NOTE TO USERS

DIETARY INTAKE AND ANTHROPOMETRY OF DENE/MÉTIS AND YUKON CHILDREN

A Thesis

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Abstract

Anthropometcic measurements and 24h-recall interviews were conducted on Dene/Métis and Yukon children, and food choice questionnaire interviews were conducted on the mothers of the children. On average, 32% of the children were above the 85th percentile of BMI-for-age in the 2000 CDC Growth Charts. The dietary nutrient intakes were compared to the DRI values. Vitamin A, calcium, phosphorus, vitamin D, vitamin E, dietary fiber, omega-6 fatty acids, omega-3 fatty acids, and magnesium intakes were low. Excessive nutrient intake was not observed. Imbalance of energy intake from carbohydrate and fat and excessive energy intake from total sugar and saturated fat were observed. Market foods were a major part of the diet. Traditional food contributed 4.6% of total energy intake. Frequently mentioned factors as having an influence on food selection were cost, health, children's preference and acceptability, traditional food and market food availability, and women's preference.

Résumé

Des données anthropométriques et des interviews de rappel sur 24 heures furent menées sur des enfants Dene/Métis et du Yukon. Des questionnaires sur les choix alimentaires des mères des enfants furent aussi récoltés. En moyenne, 32% des enfants étaient au-delà du 85^{e} rang centile de l'IMC-pour-l'âge de la charte de croissance du CDC. La consommation d'éléments essentiels fut comparée avec les valeurs du DRI. Les apports en vitamine A, calcium, phosphore, vitamine D, vitamine E, fibres alimentaires, acide gras omega-6, acide gras omega-3 et magnésium étaient réduits. Aucun élément nutritionnel n'était consommé en excès. Un débalancement de l'apport énergétique des glucides et des gras et un apport d'énergie excessif de la part des sucres et des gras saturés fut observé. Les aliments du marché constituaient une partie majeure de la diète. La nourriture traditionnelle représentait 4,6% de l'apport énergétique total. Les facteurs fréquemment mentionnés ayant une influence sur les aliments choisis étaient le coût, la santé, la préférence et l'acceptation des enfants, la disponibilité des aliments traditionnels et du marché ainsi que la préférence des femmes.

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[1] Introduction

Canadian Native Peoples have experienced health status changes over the past several decades (Young, 1988). The emergence of non-communicable chronic diseases, such as cancer, heart disease, diabetes, and stroke are currently issues of concern. Lifestyle changes resulting from "modernization," are considered to be the cause of these chronic diseases.

Modernization can result in changes in dietary patterns. Pelto (1983) suggests these changes occur because increasing portion of the daily diet comes from distant places usually through commercial channels. This implies a shift in use from local traditional food items to market food items coming from distant places.

Several studies conducted in the Subarctic and the Arctic reported a decreased use of traditional food among native people (Wein et al, 1991a; Morrison et al, 1995; Kuhnlein et al, 1995a; Wein et al, 1995; Receveur et al, 1998a). This change appeared to affect the quality of nutrient intake, such as iron, zinc, protein, carbohydrate, and fat, since traditional food items are different from market food items in terms of nutrient content (Wein et al, 1991b; Kuhnlein et al, 1995b; Kuhnlein et al, 1996a; Wein, 1996; Receveur et al, 1998a). A concern for dietary inadequacy for some nutrients, such as vitamin A, calcium, fat, and dietary fiber, has also been reported in these studies. A focus of most of these studies was on adults. It is not known how traditional food affects the quality of nutrient intakes of Dene/Métis and Yukon children. Dietary inadequacy is also of concern for the children.

[2] Literature review

2-A) Contemporary food use and nutrient intake of First Nations and Métis

"Although changes have occurred in the traditional economy throughout the historic period, in the 1970s most native peoples within the Subarctic still relied, at least in part, on hunting, fishing, and trapping (Gillespie, 1981)." It was not known at that time, however, how much these native peoples still relied on traditional food and how the dietary change have impact on their nutrient intake.

Unique attempts have been made to demonstrate the dietary pattern of native peoples in the Subarctic by focusing on two food sources, namely traditional food and market food. Wein and coworkers (1991a) examined traditional food use of Cree and Chipewyan Indians and Métis in two communities near Wood Buffalo National Park. The study conducted traditional food frequency interviews on 120 households, and four repeated 24h-recalls on 178 individuals 12 years of age and older during two interview seasons (late August to mid November and late April to mid July). Participating households were selected from band lists and Métis membership. They were categorized as [heavy] traditional food users and light/non-users in order to obtain equal representation of traditional food [heavy] users and light/non-users. Households with teenagers were identified through the school in order to obtain enough teenage participants, and then, categorized as [heavy] users and light/non-users.

The results of the study showed traditional food use as follows; traditional foods were consumed on average 319 occasions per year by households (an occasion was any meal or snack at which the food was consumed), 4.2 occasions per week and 0.5 kg per week by individuals. The use of animal foods, such as moose, caribou, and whitefish, was often reported. Traditional meat, birds, and fish accounted for one-third of the total consumption of meat, birds, and fish.

The presence of a hunter, trapper or fisherman in the household, age, and sex were also found to be sources of variation in traditional food use among individuals. The presence of a hunter, trapper or fisherman increased traditional food use both in frequency

and weight. Younger people and females were noted to consume traditional foods less often and smaller amount in comparison to older people and males, respectively.

Wein and coworkers (1992) conducted another study with native children and mothers in two communities in Northern Alberta. The primary purpose of the study was to examine food consumption patterns in the two communities, one with and the other without a school lunch program. The study conducted four repeated 24h-recalls on 163 individuals (91 native children, 43 native mothers, and 29 non-native children) during two interview seasons (September to November and March to May). The study also conducted anthropometric measures: height, weight, arm circumference, and triceps skinfold. All the native children 8 to 15 years old and their mothers in the both communities and also the non-native children 8 to 15 years old in a community were asked to participate. The participation rates for the native children and their mothers and for the non-native children were 77-90% and 30%, respectively.

The results of the study showed traditional food use as follows: traditional meat, birds, and fish were consumed more among the native children in a more isolated community; the native children took less energy (3%) from traditional food compared to their mother (7%); and the traditional food contributed more protein, cholesterol, zinc, iron, niacin, phosphorus, thiamin, and riboflavin, but less fat and saturated fat.

Morrison and coworkers (1995) examined traditional food use in two Sahtu Dene/Métis communities. The study conducted 24h-recalls on individuals three years of age and older, and food frequency interviews on households. The entire communities were asked to participate, and 709 24h-recalls from 483 individuals and 273 food frequency interviews were collected during three interview seasons: July to August (summer), November to December (winter), and May to June (spring). The individual participation rates among the seasons varied 61-100%.

The results of the study showed on average, the Dene/Métis adults received 32% of energy from traditional food. Also reported by the study was that traditional food 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, respectively. Overall, younger

people consumed less traditional food. Younger females had lower energy from traditional food than younger males, while older females had higher energy than older males.

Each of the Wood Buffalo National Park, the Northern Alberta, and the Sahtu research has an accompanied report. The Wood Buffalo National Park study reported that low intakes of vitamin D, vitamin C, iron, dietary fiber, and especially calcium, vitamin A, and folate were of concern (Wein et al, 1991b). Traditional food contributed more protein, iron, phosphorus, riboflavin, niacin, and vitamin D to the diet, but less fat and calcium. On average, 37% of dietary energy came from fat.

The Northern Alberta study reported that low intakes of vitamin A, calcium, phosphorus, iron, zinc, and folate were of concern among the mothers, while low intakes of vitamin A, calcium, zinc, folate, vitamin D, and dietary fiber were of concern among the native children (Wein et al, 1993a). Also of importance, high sugar intake (26% of energy intake) among the native children was reported. On average, 37% of dietary energy came from fat and 14% from saturated fat among the native children, and 38% from fat and 15% from saturated fat among the mothers. The high prevalence of overweight (BMI above 27) was reported among the mothers in a more isolated community but not in the other community. The anthropometric measures indicated normal growth among the native children in the communities.

The Sahtu study reported that low intakes of vitamin A and calcium were of concern (Kuhnlein et al, 1995b). Traditional food contributed more protein, iron, zinc, copper and magnesium to the diet, but less fat, carbohydrate, calcium, vitamin A and sodium. On average, 32% of energy came from fat and 11% from saturated fat.

Extensive research was conducted on Dene/Métis adults in 16 communities that examined nutrient intake and traditional food use (Receveur et al, 1996; Receveur et al, 1997). The existing band, housing and utility lists were used to select the sample in each community. Ten percent of Dene/Métis households were randomly drawn or 25 households, whichever was the larger. One man and one woman were invited to participate within each household. The participation rate for individuals was 91%. Traditional food frequency questionnaires and socio-cultural questionnaires were

conducted on 753 households and 1012 24h-recalls were collected during two interview seasons (March to April and October to November).

The results from the 24h-recalls were mainly in agreement with the findings of the earlier Sahtu Dene/Métis studies (Morrison et al, 1995; Kuhnlein et al, 1995b). Traditional food was consumed on average 264 g per day by individuals. Traditional food provided 22% of energy intake. Northern Dene/Métis communities tended to derive more energy from traditional food compared to southern Dene/Métis communities. For all the market food groups, except for the meat alternative group, the consumption by younger adults was greater than older adults, while the consumption of land animals and fish in traditional food groups was less in younger adults. Females consumed more grains but less store bought meat than males. Seasonal differences were observed only in the traditional fish group.

The study reported low intakes of vitamin A, calcium, folate, and dietary fiber which were of concern. Younger adults were found to consume more carbohydrate, dietary fiber, and sucrose in comparison to older adults. Traditional food contributed more protein, iron, zinc, copper, magnesium, phosphorus, but less carbohydrate, sucrose, fat, saturated fat, and sodium. Approximately 35% of dietary energy came from fat and 12% was from saturated fat.

