FOOD USE OF DENE/MÉTIS AND YUKON CHILDREN

Tomoko Nakano, Karen Fediuk, Norma Kassi, Harriet V. Kuhnlein

Centre for Indigenous Peoples' Nutrition and Environment (CINE), and School of Dietetics and Human Nutrition, Macdonald Campus of McGill University, Quebec, Canada

Received 26 July 2004, Accepted 26 January 2005

ABSTRACT

Objective. To describe food use of Dene/Métis and Yukon children with focus on food sources - traditional food (TF) and market food (MF), season, gender and location.

Study design. Children of 10 – 12 years of age were interviewed for 24-h recalls (n = 222 interviews) in five communities during two seasons in 2000 – 2001.

Methods. Differences in children’s food and nutrient intakes when consuming or not consuming at least one item of TF and across three regions were tested using ANCOVA after rank transformation of raw values. Food use was described and compared by food groups.

Results. MF was the major portion of the diet, with TF contributing only an average 4.3% - 4.7% of energy in the two seasons. Most TF was in the form of land animal meats. More than half of the energy intake from MF came from less nutrient dense food items. In spite of low TF intake, children who consumed TF had significantly (P ≤ 0.05) more protein, iron, zinc, copper, magnesium, phosphorus, potassium, vitamin E, riboflavin and vitamin B6 than those who did not. Children in the more northern communities consumed significantly (P ≤ 0.05) more TF, protein, iron, copper, vitamin B6 and manganese, and less energy, fat, saturated fat and sodium.

Conclusions. Extensive use of less nutrient-dense food by children is a concern, suggesting a need for dietary improvement. Use of more TF should be encouraged, especially for children living in more southern Arctic communities near commercial centers.

(Int J Circumpolar Health 2005;64(2):137-146.)

Key words: Indigenous people, arctic children, food use, traditional food, market food

INTRODUCTION

Canadian Indigenous peoples have experienced health status changes over the past several decades coincident with the emergence of non-communicable chronic diseases, such as cancer, heart disease, diabetes and stroke (1). Lifestyle change and modernization can result in changes in dietary patterns, as increasing proportions of the daily diet originate from...
distant places, usually through commercial channels (2). This implies a shift in the use of local traditional food (TF) items to market food (MF) items in communities of Indigenous people.

Several studies conducted in the Canadian Arctic and Subarctic reported a decreased use of TF among Indigenous peoples. Wein and colleagues (3) examined the TF use of Cree and Chipewyan peoples and Métis in two communities near Wood Buffalo National Park (Northern Alberta) and showed the average household TF use to be 319 occasions per year (an occasion being any meal or snack when TF is consumed), 4.2 occasions per week and 0.5 kg per week/individual. The use of animal foods, such as moose, caribou and whitefish, was often reported, and traditional meat, birds and fish accounted for one-third of the total consumption of animal food. The presence of a hunter, trapper, or fisherman in the household, age and gender were also found to affect the frequency and quantity of TF use (3). TF use by Indigenous women and children in Alberta showed that traditional meat, birds and fish were consumed more in an isolated community, and children took less energy as TF compared to their mothers (4). Morrison and coworkers (5) examined TF use in two Sahtú Dene/Métis communities, and showed adult TF intake to represent 32 - 33% of energy intake, and that TF intake varied by season, gender and age. Fish and berries were predominantly consumed in the summer, land animals in the winter, and birds in the spring. Overall, younger people consumed less TF, and younger women had a lower energy intake from TF than younger men, while older women had higher TF-derived energy intakes than older men (5).

Extensive dietary research conducted on Dene/Métis adults in 16 Northwest Territories communities in the 1990s examined TF use, and found that 133 – 580 g per day of TF were consumed and provided 12 - 33% of energy intake. Northern Dene/Métis communities (north of 60°) tended to derive more energy from TF compared to those in southern communities. For all MF groups, except the meat alternative group, the consumption by younger adults was greater than older adults, while consumption of TF land animals and fish was lower in younger adults (6,7). This pattern was followed by results from 10 Yukon First Nations communities where from 106 - 283 g TF per day were consumed, provided 9 - 18% of energy intake, and was related to higher intakes of protein, iron and zinc, but lower intakes of carbohydrate, sucrose, fat, polyunsaturated fat and saturated fat compared to MF use (8,9). Research with four Yukon First Nations communities documented most TF use in the most northern community (10).

