than that from sugar-sweetened beverages, the percentage of respondents consuming bannock declined from 23.8% to 16.75% between 1999 and 2008. Data from both surveys demonstrated that the older age group, regardless of sex, consumed less market food then their younger counterparts. This is evidenced in Figure 1, since market food makes up all the energy that is not gained from traditional food.

**Body mass index**

Body mass index increased significantly from 1999 to 2008 for all ages and sexes (p≤0.05). The 2008 survey data showed a pronounced increase in BMI in the older age groups than in the younger groups, and more so in women than in men (p≤0.05). Overall, men’s BMI did not increase during the time interval (Fig. 4).

![Figure 4](image)
DISCUSSION

The comprehensive surveys carried out in 1998–1999 and 2007–2008 made it possible to compare the intake of traditional and market food in 18 Inuit communities. The purpose of this comparative study was to assess changes in the consumption of traditional and market food in the intervening 10 years. Not surprisingly, the comparison of food intake data from the 2 surveys (1999 compared to 2008) indicated that dietary transitions are ongoing – which is consistent with previous studies on dietary changes of Indigenous people around the world – with a steady decline in the consumption of traditional food (19,26–28). In several surveys, lower consumption of traditional food was observed among younger adults as compared to older adults (2,4,29–32).

A series of relationships was observed between patterns of dietary intake, age group, sex and body mass index level. In summary, our findings are consistent with those reported in other circumpolar studies where adults consumed market food high in fat and had simultaneously higher BMI than those consuming more traditional food and less market food (33). Decline in the percentage of energy gained from traditional food was distinct in women as compared to men.

It is beyond the scope of this comparative study to provide an in-depth discussion on the prevalence of chronic health conditions associated with dietary transitions. However, in another analysis of the full 36 communities participating in the International Polar Year Inuit Health Survey, both nutrition transition and food insecurity were noted to relate to poorer dietary quality, which would theoretically lead to increased risk of nutritional health problems, including diet-sensitive chronic diseases (34). Furthermore, we noted that the prevalence of type 2 diabetes mellitus among Canadian Inuit is now comparable to that of the general Canadian population (35). The results of our current 10-year comparative analyses suggest that women experienced a nearly 2-unit increase (kg/m$^2$) in body mass index over time, whereas no difference was observed in men.

There may be a limitation in comparing the BMI results from the 2 surveys reported here. While there were no differences in the reported versus measured heights, weights and BMI readings in the 1999 survey, comparing these results to the Tanita measures from the 2008 survey may exaggerate the precise differences in BMI that may exist between the 2 surveys (36–37).

A number of observations surfaced from a comparison of the percentage of energy taken from traditional and market food. First, that some traditional foods such as caribou and arctic char were still popular among Inuit. (It should be noted here that there are several species differences among the regions and ecosystems inhabited by Canadian Inuit. Narwhal is specific to the Baffin region; salmon is specific to Labrador; whitefish is primarily consumed in the Inuvialuit and Kitikmeot regions; and arctic char and caribou are universally present in all Canadian Inuit ecosystems.) A second observation was that the percentage of energy contributed by traditional food was significantly less among younger age groups than older age groups, regardless of sex. Third, it was observed that sugar-sweetened drinks, sweets, granulated sugar, chips and pasta all gained in popularity.
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This pattern of dietary transformation away from traditional food raises concerns regarding dietary quality and calls for nutrition intervention programs for all age groups. We strongly encourage the implementation of programs that stress improvements in the acquisition and consumption of traditional food and better-quality market food to protect the health of Inuit in the Canadian Arctic.

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Harriet V. Kuhnlein
Centre for Indigenous Peoples’ Nutrition and Environment (CINE)
McGill University
21, 111 Lakeshore Rd.
Ste. Anne de Bellevue, QC H9X 3V9
CANADA
Email: harriet.kuhnlein@mcgill.ca