Another extensive study was conducted by Receveur and researchers (1998a) in 10 Yukon First Nations communities. The study design was similar to the Dene/Métis adult study in that it used the same sampling method and its participation rate was also the same. Traditional food frequency questionnaires and socio-cultural questionnaires were administered to assess 636 households and 802 24h-recalls were collected during two interview seasons (February to April and September to December). The study also conducted anthropometric measures on 416 individuals. Although adult height was measured, most weight values were self-reported.

Receveur and coworkers (1998a) found results similar to the Dene/Métis studies of Kuhnlein and Receveur. Traditional food was consumed on average 195 g per day by individuals, and provided 14% of energy intake. Low intakes of vitamin A and calcium were reported. Traditional food use was related to higher intakes of protein, iron, and zinc,

but lower intakes of carbohydrate, sucrose, fat, polyunsaturated fat, and saturated fat in comparison with market food use. On average, 36% of energy was derived from fat and 13% from saturated fat. Younger adults preferred market foods compared to older adults. The proportion of overweight (BMI above 27) increased with age, and was greater in women (48%) than men (36%). The overall prevalence of overweight adults, especially women, was more common among Dene/Métis than the Canadian population averages.

Wein and Freeman (1995) conducted a study with four Yukon First Nations communities: Haines Junction, Old Crow, Teslin, and Whitehorse. One report documented the frequency of use of traditional food species. All the households on each First Nation's band list were used to randomly select 40 households in each community. The study conducted traditional food frequency interviews on 122 households and four repeated 24h-recalls (once per season) on 122 adults (heads of households) during four seasons. The participation rate for households was 76%.

The results of the study showed that about 80 traditional species were used as food, and on average, traditional foods were consumed over 400 times per year by households, and 1.14 times per day by individuals. Over 80% of households used mammals, birds, fish, berries, and other plant foods. Moose, caribou and salmon were especially important traditional foods in contemporary diet. The differences in frequency of traditional food use among locations were also noted. Both at household and individual levels, the highest frequency of traditional food use was reported in Old Crow, the most northern of the four participating communities.

Another report documented nutrient intake of the Yukon adults in these four communities (Wein, 1996). This study showed that traditional food provided 17% of energy intake, and that low intakes of folate, calcium, vitamin A, vitamin D, vitamin C, and zinc were of concern in the population. Traditional foods, when compared to market foods, contributed to higher intakes of protein, cholesterol, vitamin D, vitamin B1, B6, and B12, riboflavin, niacin, iron, zinc, phosphorus, and potassium, but lower intakes of fat, saturated fat, monounsaturated fat, polyunsaturated fat, carbohydrate, sugar, dietary fiber, calcium, vitamin A, folate, and vitamin C. On average, 36% of energy was derived from fat and 13% from saturated fat.

In summary, the findings from these studies with First Nations and Métis are as follows: 1) traditional foods remain an important part of contemporary diet, 2) the degree of traditional food use varies by communities, 3) low intakes of vitamin A, calcium, folate, vitamin D, and dietary fiber are of concern, 4) high intakes of fat and saturated fat are also of concern, 5) season, gender, and age are sources of variation for nutrient intake and especially for food use, 6) traditional food contributes more copper, magnesium, phosphorus, niacin, riboflavin, and especially, protein, zinc, and iron, but less fat, saturated fat, carbohydrate, calcium, and sodium than market food, 7) younger people consume less traditional food and more sugar than older people, and 8) overweight among adults is more prevalent than the Canadian National averages for adults.

These findings are valuable; however, except for the Northern Alberta study, these studies have paid little attention to children. The Dene/Métis study near Wood Buffalo National Park did not include children 12 years of age and younger. The Sahtu Dene/Métis study included children, although the age category (3-12 years) was too broad considering varying nutrient requirement among children in the category. Lastly, neither the Dene adult study nor the Yukon studies included children. Considering reported low intakes of several nutrients, such as vitamin A, calcium, and folate, dietary inadequacy concerns these children because of their higher requirement of nutrients for growth and development. High intake of sugar among younger people and high intakes of fat and saturated fat among communities are also of concern since excessive sugar and high fat intakes are known to be risk factors of chronic diseases. In addition, previous studies have used the Recommended Dietary Allowances (RDAs) or the Recommended Nutrient Intakes (RNIs) as a reference for nutrient adequacy of a population, which is reported to overestimate prevalence of nutrient inadequacy in a group (IMO, 2000a).

2-B) Anthropometry

Weight and height are the most common anthropometric measurements of nutritional status in epidemiologic settings because they are simple and easy to collect. Relative weight (a standardized ratio) and indices of weight and height, such as BMI (weight/height^2), are commonly used indices. The criteria for these indices are: 1) that the

index should be highly correlated with percent body fat, and 2) that the index should not be correlated with height (Willet, 1998). Based on these measures, obesity among the Canadian population has been reported among children (Tremblay et al, 2000; Tremblay et al, 2002).

Excessive childhood overweight was reported in three studies of Canadian Native children: the eastern James Bay Cree of Quebec (Bernard et al, 1995), Mohawk community of Kahnawake (Trifonopoulos, 1995; Potvin et al, 1999), and Sandy Lake First Nation of Ontario (Hanley et al, 2000). The James Bay Cree study was conducted in two Cree communities and measured height and weight in 144 children and adolescents (Bernard et al, 1995). The sample was drawn from students in grade 4, 5, 8, and 9 using cluster sampling by classroom. The participation rate for this study was 84%. When compared with National Health and Nutrition Examination Survey II (NHANES II) reference population, 38% of the participants had BMI above the 90th percentile.

Anthropometric measurements on Mohawk children were conducted in 1994, which was a part of the baseline evaluation of the Kahnawake School Diabetes Prevention Project (KSDPP), a school-based health education program consisted of three-year intervention plan in Kahnawake started in 1994. Two studies reported the results of the measurements, although one study was based on children in two elementary schools and the other was based on children in three elementary schools. Trifonopoulos (1995) reported the anthropometric evaluation on 394 children 5 to 12 years of age (199 boys and 195 girls) in two elementary schools. The participation rate was 87%. When compared with NHANES II reference children, 29.6% of the boys and 32.8% of the girls had BMI above the 85th percentile.

Potvin and coworkers (1999) reported the anthropometric evaluation on 540 children 6 to 11 years of age (260 boys and 274 girls) in three elementary schools. The participation rate was 83%. When compared with NHANES II reference children, 30% of the boys and 33% of the girls had BMI above the 85th percentile.

The Sandy Lake study was based on a subsample from Sandy Lake Health and Diabetes Project in which 73% of eligible residents participated in a cross-sectional survey to determine the prevalence of type two diabetes and its associated risk factors (Hanley et

al, 2000). Height and weight were measured on 445 children and adolescents 2 to 19 years of age (202 boys and 243 girls). When compared with NHANES III reference population, 27.7% of the boys and 33.7% of the girls had BMI above the 85th percentile.

This excessive overweight reported among Canadian Native children agreed with the results of anthropometric measures conducted on American Native children. Table 2-B-1 summarizes selected studies which examined the prevalence of overweight in Native North American school children.

Considering that all reported studies on Native North American schoolchildren reported excessive overweight, overweight is also of likely concern for the children in Dene/Métis and Yukon communities.

Table 2-B-1 Selected studies describing the prevalence of overweight in Native North American schoolchildren

Author (s), year	Tribe (location)	Sample size (boys and girls), subjects ages (y)	Criteria to define overweight (OW), reference population	Percent OW		
				Boys	Girls	Both
Jackson, 1993	American Indians (nationwide)	n = 9,464 (boys = 4921, girls = 4543), 5 to 18	BMI ≥ 85th percentile, NHANES II	38.4	40.0	39.3
Sugarman et al, 1990	Navajo (New Mexico and Arizona)	n = 1,969 (boys = 951, girls = 1018), 5 to 17	Weight-for-age ≥ 95th percentile, NCHS *	12.5	11.2	11.9
Neumark-Sztainer et al, 1997	American Indians (nationwide)	n = 11,868 (boys = 5932, girls = 5936), 7 to 12	BMI ≥ 85th percentile, NHANES II	25.1	24.2	24.7
Caballero et al, 2003	American Indians (nationwide)	n = 1,704 (boys = 881, girls = 823), 7 to 12	BMI ≥ 95th percentile, CDC 2000 Growth Charts	26.8	30.5	28.6
			95th > BMI ≥ 85th percentile, CDC 2000 Growth Charts	19.6	21.0	20.3

* National Center for Health Statistics

2-C) Socio-cultural questionnaire data

Each of the studies conducted on the 16 Dene/Métis communities and 10 Yukon communities included socio-cultural questionnaires in which participants were asked information related to household demography, food preferences, and perceptions related to traditional and market foods (Receveur et al, 1996; Receveur et al, 1998a; Receveur and Kuhnlein, 1998b).

The advantages of either traditional and market foods given by the respondents were similar in the two studies. Traditional food was valued because it is healthy, inexpensive, natural, clean, free of chemicals, and superior in taste. The advantages of market foods were its convenience, ease of preparation, always available, accessibility, variety, fresh produce, and provision of staples. Further questions on selected attributes of traditional food were asked and most people agreed that traditional food not only provided healthy food, but it contributed to many aspects of life, such as physical fitness, saving money, providing education on natural environment, and providing survival skills.

On average, 20% of respondents in both studies noticed changes in the quality or health of traditional plants, land animals, fish, or birds. The negative comments reported included factors such as lower availability of plants, fish, and animals. Fish with cysts, soft flesh, or deformed or skinny body were also given as negative factors.