Thus, the extent of children’s use of TF and MF needed to be understood, so that health promotion activities could be initiated, if warranted. The project reported here was initiated and conducted in five Dene/Métis and Yukon First Nations communities in 2000 to 2001, in order to better understand children’s TF and MF food use, nutrition and anthropometry within these cultures. In this report, we describe food use, nutrient intakes with focus on food sources (TF and MF), season, gender and location. An accompanying report describes nutrient adequacy and anthropometry of the same children (11).
METHODS

Data collection and management
Five communities were selected by the Council of Yukon First Nations (CYFN) and the Dene Nation to represent children of the approximately 30 communities of Yukon and Denendeh within the available budget (Figure 1). The project was approved by the McGill University Human Ethics Committee, research agreements with all communities were made, and science licenses obtained from the Territorial authorities. Parents were contacted through schools and signed parental consent was obtained for children to participate in the study in each of two seasons. Children aged 10 to 12 years in Old Crow, Fort McPherson, Tulita, Carcross and Fort Resolution were interviewed for 24-h recalls during two interview seasons: November to January, 2000-2001 (season 1), and August to October, 2001 (season 2). All children/parents in the communities were asked to participate, and there was an 81% response rate; 62 girls and 43 boys participated in season 1, and 66 girls and 51 boys participated in season 2 (the total number of interview events was 222). Most children participated in both seasons, although the lack of identity retention from season 1 prevented knowing exactly which ones participated in both. Repeat recalls were conducted and, overall, 409 recalls were collected. An average of 84 percent of girls and boys (n = 187) provided repeat recalls, of which 66 percent were conducted on consecutive days and 34 percent on non-consecutive days. Thirty-five children gave a single recall. To represent usual intake, repeat recalls from a child in one season were averaged.

Figure 1. Five Dene/Métis and Yukon Communities included in this study.
Interviewers from each community were trained to conduct quantitative 24-hour recalls with children and followed a standardized protocol, using food portion models (locally available bowls, cups and spoons and a two-dimensional drawing of bannock, the local bread) and photos of traditional food species. Food items were coded using the University of California Berkeley Minilist (12), derived from Agriculture Handbook 8, adjusted to Canadian nutrient fortification, updated for carotenoid content of foods, and fine-tuned for recent requirements of dietary reference intake procedures and new nutrient data reported by USDA (13-15) and the CINE Arctic TF composition database (16-21). Dietary fiber was included only in the market food database. Dietary data were entered in Epi Info Version 1.1.2 (22) with double entry of a 10% random subset. Data were exported to SAS Version 8.0 for Windows (23) for analysis. Only food intake was used to estimate dietary nutrients, since information on supplement use was not sufficient to incorporate in this study.

Data analysis

Food use (TF and MF) and nutrient intakes were compared for children, with or without TF, by season, gender and location. Only children with 2 days of recalls were used for comparison of "with TF" and "without TF" groups. The five participating communities were grouped into three regions: north, central and south. The north region included the communities of Old Crow and Fort McPherson, the central region was Tulita, and Carcross and Fort Resolution comprised the south region. Since nutrients and food intakes of interest in this study were not normally distributed, ANCOVA was performed after rank transformation of raw values (24). Several factors known to affect dietary intake, such as the day of the week and age, were adjusted for the comparisons. Tukey’s test was performed when a significant difference was observed in ANCOVA for an independent variable containing more than three categories (25). Bonferroni comparisons were used to identify significant differences between mean values during multiple comparisons (26). All statistical analyses used p < 0.05 for level of significance.