It was reported among the Dene/Métis that 60% of respondents consumed less traditional food than five years ago, while 18% consumed more and 22% remained the same. Traditional food consumption in the Yukon communities over the past five years had decreased among 33% but increased in 17% and remained the same in 53% of the people. Reasons for decreased use of traditional foods were similar in both studies and included no time and employment, too expensive and no equipment, and low availability of animals.

In summary, both traditional and market foods were each reported to have advantages, and many of the participants agreed on contributions of traditional food to different aspects of their lifestyle, such as physical fitness and saving money. However, the trend was to consume less traditional food. Negative changes observed in the traditional food system were of concern, and could be a reason for the decrease in traditional food

consumption. Several other factors, such as employment and high cost of hunting and fishing, were also mentioned as leading to less traditional food use.

At the same time, several nutritional problems were reported with the decrease in traditional food use (Receveur et al, 1997; Receveur et al, 1998a) as described in this literature review. Popkin (1998) says that replacement of traditional foods with less nutrient dense market food may be a problem. The major question that arises from these findings is "why do people choose less nutritious market foods?". The suggested reason is that food needs are multifactorial and relate to wide range of environmental, societal, and personal influences (Kuhnlein, 1996b). It is important to further explore the factors affecting food selection because the result may give an implication for improvement of food choice or nutrient intake, and thus health.

[3] Rational

The research collaboration between the Center for Indigenous Peoples' Nutrition and Environment (CINE) and Dene/Métis and Yukon communities in the Western Arctic was initiated due to a concern of environmental contaminants in the communities. Data on food intake was especially needed since food is often the main source of exposure to contaminants. Between 1994 to 1998, several research projects were conducted in 16 Dene/Métis and 10 Yukon First Nation communities, covering food use, dietary intake, and lab analysis of their food items. Based on these studies, a project, "Food Choice Decisions by Western Arctic Aboriginal Women and Children," was initiated and conducted in 2000 to 2001. The main objectives of this project were 1) to understand the factors influencing food choice decisions by Arctic women and children, 2) to understand the factors involved in making choices among traditional and market food, and 3) to better understand children's anthropometry, nutrition, and traditional and market food use in Dene/Métis and Yukon First Nation communities (Kuhnlein, 2002a). Five communities, Old Crow, Fort Mcpherson, Tulita, Carcross, and Fort Resosution, were selected by the Council of Yukon First Nations (CYFN) and Dene Nation to represent Yukon First Nation and Dene/Métis women and children. Dietary 24h-recalls were taken of children 10-12 years of age and food chice questionnaires were conducted on women, and height and weight of the children were also measured.

This thesis involves data analyses and results from this project. The objectives of this thesis were two-fold: 1) to describe anthropometry, nutrient intakes, and food use of the children and to analyze the data, with focus on food sources, traditional food (TF) and market food (MF), season, gender, location, and BMI category, and 2) to describe factors which affect food choices of the children's households.

In this study, five null hypotheses were tested: there is no difference in nutrient intake and food use between days with and without TF, seasons, and gender, and among locations and BMI category groups

[4] Significance

The significance of the present study was: 1) the nutrient status, dietary pattern, and anthropometry of Dene/Métis and Yukon children have not been described, 2) the kinds of factors affect food selection on households in Dene/Métis and Yukon communities have not been studied, 3) the present study will contribute to developing food policy and nutrition education, and to documentation of a part of cultural change.

[5] Methods

5-A) Ethics

Human ethics research approval was given from McGill University (Appendix 1).

5-B) Dietary 24h-recall interview and anthropometric measurement

Two repeated 24h-recall interviews and anthropometric measurements (height and weight) were conducted with children 10 to 12 years of age during two interview seasons: November to January (2000-2001) and August to October (2001). All of the children in the communities were asked to participate. Signed parental consent was obtained for children to participate in the interviews (Appendix 2).

Interviewers from each community were trained to conduct quantitative 24h-recalls and anthropometric measurements on children. The 24h-recall interview followed a standardized protocol, similar to that described by Gibson (1993). The children were measured for height and weight without shoes and in light indoor clothing (no jackets, sweaters) (Gibson, 1993; Lohman, 1998). Weight was measured using an electronic digital scale (Model Seca 770; Germany) to the nearest 0.1 kg. Height was measured using a height measuring board (Shorr Productions, Irwin J. Shorr, Olney, Maryland) to the nearest 0.1 cm.

5-C) Food choice questionnaire interview

The food choice questionnaire interview was conducted with 49 female caregivers of the children from August to October (2002). All of the caregivers of the children were eligible to participate. The participants were asked questions related to household demography and factors that influenced family food choices. A written consent form was obtained for women to participate in the interview (Appendix 3).

A food choice questionnaire consisted of 36 questions most of which were close-ended questions. The questionnaire was developed from a focus group method which was considered an effective, efficient and culturally acceptable way to gather community members' perspectives on decisions made around which and why certain foods were eaten

at the household level. The focus group method used in the present study was based on the processes described by Krueger (1988), Dawson and Manderson (1993), Morgan (1997), and Gittelsohn and researchers (1998) as well as several reports on Dene/Métis and Yukon people (Kuhnlein and Receveur, 1996b; Receveur et al, 1996; Receveur et al, 1998a; Kuhnlein and Delormier, 2000). A written consent form was obtained for women to participate in the focus group (Appendix 4).

5-D) Coding and data entry

Each record was assigned a numeric identification number. Foods recorded in the 24h-recalls were coded using the University of California Berkeley Minilist and the CINE arctic traditional food composition database (refer to the food composition databases section). The 24h-recalls and the food choice questionnaires were entered in Epi Info Version 1.1.2 (Atlanta, GA, 2000) and exported to SAS Version 8.0 for Windows (Cary, NC, 2002) for analysis. The anthropometric records were coded and entered within the NutStats program of Epi Info. The data were carefully checked at the data entry and at the coding levels for the variables of interest.

5-E) Food composition databases

Nutrient analyses of dietary data were performed using two food composition databases: a database of the composition of traditional arctic food derived from various published reports (Kuhnlein et al, 2002b; Kuhnlein et al, 1994; Morrison and Kuhnlein, 1993; Appavoo et al, 1991; Kuhnlein et al, 1991; Kuhnlein and Soueida, 1992); and a market food composition database (Murphy and Gross, 1987) derived from Agricultural Handbook No.8 series adjusted to include Canadian food items and fortification levels (Thompson and Brule, 1991).

5-F) Description of nutrient status

The Dietary References Intakes (DRIs) were used for description of adequacy of nutrient intakes in this research. The DRIs are being set by the Institute of Medicine's Food and Nutrition Board (IOM), and they are designed to replace the former

Recommended Dietary Allowances (RDAs) in the United States and the Recommended Nutrient Intakes (RNIs) in Canada (IMO, 2000a). The DRIs are new values for planning and assessing diets of both individuals and groups.

The DRIs consist of four reference values that can be used for assessing nutritional adequacy: the Estimated Average Requirement (EAR), the Recommended Dietary Allowance (RDA), the Adequate Intake (AI), and the Tolerable Upper Intake Level (UL) (IMO, 2000a). The EAR is the nutrient intake level at which 50% of the individuals meet the requirement of a nutrient. The RDA is set at two standard deviations above the EAR, indicating nearly all the individuals (97 to 98%) meet the requirement of a nutrient. The AI is used when sufficient data are not available to estimate the EAR and therefore the RDA. It is set at the level where all individuals meet or exceed the requirements, and is based on observed or experimentally determined approximations or estimates of nutrient intakes of healthy groups that are assumed to be adequate. The UL is the highest nutrient intake level that posses no risk for almost all the individuals. Each of the DRI values refers to the usual daily nutrient intake of healthy individuals over time. Nutrient recommendations are given for specific life stage groups and by gender if available.

The EAR, RDA, and AI values are defined by selected criteria for each nutrient (IMO, 2000a). For example, criterion of adequate calcium intake for most age groups is desirable calcium retention which is known to be related to a reduced risk of fracture in later life (IMO, 1997). Another example is that adequacy of protein is based on nitrogen equilibrium (IMO, 2002). The UL is defined by specific indicators of excessive intake, if they are available. For example, the UL for selenium is based on hair and nail brittleness and loss as the critical endpoints (IMO, 2000b).

The DRIs allow the calculation of the probability of adequacy for an individual as well as the prevalence of inadequacy for a population (IMO, 2000a). There are two general methods of assessing the prevalence of inadequate intake for groups: the probability approach and the EAR cut-point method. In this research, the EAR cut-point method, which is a simpler version of the probability approach, was used to assess the

adequacy of nutrient intake. The EAR method mainly requires two assumptions: intakes and requirements are independent, and the distribution of requirements is symmetrical.

The EAR cut-point method requires the usual intake distribution of a nutrient (IMO, 2000a). The observed intakes were adjusted by the NRC method in order to acquire the usual intake distribution (NRC, 1986). The nutrient intakes of the first day were adjusted to be usual intakes with the NRC formula:

Adjusted intake = (Observed intake – Mean intake)

x SD (inter-individual) / SD (observed) + Mean intake

Several steps were performed to acquire usual intake distribution. Firstly, the normality of the first day nutrient intakes was tested using PROC UNIVARIATE procedure in the SAS system, and if not normally distributed, log or square root transformation was used to achieve the normality of the distribution. P-value less than 0.05 in Shapiro-Wilk or Kolmogorov-Smirnov test was considered to be not normal. Secondly, SD (inter-individual) / SD (observed) was estimated using PROC MIXED in the SAS system with two repeated 24h-recalls conducted on non-consecutive days. Vitamin A, folate, vitamin D, and selenium intakes for girls in season 1 and vitamin A, folate, selenium, zinc, protein, omega-3 fatty acids and manganese intakes for boys in season 1 had zero for inter-individual variation. The NRC formula was not applied to these nutrients. Thirdly, these calculated values were applied to the formula. Finally, adjusted intake was transformed back to original units of measurement to facilitate interpretation of results. The percentage below the EAR as well as above the UL was calculated with the adjusted distribution. Nutrient intakes from supplements were not incorporated in the present research.

5-G) Description of anthropometry

The 2000 CDC Growth Charts were used as a reference for the anthropometric measurements. The 2000 Growth Charts were published by National Center for Chronic Disease Prevention and Health Promotion (CDC) in 2000 (CDC, 2003; Roberts and Dallal, 2001). They are a revised version of the 1977 Growth Charts which were developed by the National Center for Health Statistics (NCHS) as a clinical tool for health professionals to determine adequacy of growth of a child. The physical measurement data

from a series of large scale surveys in the United States, such as the National Health and Nutrition Examination Survey (NHANES), were used to construct the 2000 Growth Charts. The 2000 Growth Charts provide a tool for evaluating the adequacy of the growth of infants and children in clinical and research settings.

The 2000 Growth Charts include 16 age- and gender- specific charts: eight for boys and eight for girls (CDC, 2003; Roberts and Dallal, 2001). Weight-for-age, height for age, and BMI-for-age charts were used to assess physical growth of the children in this study as recommended by CDC. BMI-for-age is used as a screening tool for overweight and underweight children in this research. CDC recommends BMI-for-age cutoff values as follows:

BMI $\geq 95^{th}$ percentile --- overweight,
95^{th} > BMI $\geq 85^{th}$ percentile --- risk of overweight,
BMI < 5^{th} percentile --- underweight.

As Himes and Diets (1994) mentioned that there is not enough information to establish specific cutoff values for BMI in adolescence associated with increased health risks, these cutoff values for overweight are not based on health risks, and the values are for screening purposes.

However, obesity in childhood was reported to be related to increased risk factors for chronic diseases, such as hyperlipidemia, glucose intolerance, and hypertension, as well as psychosocial factors, such as parental neglect and behavioral and learning difficulties (Diets, 1998; CDC, 2003).

5-H) Food groups

Food groups were created in order to describe the quality and the patterns of the diet. Canada's Food Guide for Healthy Eating (CFGHE) and the tables with Health Canada recommended reasonable portion sizes and food groupings for about 5000 foods in the Canada's reference food composition database were referred to classify market food items (Health Canada, 2003)

CFGHE is a nutrition education tool for food selection and better nutritional health for Canadians (Health Canada, 2003). It consists of two pages. The first page displays four groups: grain products, vegetables and fruit, milk products, and meat and alternatives. Some pictures of foods and brief advice for each food group are given. The second page explains recommended serving sizes of each food group, and briefly describes the "other" food group, which is advised to be consumed in moderation. It also mentions that the amount of food which we need depends on age, body size, physical activity level, gender, and physiological state, such as pregnancy. CFGHE is a simple, helpful guide for food selection, although it does not give enough details for food grouping. Therefore, the tables with 5000 food items were also referred to the classification of market food groups.

The market food items were classified into five groups based on CFGHE and the tables: grains, dairy, fruit and vegetables, meat and alternatives, and "other" foods. The "other" food group contains food items such as butter, carbonated drink, coffee, mixed dishes, snacks, etc. The special interest of this study was in the use of fat and sugar rich food items and in mixed dishes. Therefore, three more groups were created: fat, sugar, and mixed dishes. The definitions of fat and sugar groups were as follows:

Fat group – food items where more than 40% of energy come from fat, and protein contributes less than 15% of energy

Sweet group – food items where more than 40% of energy come from sugar except for raw fruit, fruit juice, and vegetables

The food items rich in both fat and sugar were classified as fat or sugar group whichever was the higher. Since most of the food items in the "other" food group were categorized as fat or sweet or mixed dish group in this research, the rest of a small number of food items were classified under extra group. Table 5-H-1 lists market food groups used in this study and examples of food items in each food group.

Table 5-H-1 Market food groups and examples of food items in each food group

Food groups (total number of items)	Food items
Grains (n = 23)	Biscuits, Bread, Coffee cake, Cookies, Corn flakes, Crackers, Granola, Muffins, Egg noodles, Pancakes, Apple pie, Rice, Wheat flakes
Dairy (n = 10)	Cheddar cheese, Cottage cheese, Cheese sauce, Cream soup with milk, 2% milk, Evaporated milk, Skim milk, Whole Milk,
Fruit and vegetables (n = 35)	Apple, Apple juice(canned), Banana, Broccoli, Carrots, Sweet corn, Cucumbers, Grapefruit juice (unsweetened, canned), Lettuce, Mushrooms (canned), Onions, Orange, Orange juice, Peach, Pinapple, Green peas (frozen), Tomato soup
Meat and alternatives (n = 21)	Bacon (cured, canned), Beef (round, broiled), Corned beef (canned), Chicken (fryers), Eggs, Fishsticks (frozen), fish (fried), Peanut butter, Pork ham (canned), Smoked salmon, Pork (lean, roasted), Salami, Tuna (canned), Turkey (roasted), Boiled shrimp
Mixed dishes (n = 17)	Beef & vegetable stew (canned), Beef potpie (frozen), Chicken chow mein (canned), Frozen dinner, Gravy meat brown, Hash corned beef (canned), Macaroni cheese, Pizza, Spaghetti in tomato sauce with cheese (canned), Spaghetti with meat balls & tomato sauce,
Fat (n = 22)	Bannock[1], Butter, Chocolate milk candy, Canola oil, Corn oil, Cream cheese, Cream(half &half), Doughnuts, Fat (vegetable cooking), Frankfurters, French fries, Ice cream, Lard, Margarine, Mayonnaise, Olive oil, Potato chips, Pumpkin pie, Salad dressing (Italian), Salad dressing (mayonnaise type), Whipped cream
Sweet (n = 25)	Applesauce (sweetened, canned)[2], Cake (angelfood), Caramels, Catsup, Chocolate syrup, Cocoa mix, Cola, Fortified powdered drinks, Gelatin dessert, Gingerale, Honey, Jellies, Maple syrup, Milk shake, Peach (heavy syrup)[3], Pickle cucumber (sweet), Pinapple (heavy syrup)[4], Maple syrup, Sugar brown beet or cane, Sugar granulated beet or cane, Sunny Delight, Unfortified powdered drink,
Extra (n = 5)	Coffee, Popcorn, Soy sauce, Tea (unsweetened), Yellow mustard,

[1] 42% of energy as fat
[2] 66% of energy as sucrose (1.3 times higher energy content compared to raw apple)
[3] 88% of energy as sucrose (1.7 times higher energy content compared to raw peach)
[4] 67% of energy as sucrose (1.6 times higher energy content compared to raw pinapple)

5-I) Data analysis

Since nutrients and food intakes of interest in this study were not normally distributed, ANCOVA was performed after rank transformation of raw values (Conover et al, 1982). Food use (traditional food and market food) and nutrient intakes were compared against days with or without traditional food, seasons, gender, locations, and BMI categories. Several factors, such as day of the week and age, were adjusted for the comparisons. Tukey test was performed when significant difference was observed in

ANCOVA for an independent variable containing more than three categories (Zar, 1999). The alpha level of 0.05 was used for all the statistical tests. More conservative alpha level calculated by Bonferroni adjustment to alpha method was also used for ANCOVA (Jekel et al, 2001). The Bonferroni method is to simply divide 0.05 by the number of hypotheses tested. The data was analyzed with SAS, version 8.0 for windows (Cary, NC, 2002)

[6] Results

6-A) Participating communities

Five communities participated in the present research: Fort Mcpherson, Old Crow, Tulita, Fort Resolution, and Carcross (Figure 6-A-1). Table 6-A-1 shows the selected community variables. The participating communities vary in several ways. Fort Mcpherson has the greatest population followed by Fort Resolution, Tulita, Old Crow, and Carcross. Two languages, a Native language and English, are spoken in these communities. The southern communities, Tulita, Fort Resolution, Carcross, have year-round road access, while the northern communities, Fort Mcpherson, Old Crow, do not.

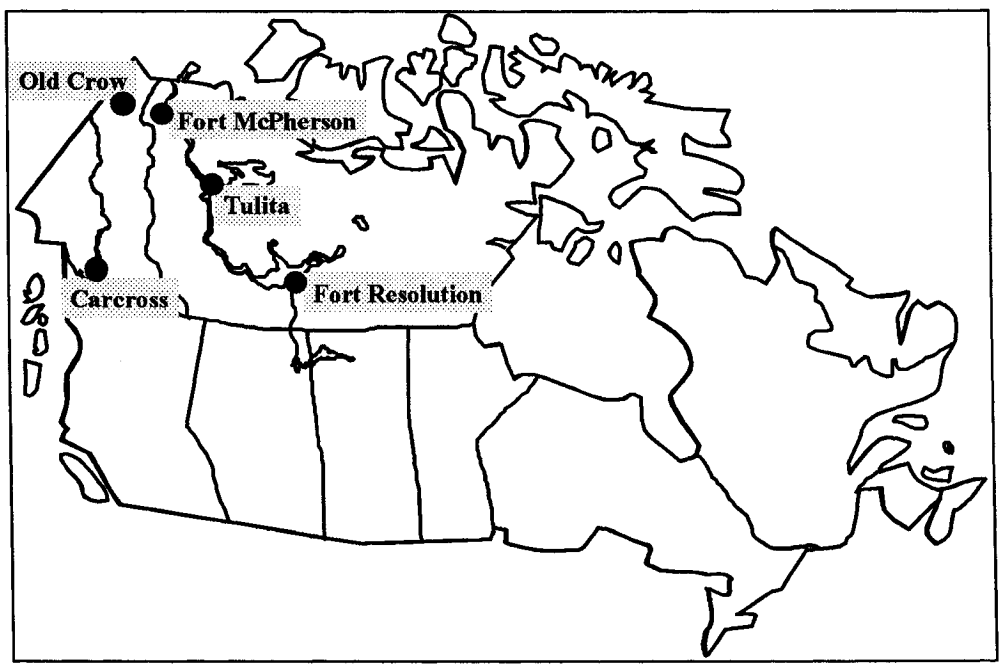

Figure 6-A-1 Five Dene/Métis and Yukon Communities

Table 6-A-1 Selected community variables

Participating communities	Territory	Latitude [1]	Population size (First Nation) [3]	Language [1]	Year-round road access [1,6]
Fort Mcpherson	NWT	67'26'N	910 (820)	Gwich'in, English	No*
Old Crow	Yukon	67'56'N [2]	278 (245) [4]	Gwich'in, English [5]	No [7]
Tulita	NWT	64'54'N	506 (456)	North Slavey, English	No
Fort Resolution	NWT	61'11'N	562 (513)	Chipewyan, English	Yes
Carcross	Yukon	60'16'N [2]	277 (197) [4]	Tagish, English [5]	Yes [7]