Food groups were created to describe quality and patterns of the diet. Canada’s Food Guide for Healthy Eating (CFGHE) and tables from Health Canada recommending reasonable portion sizes and food groupings for about 5000 foods in the Canada's reference food composition database (27) were used to classify MF items into five groups: grains, dairy, fruit and vegetables, meat and alternatives, and "other" foods. The "other" food group contained food items such as butter, carbonated drinks, coffee, mixed dishes, snacks, etc. Of special interest to this study was the use of fat- and sugar-rich food items and mixed dishes, creating three more groups: fat, sugar and mixed dishes. The fat group contained food items with more than 40 percent of energy derived from fat, and protein contributing less than 15 percent of energy; the sweet group items provided more than 40 percent of energy from sugar (and excluded raw fruit, fruit juice, and vegetables). Food items rich in both fat and sugar were classified in the fat, or sugar groups, whichever was the higher. Most food items in the "other" food group were categorized as fat, sweet, or mixed dishes; the remaining small number of items formed an "extra" group.
RESULTS

TF Use

Figure 2 shows TF intake as a percentage of total energy intake by Dene/Métis and Yukon children in total, by season, gender and community. On average, when considering all recalls in both seasons, TF contributed 4.5% of the total energy intake, and was consumed slightly more in season 2. When individual children’s intakes in season 2 were investigated (averaging repeat recalls of individuals) there was slightly more intake by girls, but more remarkable were the differences among children in communities on the North to South continuum. The highest per child TF consumption was in Old Crow, followed by Fort McPherson, Tulita, Fort Resolution and Carcross. Thus, TF was found to be consumed more in northern Dene/Métis communities than in those further south.

Table 1. Traditional food items and percent in 24h recalls (n= 409 recalls)

| Species   | Part     | Preparation | % of recalls |
|-----------|----------|-------------|--------------|
| Caribou   | Meat     | Fried       | 28           |
| Caribou   | Meat     | Boiled      | 24           |
| Moose     | Meat     | Fried       | 6.4          |
| Moose     | Meat     | Boiled      | 6.4          |
| Caribou   | Meat     | Dried       | 5.9          |
| Caribou   | Ribs     | Cooked      | 5.5          |
| Caribou   | Fat      | Raw         | 3.5          |
| Whitefish | Flesh    | Baked       | 2.5          |
| Whitefish | Flesh    | Fried       | 2.5          |
| Caribou   | Heart    | Cooked      | 2.0          |
| Caribou   | Meat     | Baked       | 1.5          |
| Whitefish | Flesh    | Smoked/Dried| 1.5          |
| Moose     | Meat     | Roasted     | 1.5          |
| Duck      | Flesh    | Boiled      | 1.0          |
| Bison     | Meat     | Cooked      | 1.0          |
| Lake trout| Flesh    | Boiled      | 1.0          |
| Blackberries | Berries | Raw    | 0.5          |
| Blueberries| Berries | Raw    | 0.5          |
| Inconu    | Flesh    | Smoked/Dried| 0.5          |
| Moose     | Meat     | Baked       | 0.5          |
| Arctic hare | Flesh | Boiled | 0.5          |
| Cranberries| Fruit   | Raw         | 0.5          |
| Moose     | Bone marrow | Cooked | 0.5          |
| Loche     | Flesh    | Baked       | 0.5          |
| Spruce hen| Flesh    | Baked       | 0.5          |
| Salmon    | Flesh    | Cooked      | 0.5          |
| Cranberry | Fruit    | Jam         | 0.5          |
| Whitefish broad | Flesh | Dried | 0.5          |

Figure 2. Traditional food intake as percentages of total energy intakes in diets of Dene/Métis and Yukon children (n = 222) in total, by season, gender and community. Season 1 is November – January and Season 2 is August – October.
Table I lists TF items mentioned in all 24-h recalls, and the percentage of recalls for each item. In total, 28 TF items were reported. The frequently mentioned species were caribou, moose, and whitefish and, when all preparation methods were considered, these three species accounted for 70%, 15% and 10%, respectively, of total energy intake from TF (not shown).

Figure 3 presents TF groups as percentages of the total energy intake in the form of TF consumed by children. Twenty-eight TF items were classified into four groups: land animals, fish, birds and berries. Most TF energy came from land animals.