[1] Legislative Assembly of the Northwest Territories, 2003
[2] Industry Canada, 2003
[3] NWT Bureau of Statistics, 2003
[4] Fediuk, 2003
[5] Ethnologue.com, 2003
[6] "No" means no road access in summer, ice-road in winter, "No*" means that road access is shortly interrupted during freeze-up and break-up, "Yes" is for uninterrupted road access
[7] Government of Yukon, 2003

6-B) Participation

Table 6-B-1 shows the participation rates for 24h-recall interviews, anthropometric measurements, and food choice questionnaires. In a total of two seasons, the participation rates for 24h-recall interviews (81%) and anthropometic measurements (80%) were high, which means that these participants represented the total population of the communities. The main reasons for rejection or exclusion were due to physical, medical, or mental problems. The participation rate for women's food choice questionnaires (56%) was lower, although it may not be a concern in this research since the questionnaires were descriptive.

6-C) Anthropometry

6-C-1) Age and gender distribution

Table 6-C-1-1 shows the age and gender distribution of anthropometric measurements of Dene/Métis and Yukon children. Three anthropometric records were excluded because of missing weight. Height and weight measurements on 216 children were used for description and analysis of anthropomety.

Table 6-B-1 Participation rates for 24h-recall interviews, anthropometric measurements, and food choice questionnaires

	24h-Recalls % (n / total number of children[1])		Anthropometry % (n / total number of children[1])		Food choice questionnaires % (n / total number of women[2])
	Season 1	Season 2	Season 1	Season 2	Season 2
Fort Mcpherson	85 (35/ 41)	85 (34/ 40)	85 (35/ 41)	83 (33/ 40)	50 (17/ 34)
Old Crow	100 (11/ 11)	N/A (12/ N/A)	100 (11/ 11)	N/A (11/ N/A)	58 (7/ 12)
Tulita	61 (22/ 36)	73 (29/ 40)	61 (22/ 36)	70 (28/ 40)	-[4]
Fort Resolution	89 (32/ 36)	90 (36/ 40)	89 (32/ 36)	90 (36/ 40)	57 (20/35)
Carcross	83 (5/ 6)	N/A (6/ N/A)	83 (5/ 6)	N/A (6/ N/A)	83 (5/6)
Total per season	78 (105/131)	82 (99/120)[3]	80 (105/131)	81 (97/120)[3]	56 (49/87)[5]
Total of 2 seasons	81 (204/251)[3]		80 (202/251)[3]		

[1] Children aged ten to twelve years

[2] The women were the children's mothers

[3] Old Crow and Carcross were excluded

[4] Participation was not asked

[5] Tulita was excluded

Table 6-C-1-1 Age and gender distribution of anthropometric measurements of Dene/Métis and Yukon children

Age (y)	Boys		Girls		Total
	Season 1 (n=40)	Season 2 (n=51)	Season 1 (n=62)	Season 2 (n=63)	
10	11	23	27	20	81
11	15[1]	13	22	28	76
12	17[2]	15	13	15	59
Total per gender	94		125		216

[1] Two boys were excluded because of missing data
[2] One boy was excluded because of missing data

6-C-2) Description of anthropometry

Table 6-C-2-1 shows mean, standard deviation, and median for weight, height, and body mass index (BMI) of Dene/Métis and Yukon children by gender and age compared to the 2000 CDC Growth Charts. Mean and median values of Dene/Métis and Yukon children for weight and height exceeded the corresponding values of the Growth Charts. In addition, mean and median BMI values of subjects appeared to be higher than the reference population.

Table 6-C-2-2 shows mean, standard deviation, and median of z-scores for height-for-age, weight-for-age, and BMI-for-age by gender and age. This is another way to compare anthropometric measures with a reference population. Values were all positive for Dene/Métis and Yukon children, indicating values higher than the reference.

Table 6-C-2-3 shows percent of Dene/Métis and Yukon children in underweight, normal weight, risk of overweight, and overweight categories of the 2000 CDC Growth Charts. In both seasons, underweight was less prevalent, but risk of overweight and especially overweight were more prevalent than the CDC children. The percent of overweight children was similar between girls and boys. The percent of children at risk of overweight was higher among girls than boys. Boys in the season 1 had less percent for risk of overweight than the CDC boys.

Table 6-C-2-1 Mean (X), standard deviation (SD), and median (MD) for weight, height, and body mass index (BMI) of Dene/Métis and Yukon children by gender and age compared to the 2000 CDC Growth Charts

Gender/ Age group	Weight (Kg)						Height (cm)						BMI (Kg/m2)					
	Dene/Métis and Yukon				2000 CDC		Dene/Métis and Yukon				2000 CDC		Dene/Métis and Yukon				2000 CDC	
	n	X	SD	MD	X = MD	SD	n	X	SD	MD	X = MD	SD	n	X	SD	MD	X = MD	SD
Boys																		
10	34	38.9	11.5	34.1	33.7	7.7	34	143.8	6.4	142.2	140.9	6.8	34	18.7	4.4	17.0	16.9	2.7
11	26	45.4	15.6	39.5	37.9	9.0	28	148.3	8.4	146.8	145.9	7.3	26	20.1	4.2	18.6	17.5	2.9
12	31	47.1	9.2	43.9	42.8	10.2	32	154.1	8.5	152.8	152.1	7.7	31	19.8	4.0	18.6	18.1	3.1
Girls																		
10	47	39.6	10.7	36.8	34.8	8.5	47	142.7	7.2	144.0	140.5	7.1	47	19.2	3.9	17.6	17.1	3.1
11	50	47.4	12.0	46.5	39.2	9.8	50	150.8	6.6	151.1	147.2	7.4	50	20.7	4.5	20.0	17.7	3.4
12	28	51.4	15.7	49.4	43.6	10.7	28	156.0	8.7	156.7	154.3	7.1	28	20.8	4.9	19.8	18.4	3.5

Table 6-C-2-2 Mean (X), standard deviation (SD), and median (MD) of z-scores for height-for-age (HAZ), weight-for-age (WAZ), and BMI-for-age by gender and age[1]

Gender/ Age group	HAZ				WAZ				BMI-for age			
	n	X	SD	MD	n	X	SD	MD	n	X	SD	MD
Boys												
10	34	0.77	0.95	0.53	34	0.70	0.94	0.35	34	0.36	1.18	0.17
11	28	0.66	1.13	0.46	26	0.77	1.08	0.48	26	0.66	0.10	0.56
12	32	0.66	1.12	0.50	31	0.58	0.82	0.40	31	0.44	0.91	0.33
Girls												
10	47	0.67	1.06	0.88	47	0.61	1.11	0.55	47	0.53	1.03	0.32
11	50	0.92	0.91	0.97	50	0.85	1.14	1.02	50	0.64	1.27	0.83
12	28	0.66	1.18	0.75	28	0.68	1.10	0.79	28	0.55	0.90	0.56

[1] The 2000 CDC Growth Charts were used as the reference

Table 6-C-2-3 Percent of Dene/Métis and Yukon children in underweight, normal weight, risk of overweight, and overweight categories of the 2000 CDC Growth Charts

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

6-D) Nutrient intake

6-D-1) Dietary 24h-recalls

Table 6-D-1-1 shows the number of 24h-recalls and repeated 24h-recalls on Dene/Métis and Yukon children for data analysis. A record which showed daily energy intake below 500 kcal or below 1000 kcal for sick individuals were considered an unusual dietary intake, and the record was excluded from data analysis. In total, three records were excluded. Finally, 409 24h-recalls were used for data analysis. Ninety-one percent of the children had two repeated recalls of which 65% were conducted on consecutive days and 35% were on non-consecutive days.

6-D-2) Adequacy of nutrient intake

Table 6-D-2-1 and Table 6-D-2-2 show the median usual nutrient intake of Dene/Métis and Yukon girls and boys 10-12 years of age, respectively, the DRIs, and percent below the EAR and above the UL. Twenty nutrients from the diet were compared to the DRI values.

Table 6-D-1-1 Number of 24h-recalls and repeated 24h-recalls on Dene/Métis and Yukon children

	Season 1 (n=194)				Season 2 (n=215)			
	Girls (n=119)		Boys (n=75)		Girls (n=123)		Boys (n=92)	
	24h-recall (n=62)	Repeated (n=57)	24h-recall (n=43)	Repeated (n=32)	24h-recall (n=66)	Repeated (n=57)	24h-recall (n=51)	Repeated (n=41)
Fort Mcpherson	15	13	20[1]	13	21	18	13	13
Tulita	15	15	7[1]	3	15	13	14	7
Fort Resolution	18	16	14	14	16	15	20[1]	17
Old Crow	9	8	2	2	10	8	2	2
Carcross	5	5	0	0	4	3	2	2
Total of 2 seasons	409							

[1] One record was excluded

Less than 10% of the children had intakes below the EAR for carbohydrate, protein (girls in season 1, boys in season 2), iron, copper, vitamin C (girls in season 1, boys), riboflavin(girls in season 2, boys), vitaminB6, selenium (girls and boys in season 2), and zinc (girls in season 1). These nutrients exceeded the RDA even at the 25th percentile of intake. Mean value of manganese exceeded the AI.

For folic acid, 32% of girls in season 2 and 29% of boys in season 2, for zinc, 35% of girls in season 2 and 22% of boys in season 2, for protein, 23 % of girls in season 2, for vitamin C, 17% of girls in season 2, for riboflavin, 11% of girls in season 1, for phosphorus, 44% of boys in season 1, and for magnesium, 48% of girls in season 1 and 40-45% of boys had intakes below the EAR. More than 50% of the children had intakes below the EAR for magnesium (girls in season 2), phosphorus (girls, boys in season 2), vitamin A(girls and boys in season 2), and especially vitamin E. Mean values of calcium, vitamin D, dietary fiber, omega-6 fatty acids, and omega-3 fatty acids were below the AI. Table 6-D-2-5 summarizes the results of nutrient intake of the children from the diet. None of the nutrients having the UL values were more than 1 % above the UL for girls. Zinc in season 2 and copper had small percent above the UL for boys.

A possible underestimation or overestimation of fiber intake of the present study when compared to the DRI values may have occurred because of differences in the definition of fiber between the DRIs and the databases used in the present research. In addition, fiber intake from only market food was compared to the DRI values.

Recommendations for nutrient intake are generally set to provide adequate nutrition (IMO, 2002). However, this does not fit for energy since excess energy intake results in weight gain. The Estimated Energy Requirement (EER) is defined as the dietary energy intake that is predicted to maintain energy balance in healthy, normal weight individuals of a defined age, gender, weight, height, and level of physical activity consistent with good health. The EER could not be estimated since habitual physical activity information which is required for the calculation of the EER was not available.

Instead, the usual energy intake of each child was compared to energy intake to maintain normal body size by all the activity levels. The normal body size is defined as between the 5th and 85th percentiles of BMI-for-age by CDC (CDC, 2003). Table 6-D-2-6 shows percent of the children with usual energy intake below the 5th percentile level,

between the 5th and 85th percentile levels, and above the 85th percentile level by each activity level. A large percent of the children fell below or above the adequate energy intake levels at any activity level. It was seen that although anthropometric data showed that less than 5% of Dene/Métis and Yukon children were underweight category (Table 6-C-2-3), more than 25% of the children consumed energy below the lowest energy intake level to maintain normal body weigh at any physical activity level.

Table 6-D-2-1 Median usual nutrient intakes of Dene/Métis and Yukon girls 10-12 years of age in season 1, DRIs, and percent below EAR[1] and above UL[2]

	Median (25th, 75th percentiles)	EAR	AI[3]	RDA[4]	UL	Percent <EAR	Percent >UL
Energy	1707 (1443, 2210)	NA	-	-	-	-	-
Carbohydrate (g)	235 (182, 301)	100	-	130	-	3.0	-
Protein (g/d)	69 ± 25[6]	-	34[8]	-	-	-	-
Protein (g/kg/d)	1.5 (1.1, 2.1)	0.76	-	0.95	-	8.1	-
Vitamin A(μg, RAE)	397 (271, 625)[14]	420	-	600	1700[10]	-[15]	-
Iron (mg)	14 (12, 17)	5.7	-	8.0	40	0.0	< 1.0
Zinc (mg)	9.7 (8.8, 11)	7.0	-	8.0	23	4.8	< 1.0
Copper (μg)	1062 (945, 1355)	540	-	700	5000	0.0	< 1.0
Calcium (mg)	665 ± 361[6]	-	1300	-	2500	-	< 1.0
Magnesium (mg)	202 (150, 247)	200	-	240	350[11]	48	UK[13]
Phosphorus (mg)	955 (793, 1192)	1055	-	1250	4000	65	< 1.0
Vitamin D (μg)	4.0 ± 5.0[6, 14]	-	5	-	50	-	-
Vitamin E (mg)[5]	3.1 (2.4, 4.2)	9	-	11	600	100	UK
Vitamin C (mg)	117 (69, 152)	39	-	45	1200	8.1	< 1.0
Folic acid (μg, DFE)	277 (182, 453)[14]	250	-	300	600	-[15]	UK
Riboflavin (mg)	1.3 (1.1, 1.7)	0.8	-	0.9	NA[12]	11	NA
Vitamin B6 (mg)	1.9 (1.2, 2.4)	0.8	-	1.0	60	8.1	< 1.0
Dietary fiber (g)	11 ± 4.7[6,7]	-	31[9]	-	-	-	-
Selenium (μg)	65 (49, 88)[14]	35	-	40	280	-[15]	-
Manganese (μg)	2.1 ± 0.9[6]	-	1.6	-	-	-	-
n-6 (g)	7.7 ± 4.5[6]	-	10	-	-	-	-
n-3 (g)	0.9 ± 0.4[6]	-	1.0	-	-	-	-

[1] EAR = Estimated Average Requirement
[2] UL = Tolerable Upper Intake Level
[3] AI = Adequate intake
[4] RDA = Recommended Dietary Allowance
[5] α-tocopherol
[6] Mean ± SD
[7] Intakes refer only to dietary fiber in market food
[8] Based on 0.8g protein/kg body weight for reference body weight
[9] Total fiber = dietary fiber + functional fiber
Dietary fiber: nondigestible carbohydrates and lignin that are intrinsic and intact in plants
Functional fiber: isolated, nondigestible carbohydrates that have beneficial physiological effects in humans
[10] Preformed vitamin A only
[11] UL for magnesium applies to supplements only
[12] NA = not applicable
[13] UK = unknown because the UL applies only to intakes from supplements (magnesium) or from supplemental and fortification sources (folate and vitamin E)
[14] Intakes are not adjusted to usual intakes
[15] Estimation is not performed because intakes are not adjusted to usual intakes

Table 6-D-2-2 Median usual nutrient intakes of Dene/Métis and Yukon girls 10-12 years of age in season 2, DRIs, and percent below EAR[1] and above UL[2]

	Median (25th, 75th percentiles)	EAR	AI[3]	RDA[4]	UL	Percent <EAR	Percent >UL
Energy	1682 (1412, 1966)	NA	-	-	-	-	-
Carbohydrate (g)	237 (202, 279)	100	-	130	-	0.0	-
Protein (g/d)	63 ± 24[6]	-	34[8]	-	-	-	-
Protein (g/kg/d)	1.4 (1.0, 2.0)	0.76	-	0.95	-	23	-
Vitamin A(μg, RAE)	387 (295, 478)	420	-	600	1700[10]	62	< 1.0
Iron (mg)	13 (10, 15)	5.7	-	8.0	40	0.0	< 1.0
Zinc (mg)	8.4 (6.3, 9.7)	7.0	-	8.0	23	35	< 1.0
Copper (μg)	1045 (850, 1298)	540	-	700	5000	1.5	< 1.0
Calcium (mg)	574 ± 305[6]	-	1300	-	2500	-	< 1.0
Magnesium (mg)	173 (145, 220)	200	-	240	350[11]	71	UK[13]
Phosphorus (mg)	890 (650, 1166)	1055	-	1250	4000	70	< 1.0
Vitamin D (μg)	2.4 ± 2.4[6]	-	5	-	50	-	-
Vitamin E (mg)[5]	2.8 (2.1, 3.4)	9	-	11	600	100	UK
Vitamin C (mg)	100 (52, 150)	39	-	45	1200	17	< 1.0
Folic acid (μg, DFE)	310 (228, 408)	250	-	300	600	32	UK
Riboflavin (mg)	1.2 (1.0, 1.6)	0.8	-	0.9	NA[12]	6.1	NA
Vitamin B6 (mg)	1.5 (1.2, 1.9)	0.8	-	1.0	60	4.6	< 1.0
Dietary fiber (g)	9.5 ± 1.0[6,7]	-	31[9]	-	-	-	-
Selenium (μg)	70 (56, 86)	35	-	40	280	0.0	< 1.0
Manganese (μg)	2.1 ± 0.9[6]	-	1.6	-	-	-	-
n-6 (g)	7.4 ± 3.7[6]	-	10	-	-	-	-
n-3 (g)	0.7 ± 0.2[6]	-	1.0	-	-	-	-

[1] EAR = Estimated Average Requirement
[2] UL = Tolerable Upper Intake Level
[3] AI = Adequate intake
[4] RDA = Recommended Dietary Allowance
[5] α-tocopherol
[6] Mean ± SD
[7] Intakes refer only to dietary fiber in market food
[8] Based on 0.8g protein/kg body weight for reference body weight
[9] Total fiber = dietary fiber + functional fiber
Dietary fiber: nondigestible carbohydrates and lignin that are intrinsic and intact in plants
Functional fiber: isolated, nondigestible carbohydrates that have beneficial physiological effects in humans
[10] Preformed vitamin A only
[11] UL for magnesium applies to supplements only
[12] NA = not applicable
[13] UK = unknown because the UL applies only to intakes from supplements (magnesium) or from supplemental and fortification sources (folate and vitamin E)

Table 6-D-2-3 Median usual nutrient intakes of Dene/Métis and Yukon boys 10-12 years of age in season 1, DRIs, and percent below EAR[1] and above UL[2]