**MF use**

All children’s 24-h recalls contained market food (MF), and 158 MF items were mentioned in the recalls (not shown). Figure 4 presents MF groups as percentages of total energy intake using all recalls - averaged if repeat, or single - in both seasons. Four major groups in CFGHE, dairy, fruit and vegetables, grains, and meat and alternatives, contributed to less than half of the energy intake. The "other" groups (fat, sweet, mixed dishes and "extra") contributed the balance, with more than 40% of energy derived from fat and sweet foods.
### Table III. Micronutrient intake and food weight by children with and without traditional food (TF) and region in season 2 (August-October).

| Micronutrient | with TF (n=58) | without TF (n=40) | North (n = 46) | Central (n = 29) | South (n = 42) |
|---------------|----------------|------------------|---------------|-----------------|---------------|
| Iron (mg)     | 16 ± 0.6       | 14 ± 0.7 *       | 17 ± 1.1 a    | 17 ± 1.4 ab     | 13 ± 1.3 b *  |
| Zinc (mg)     | 11 ± 0.5       | 8.6 ± 0.6 *      | 11 ± 0.9      | 11 ± 1.1        | 10 ± 1.0      |
| Copper (µg)   | 1293 ± 41      | 1066 ± 48 *      | 1296 ± 79 a   | 1064 ± 97 ab    | 983 ± 90 b *  |
| Calcium (mg)  | 633 ± 38       | 635 ± 44         | 804 ± 70      | 704 ± 87        | 910 ± 81      |
| Magnesium (mg)| 203 ± 5.7      | 182 ± 6.6 *      | 194 ± 10      | 180 ± 13        | 182 ± 12      |
| Phosphorus (mg)| 1044 ± 32     | 924 ± 37 *       | 1128 ± 60     | 982 ± 74        | 1034 ± 69     |
| Sodium (mg)   | 2963 ± 137     | 2997 ± 159       | 2942 ± 245 ab | 2483 ± 303 a    | 3408 ± 282 b *|
| Potassium (mg)| 2291 ± 86      | 2043 ± 99 *      | 1939 ± 160    | 1903 ± 198      | 1883 ± 183    |
| Selenium (µg) | 74 ± 3.5       | 75 ± 4.0         | 75 ± 5.7      | 64 ± 7.1        | 78 ± 6.6      |
| Manganese (µg)| 2.4 ± 0.1      | 2.1 ± 0.2        | 2.4 ± 0.2 a   | 1.6 ± 0.3 b     | 2.0 ± 0.3 ab *|
| Vitamin A (µg RAE)| 452 ± 33 | 410 ± 38        | 367 ± 54      | 298 ± 66        | 450 ± 61      |
| Vitamin D (µg)| 3.2 ± 0.4      | 2.5 ± 0.5        | 2.8 ± 0.7     | 1.2 ± 0.9       | 2.0 ± 0.8     |
| Vitamin E (mg)| 3.5 ± 0.2      | 3.1 ± 0.2         | 3.6 ± 0.3     | 3.1 ± 0.4       | 3.9 ± 0.3     |
| Vitamin C (mg)| 130 ± 15       | 139 ± 17         | 87 ± 24       | 85 ± 30         | 90 ± 28       |
| Folate (µg)   | 338 ± 23       | 344 ± 27         | 342 ± 39      | 251 ± 48        | 357 ± 45      |
| Riboflavin (mg)| 1.6 ± 0.07  | 1.2 ± 0.08 *     | 1.5 ± 0.1     | 1.7 ± 0.2       | 1.4 ± 0.1     |
| Vitamin B6 (mg)| 1.9 ± 0.08  | 1.6 ± 0.09 *     | 1.8 ± 0.2 a   | 1.8 ± 0.2 a     | 1.3 ± 0.2 b *  |
| Dietary fibre (g)| 10 ± 0.5   | 10 ± 0.5         | 8.9 ± 0.8     | 8.3 ± 1.0       | 9.0 ± 0.9     |
| Food weight (g)| 1761 ± 57     | 1639 ± 66        | 1522 ± 94     | 1599 ± 117      | 1499 ± 108    |
| Dry food weight (g)| 421 ± 2.8  | 416 ± 3.2        | 426 ± 4.7     | 424 ± 5.8       | 415 ± 5.4     |
| TF weight (g) | 73 ± 8.9       | 0               | 95 ± 17 a     | 76 ± 21 a       | 22 ± 19 b *   |
| TF dry weight (g)| 27 ± 3.7   | 0               | 35 ± 7.0 a    | 25 ± 8.7 a      | 6.3 ± 8.1 b * |