	Median (25th, 75th percentiles)	EAR	AI[3]	RDA[4]	UL	Percent < EAR	Percent > UL
Energy	1805 (1561, 2242)	NA	-	-	-	-	-
Carbohydrate (g)	221 (195, 321)	100	-	130	-	0.0	< 1.0
Protein (g/d)	78 ± 36[6, 14]	-	34[8]	-	-	-	-
Protein (g/kg/d)	1.7 (1.2, 2.2)[14]	0.76	-	0.95	-	-[15]	-[15]
Vitamin A (μg, RAE)	432 (279, 580)[14]	445	-	600	1700[10]	-[15]	-[15]
Iron (mg)	15 (13, 16)	5.9	-	8.0	40	0.0	< 1.0
Zinc (mg)	9.0 (7.1, 12)[14]	7.0	-	8.0	23	-[15]	-[15]
Copper (μg)	1108 (928, 1308)	540	-	700	5000	0.0	1.1
Calcium (mg)	722 ± 271[6]	-	1300	-	2500	-	
Magnesium (mg)	207 (170, 230)	200	-	240	350[11]	40	UK[13]
Phosphorus (mg)	1084 (996, 1222)	1055	-	1250	4000	44	< 1.0
Vitamin D (μg)	3.8 ± 2.6[6]	-	5	-	50	-	-
Vitamin E (mg)[5]	1.0 (0.8, 1.2)	9	-	11	600	100	UK
Vitamin C (mg)	89 (52, 136)	39	-	45	1200	4.7	< 1.0
Folic acid (μg, DFE)	295 (183, 422)[14]	250	-	300	600	-[15]	UK
Riboflavin (mg)	1.4 (1.1, 1.7)	0.8	-	0.9	NA[12]	0.0	NA
Vitamin B6 (mg)	1.9 (1.5, 2.4)	0.8	-	1.0	60	4.7	< 1.0
Dietary fiber (g)	9.6 ± 3.9[6,7]	-	26[9]	-	-	-	-
Selenium (μg)	69 (50, 91)[14]	35	-	40	280	-[15]	-[15]
Manganese (μg)	2.2 ± 1.2[6, 14]	-	1.9	-	-	-	-
n-6 (g)	8.4 ± 5.3[6]	-	12	-	-	-	-
n-3 (g)	1.1 ± 0.6[6, 14]	-	1.2	-	-	-	-

[1] EAR = Estimated Average Requirement
[2] UL = Tolerable Upper Intake Level
[3] AI = Adequate intake
[4] RDA = Recommended Dietary Allowance
[5] α-tocopherol
[6] Mean ± SD
[7] Intakes refer only to dietary fiber in market food
[8] Based on 0.8g protein/kg body weight for reference body weight
[9] Total fiber = dietary fiber + functional fiber
Dietary fiber: nondigestible carbohydrates and lignin that are intrinsic and intact in plants
Functional fiber: isolated, nondigestible carbohydrates that have beneficial physiological effects in humans
[10] Preformed vitamin A only
[11] UL for magnesium applies to supplements only
[12] NA = not applicable
[13] UK = unknown because the UL applies only to intakes from supplements (magnesium) or from supplemental and fortification sources (folate and vitamin E)
[14] Intakes are not adjusted to usual intakes
[15] Estimation is not performed because intakes are not adjusted to usual intakes

Table 6-D-2-4 Median usual nutrient intakes of Dene/Métis and Yukon boys 10-12 years of age in season 2, DRIs, and percent below EAR[1] and above UL[2]

	Median (25th, 75th percentiles)	EAR	AI[3]	RDA[4]	UL	Percent < EAR	Percent > UL
Energy	1999 (1655, 2381)	NA	-	-	-	-	-
Carbohydrate (g)	283 (254, 320)	100	-	130	-	0.0	< 1.0
Protein (g/d)	70 ± 16[6]	-	34[8]	-	-	-	-
Protein (g/kg/d)	1.6 (1.4, 2.0)	0.76	-	0.95	-	0.0	-
Vitamin A (μg, RAE)	411 (295, 512)	445	-	600	1700[10]	65	< 1.0
Iron (mg)	17 (14, 20)	5.9	-	8.0	40	0.0	< 1.0
Zinc (mg)	9.3 (7.2, 12)	7.0	-	8.0	23	22	3.9
Copper (μg)	1272 (1010, 1545)	540	-	700	5000	0.0	1.1
Calcium (mg)	796 ± 325[6]	-	1300	-	2500	-	
Magnesium (mg)	205 (163, 265)	200	-	240	350[11]	45	UK[13]
Phosphorus (mg)	1034 (872, 1380)	1055	-	1250	4000	55	< 1.0
Vitamin D (μg)	2.5 ± 0.1[6]	-	5	-	50	-	-
Vitamin E (mg)[5]	3.3 (2.0, 4.6)	9	-	11	600	100	UK
Vitamin C (mg)	114 (62, 166)	39	-	45	1200	5.9	< 1.0
Folic acid (μg, DFE)	329 (240, 455)	250	-	300	600	29	UK
Riboflavin (mg)	1.5 (1.3, 1.7)	0.8	-	0.9	NA[12]	0.0	NA
Vitamin B6 (mg)	1.9 (1.6, 2.3)	0.8	-	1.0	60	0.0	< 1.0
Dietary fiber (g)	11 ± 2.1[6,7]	-	26[9]	-	-	-	-
Selenium (μg)	76 (54, 95)	35	-	40	280	7.8	< 1.0
Manganese (μg)	2.5 ± 1.0[6]	-	1.9	-	-	-	-
n-6 (g)	8.8 ± 4.7[6]	-	12	-	-	-	-
n-3 (g)	1.1 ± 0.3[6]	-	1.2	-	-	-	-

[1] EAR = Estimated Average Requirement
[2] UL = Tolerable Upper Intake Level
[3] AI = Adequate intake
[4] RDA = Recommended Dietary Allowance
[5] α-tocopherol
[6] Mean ± SD
[7] Intakes refer only to dietary fiber in market food
[8] Based on 0.8g protein/kg body weight for reference body weight
[9] Total fiber = dietary fiber + functional fiber
Dietary fiber: nondigestible carbohydrates and lignin that are intrinsic and intact in plants
Functional fiber: isolated, nondigestible carbohydrates that have beneficial physiological effects in humans
[10] Preformed vitamin A only
[11] UL for magnesium applies to supplements only
[12] NA = not applicable
[13] UK = unknown because the UL applies only to intakes from supplements (magnesium) or from supplemental and fortification sources (folate and vitamin E)

Table 6-D-2-5 Summary of adequacy of nutrient intake of Dene/Métis and Yukon children 10-12 years of age from diet only

Probably inadequate : ≥ 50% of population below EAR / mean value below AI	Possibly adequate : ≥ 10% - <50% of population below EAR	Probably adequate : < 10% of population below EAR / mean value above AI
● Vitamin A (girls and boys in season 2) ● Vitamin E ● Magnesium (girls in season 2) ● Phosphorus (girls, boys in season 2) ● Calcium ● Vitamin D ● Dietary fiber ● n-6 ● n-3	● Folate (girls and boys in season 2) ● Zinc (girls and boys in season 2) ● Magnesium (girls in season 1, boys) ● Vitamin C (girls in season2) ● Protein (girls in season 2) ● Phosphorus(boys in season 1) ● Riboflavin(girls in season a)	● Carbohydrate ● Iron ● Copper ● Selenium (girls and boys in season 2) ● Riboflavin (girls in season 2, boys) ● Vitamin B6 ● Vitamin C (girls in season 1, boys) ● Zinc (girls in season 1) ● Protein (girls in season 1, boys in season 2) ● Manganese

Table 6-D-2-6 Percent of the children with usual energy intake below 5th percentile[2], between 5th and 85th percentiles[2], and above 85th percentile[2] by each activity level

PA[1]	Girls (n=125)			Boys (n=91)		
	< 5th percentile	≥ 5th and < 85th percentile	≥85th percentile	< 5th percentile	≥5th and < 85th percentile	≥85th percentile
Sedentary	34	13	54	25	33	42
Low active	55	15	30	52	22	26
Active	73	9	19	67	18	15
Very active	88	4	8	85	9	7

[1] PA=Physical Activity

[2] Estimated from the following equations for each child (IOM, 2002):
Girls: EER = 135.3 - 30.8 * age[y] + PA * (10.0 * Weight[kg] + 934 * Height[m]) + 25
Boys: EER = 88.5 – 61.9 * age[y] + PA * (26.7 * Weight[kg] + 903 * Height[m]) + 25
Weight was calculated for 5th and 85th percentile of BMI-for-age by the CDC Growth Charts.
PA values were given for each activity level category:
PA (Sedentary) = 1.00 for girls and boys
PA (Low active) = 1.16 for girls and 1.13 for boys
PA (Active) = 1.31 for girls and 1.26 for boys
PA (Very active) = 1.56 for girls and 1.42 for boys

6-D-3) Macronutrient intake

Table 6-D-3-1 and Table 6-D-3-2 show macronutrient intakes as a percent of total energy and percent of Dene/Métis and Yukon children out of Acceptable Macronutrient Distribution Ranges (AMDRs) for children 4 to 18 years of age. AMDRs were set for individuals based on evidence to suggest a role in chronic disease and based on information ensuring sufficient intakes of essential nutrients (IMO, 2002). The

consumption out of these ranges indicates a possibility for increasing the risk of chronic diseases as well as increasing the risk of insufficient intakes of essential nutrients.

For carbohydrate, more than 20% of the children, and for fat, more than 30% were out of the ranges. Most of the children were observed in the range for protein intake. A high percentage of children were out of the ranges for omega-6 fatty acids and omega-3 fatty acids.