1. Values are least square means ± SEM adjusting for the effects of variables. Significant difference, * (P<0.05) and ** (P<0.006), based on ANCOVA, adjusting for the effects of the variables after rank transformation of raw values.
2. Adjusting for the effects of region, day of the week, age, and gender.
3. Adjusting for the effects of day of the week, age, and gender.
Nutrient intake by children with and without dietary TF and region

Table II shows the differences in macronutrient intakes as percentages of energy intakes for children with and without TF and by region in season 2. Children with TF and in the north region had significantly more protein. Energy, fat and saturated fat were significantly lower in the north region. Analysis across season and gender in season 2 revealed few differences (not shown).

Table III gives the micronutrient intake and food weight by children with and without TF and by region in season 2. Children with TF consumed significantly more iron, zinc, copper, magnesium, phosphorus, potassium, vitamin E, riboflavin and vitamin B6. Compared to the south region, the north and central regions had significantly higher TF consumption, and iron, copper and vitamin B6 intakes, and lower in sodium intakes. Few differences in micronutrients were observed between genders (not shown).

Table IV shows the percentages of total energy intake from MF and TF groups for children with and without TF and by region in season 2. Intakes of MF meat and alternate products and grains were higher for children without TF. Children in the south region had less TF land animal foods and more MF fat, compared to those from the other regions.

**DISCUSSION**

While the energy contribution of TF for these children was less than 5% of the total diet (Figure 2), it was close to that of Northern Alberta children (4), but less than for adults reported in research across several Dene/Métis commu-

### Table IV

Percent of total energy intake¹ from market (MF) and traditional food (TF) groups by children with and without TF ² and region ³ in season 2 (August-October).

| MF groups          | with TF (n=58) | without TF (n=40) | North (n=46) | Central (n=29) | South (n=42) |
|--------------------|---------------|------------------|-------------|---------------|-------------|
| Dairy              | 5.4 ± 0.8     | 6.8 ± 1.0        | 4.8 ± 1.5   | 5.0 ± 1.8     | 6.4 ± 1.7   |
| Fruits and vegetables | 8.1 ± 1.1    | 8.5 ± 1.3        | 5.2 ± 1.9   | 6.9 ± 2.2     | 6.4 ± 2.0   |
| Grains             | 19 ± 1.4      | 24 ± 1.7         | 20 ± 2.6    | 15 ± 3.1      | 16 ± 2.9    |
| Meats and alternates | 7.0 ± 1.0    | 10 ± 1.2         | 4.8 ± 1.8   | 6.6 ± 2.2     | 6.8 ± 2.0   |
| Mixed dishes       | 14 ± 1.6      | 12 ± 1.9         | 14 ± 2.9    | 8.9 ± 3.4     | 19 ± 3.1    |
| Sweet              | 20 ± 1.5      | 19 ± 1.7         | 21 ± 2.7    | 23 ± 3.2      | 16 ± 2.9    |
| Fat                | 19 ± 1.6      | 19 ± 1.9         | 22 ± 2.8 a  | 28 ± 3.4 ab   | 28 ± 3.1 b  |
| Extra              | 0.2 ± 0.1     | 0.3 ± 0.1        | 0.1 ± 0.2   | 0.2 ± 0.2     | 0.2 ± 0.2   |
| TF groups          |               |                  |             |               |             |
| Berries ⁴          | 0.1 ± 0.1     | 0                | 0.1 ± 0.2   | 0.002 ± 0.2   | 0           |
| Birds ⁴            | 0.1 ± 0.05    | 0                | 0.2 ± 0.09  | 0.001 ± 0.08  |             |
| Fish ⁴             | 0.7 ± 0.3     | 0                | 0.8 ± 0.6   | 0             | 0.2 ± 0.6   |
| Land animals ⁴     | 6.6 ± 0.7     | 0                | 6.7 ± 1.4 a | 6.1 ± 1.7 a   | 1.0 ± 1.5 b ** |

¹ Values are least square means ± SEM adjusting for the effects of variables. Significant difference, ² (P<0.05) and ³ (P<0.004), based on ANCOVA, adjusting for the effects of variables after rank transformation of raw values.

Values in the same row with different letter are statistically different (Tukey’s test, P<0.05)

² Adjusting for the effects of region, day of the week, age, and gender

³ Adjusting for the effects of day of the week, age, and gender

⁴ Significant difference was not examined between children with and without TF
nities (12-33%), or Yukon First Nations (9-18%) (5, 7, 8, 28). These findings are in general agreement with research showing that younger Arctic people are consuming less TF than older people. Children’s TF use is higher in the more Northern communities, as has been demonstrated for adult diets (7), with differences related to TF availability, population size, road access and the availability of affordable MF, and prevalent fishing and hunting practices. The extent of contribution of TF to nutrient profiles in these children’s diets parallels that found for adults in Dene/Métis and Yukon First Nation communities (9).

MF was found to comprise the major portion of the diet, and over half of the MF energy came from fat, sweet, mixed dishes and "extra" items, suggesting a necessity for dietary improvement for these children. This is especially true in more Southern Dene/Métis and Yukon communities, where children are eating less TF land animals and fat foods (Table IV). More market meat was also consumed (higher fat meat), but this was not significant.

Although the overall TF intake was less than 5% for these children, it contributed substantial amounts of a number of nutrients in the diet (protein, iron, zinc, copper, magnesium, phosphorus, potassium, vitamin E, riboflavin and vitamin B6). In fact, regional differences in nutrient intakes were likely explained by the difference in TF meat consumption. Therefore, it appears that the replacement of energy acquired from TF meat by Southern children resulted in less nutrient-dense diets. These results suggest that an increased TF intake would lead to a dietary improvement for the children. However, concern about the intake of dairy products, fruit and vegetables may remain, since TF nutritionally equivalent to these food groups (organ meats, eggs, wild plants) were infrequently mentioned in recalls. Contributions of TF harvest and use to society, physical activity and cultural values are other important aspects of TF to be considered.

In conclusion, the important messages of this research with Arctic children are:

1) High use of food of low nutrient density was a concern in diets of Western Arctic children in this study, suggesting the need for dietary improvement.

2) TF use, even at levels as low as 4-5 percent of energy, contributed to significantly higher intakes of a number of essential nutrients.

3) Latitude of residence explained several differences in food use and nutrient intakes, and showed that children in Northern communities of Arctic Indigenous People consumed greater amounts of TF.

It thus becomes very obvious that TF use in meals of Arctic children should be increased as an important step in health promotion.

Acknowledgements

The authors thank the Council of Yukon First Nations and the Dene Nation for assisting with this study. We are grateful to all participants for their patience and good will during the research process. For funding support, we thank the Northern Contaminants Program of the Department of Indian and Northern Development and, within the Canadian Institutes of Health Research, we thank the Institute of Nutrition, Metabolism and Diabetes and the Institute of Aboriginal Peoples’ Health.
REFERENCES

1. Young TK. Health Care and Cultural Change: the Indian Experience in the Central Subarctic. Toronto: University of Toronto press, 1988.

2. Pelto GH, Pelto PJ. Diet and delocalization: dietary changes since 1750. J Interdiscip Hist 1983; 14(2): 507-28.

3. Wein EE, Sabry JH, Evers FT. Food consumption patterns and use of country foods by Native Canadians near Wood Buffalo National Park, Canada. Arctic 1991; 44(3): 196-205.

4. Wein EE, Gee ML, Hawrysh ZJ. Food consumption patterns of native school children and mothers in Northern Alberta. J Can Diet Assoc 1992; 53: 267-273.

5. Morrison NE, Receveur O, Kuhnlein HV, Appavoo DM, Soueida R, Pierrot P. Contemporary Sahtú Dene/ Métis use of traditional and market food. Ecol Food Nutr 1995; 34: 197-210.

6. Receveur O, Boulay M, Mills C, Carpenter W, Kuhnlein HV. Variance in food use in Dene / Métis communities (Research report). Ste. Anne de Bellevue, QC: Center for Indigenous Peoples' Nutrition and Environment (CINE), 1996.

7. Receveur O, Boulay M, Kuhnlein HV. Decreasing traditional food use affects diet quality for adult Dene / Métis in 16 communities of the Canadian North West Territories. J Nutr 1997; 127: 2179-2186.

8. Receveur O, Kassi N, Chan HM, Berti PR, Kuhnlein HV. Yukon First Nations' assessment of dietary benefit risk (Research report). Ste. Anne de Bellevue, QC: Center for Indigenous Peoples' Nutrition and Environment (CINE), 1998.

9. Kuhnlein HV, Receveur O, Soueida R, Egeland GM. Arctic Indigenous Peoples experience the nutrition transition with changing dietary patterns and obesity. J Nutr 2004; 134(6): 1447-53.

10. Wein EE, Freeman MM. Frequency of traditional food use by three Yukon First Nations living in four communities. Arctic 1995; 48(2): 161-171.

11. Nakano T, Fediuk K, Kassi N, Egeland GM, Kuhnlein HV. Dietary nutrients and anthropometry of Dene/Métis and Yukon Children. Int J Circumpolar Health 2005;6(2): 147-156.

12. Murphy SP and Gross KR. The UCB Mini-List Diet Analysis System, MS-DOS Version User's Guide (Revised June 1987). The Regents of the University of California, Berkeley, CA, 1987.

13. Holden JM, Eldridge AL, Beecher GR, Buzzard IM, Bhagwat S, Davis CS et al. Carotenoid content of U.S. foods: an update of the database. J Food Comp Anal 1999;12: 169-196.

14. Murphy SP. Changes in dietary guidance: implications for food and nutrient databases. J Food Comp Anal 2001; 14: 269-278.

15. United States Department of Agriculture (USDA) [homepage on the Internet]. Washington, DC: The organization. Agricultural Research Service. Nutrient Data Laboratory. Accessed: June 2000. Available from: http://www.nal.usda.gov/fnic/cgi-bin/nut_search.pl

16. Kuhnlein HV, Chan HM, Leggee D, Barthez V. Macronutrient, mineral and fatty acid composition of Canadian Arctic traditional food. J Food Comp Anal 2002; 15: 545-566.

17. Kuhnlein HV, Appavoo D, Morrison N, Soueida R, Pierrot P. Use and nutrient composition of traditional Sahtú (Hareskin) Dene/Métis foods. J Food Comp Anal 1994; 7: 144-57.

18. Morrison N, Kuhnlein HV. Retinol content of wildlife foods consumed by the Sahtú (Hareskin) Dene/Métis. J Food Comp Anal 1993; 6: 10-23.

19. Appavoo DM, Kubow S, Kuhnlein HV. Lipid composition of indigenous foods eaten by the Sahtú Dene/Métis of the Northwest Territories. J Food Comp Anal 1991; 4: 108-19.

20. Kuhnlein HV, Kubow S, Soueida R. Lipid components of traditional Inuit foods and diets of Baffin Island. J Food Comp Anal 1991; 4: 227-36.

21. Kuhnlein HV, Soueida R. Use and nutrient composition of traditional Baffin Inuit foods. J Food Comp Anal 1992; 5: 112-26.

22. Epi Info Version 1.1.2: a word processing, database, and statistics program for epidemiology on microcomputers. Centers for Disease Control and Prevention, Atlanta, Georgia, 2000.

23. Statistical Analysis Systems (SAS) for Personal Computers, Version 8.0. SAS Institute Inc., Cary, North Carolina, 2002.

24. Conover WJ and Iman RL. Analysis of covariance using the rank transformation. Biometrics 1982; 38: 715-724.

25. Zar JH. Biostatistical Analysis, 4th ed. Upper Saddle River, NJ: Prentice Hall, 1999.

26. Jekel JF, Katz DL, Elmore JG. Epidemiology, Biostatistics, and Preventive Medicine, 2nd ed. Philadelphia: Saunders, 2001.

27. Health Canada [homepage on the Internet]. Ottawa: The organization. Relating Canada's Food Guide to Healthy Eating to Canadian Nutrient File Foods. Accessed: July 2003. Available from: http://www.hc-sc.gc.ca/food-aliment/nl-sc/nr-rr/nutrition/nut-aliment/nl-sc/nr-rr-surveillance/cnf-fcen/e_relating cfg.html.

28. Wein EE. Nutrient intakes of First Nations People in four Yukon communities. Nutr Res 1996; 15(8): 1105-1119.