Added sugar is defined as sugars and syrups that are added to foods during processing or preparation. Lower micronutrient densities of foods rich in added sugar, such as soft drinks and cakes, were reported compared to foods rich in naturally occurring sugars, such as fruit and fresh juice. No more than 25% of energy intake from added sugar is recommended (IOM, 2002). Total sugar intake shown in the Table 6-D-3-1 and Table 6-D-3-2 included both added sugar and naturally occurring sugars, and more than 30% of the children were found to exceed 25% for total sugar intake. However, there is a possibility for overestimation of the children above 25% sugar intake.

Higher saturated fat intake is a known risk factor of chronic diseases for adults. Although IOM recommends minimizing saturated fat intake, it does not set a recommended level of intake (IOM, 2002). When compared to the Recommended Nutrient Intake (RNI): no more than 10% of energy from saturated fat (Health Canada, 1990), more than 60% of the children exceeded the recommendation for saturated fat intake.

Table 6-D-3-1 Mean macronutrient intakes as a percent of total energy in season 1 and percent of Dene/Métis and Yukon children out of Acceptable Macronutrient Distribution Ranges (AMDRs) for children 4 – 18 years of age

Energy source	Girls (n = 62)		Boys (n = 43)		AMDRs for children 4 – 18 years of age [1]
	Mean	Out of range (below, above)	Mean	Out of range (below, above)	
Carbohydrate	55	33 (18, 15)	51	26 (21, 5)	45 – 65
Protein	15	11 (11, 0)	16	14 (12, 2)	10 – 30
Fat	31	44 (21, 23)	34	65 (14, 51)	25 – 35
n-6	3.7	82 (82, 0)	3.6	79 (79, 0)	5 – 10
n-3	0.5	81 (81, 2)	0.5	65 (63, 2)	0.6 – 1.2
Total sugar	24	42 [2]	22	26 [2]	-
Saturated fat	11	66 [3]	13	79 [3]	-

[1] IOM, 2002
[2] Percent of children total sugar intake at and above 25%
[3] Percent of children saturate fat intake at and above 10%

Table 6-D-3-2 Mean macronutrient intakes as a percent of total energy in season 2 and percent of Dene/Métis and Yukon children out of Acceptable Macronutrient Distribution Ranges (AMDRs) for children 4 – 18 years of age

Energy source	Girls (n = 66)		Boys (n = 51)		AMDRs for children 4 – 18 years of age [1]
	Mean	Out of range (below, above)	Mean	Out of range (below, above)	
Carbohydrate	57	19 (5, 14)	58	20 (6, 14)	45 – 65
Protein	15	8 (8, 0)	14	2 (2, 0)	10 – 30
Fat	30	27 (15, 12)	30	56 (28, 28)	25 – 35
n-6	3.8	85 (85, 0)	3.7	78 (78, 0)	5 – 10
n-3	0.4	95 (95, 0)	0.5	73 (73, 0)	0.6 – 1.2
Total sugar	25	42 [2]	23	37 [2]	-
Saturated fat	11	56 [3]	11	63 [3]	-

[1] IOM, 2002
[2] Percent of children total sugar intake at and above 25%
[3] Percent of children saturate fat intake at and above 10%

6-E) Supplement use

Figure 6-E-1 shows the supplement use as percent of the total children. The supplement use was reported by 56 children (26 from girls and 30 from boys) accounting for a quarter of the total number of children (n=222).

Figure 6-E-2 shows the types of supplements reported by Dene/Métis and Yukon children as percent of the total supplement users. The reported supplements were grouped into six types: not specified, vitamins only, minerals only, vitamins/minerals, cod liver oil, and no answer. Not specified group included supplements, such as mentioned as "chewable" which is too generic to classify it into a group. Vitamins/minerals group included brands, such as "Flintstones" and "Pokemon". Vitamins only group included vitamins, such as vitamin B, vitamin C, and vitamin D. Calcium was the only mineral reported to minerals only group.

Vitamins/minerals group was most frequently mentioned (32%) by the children, followed by not specified (25%), vitamins only (23%), no answer (16%), cod liver oil (2%), and minerals only (2%). More than 50% of vitamins/minerals group reported a daily supplement use and 30% reported supplement use as once a week. Almost a half of vitamins only group reported a daily supplement use, followed by supplement use as less than a week (15%), once a week (15%), and once in a while (15%). One third of not specified group mentioned daily supplement use, and 40% reported supplement use as once a week. Supplement contents were not considered in nutrient analysis of the 24h-recalls.

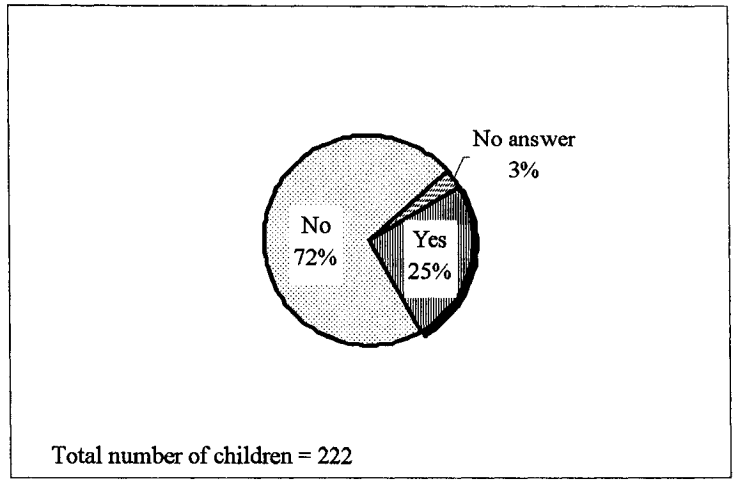

Figure 6-E-1 Supplement use of Dene/Métis and Yukon children as percent of the total children

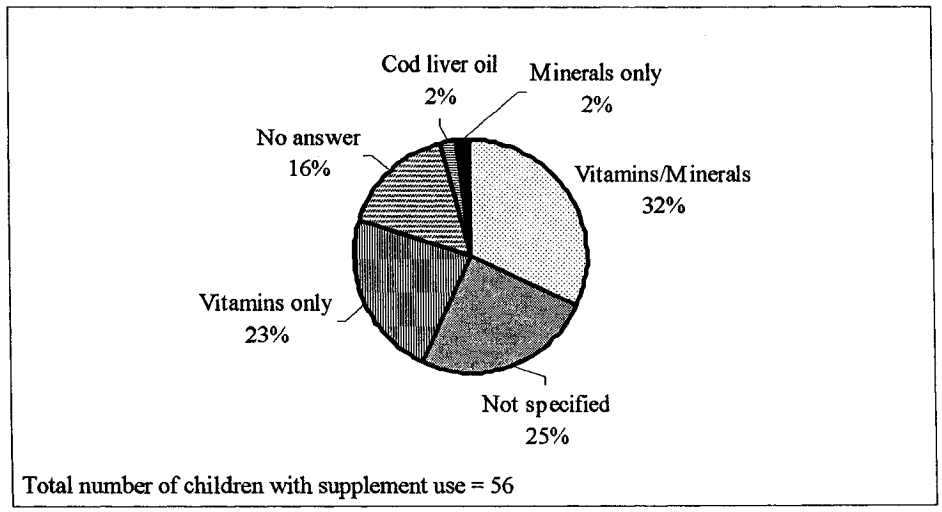

Figure 6-E-2 Types of supplements reported by Dene/Métis and Yukon children as percent of the total supplement users

6-F) Food use

6-F-1) Traditional food use

Figure 6-F-1-1 shows traditional food intake as percent of total energy of Dene/Métis and Yukon children in total, by season, gender, and community, and Figure 6-F-1-2 shows traditional food intake grams per day. Thirty-six percent (n =148) of all the 24h-recalls (n =409) contained at least one traditional food item. On average, 43g of traditional food that was consumed on a daily basis, contributed 4.3% of the total energy intake of the children. Traditional food was consumed more in season 2 and among girls,

but the differences were not remarkable compared to the differences among communities. The highest consumption was reported in Old Crow, followed by Fort Mcpherson, Tulita, Fort Resolution, and Carcross. Traditional food was found to be consumed more in northern Dene/Métis communities than southern Dene/Métis communities.

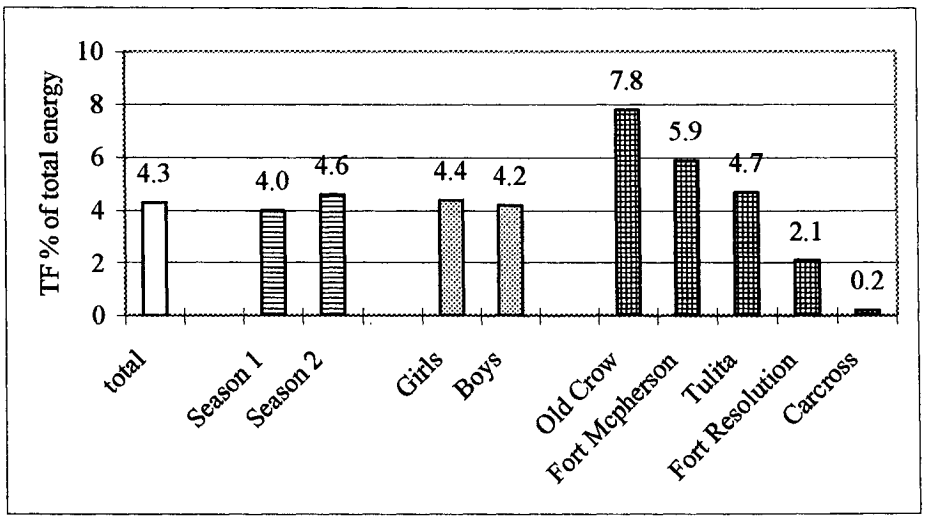

Figure 6-F-1-1 Traditional food (TF) intake as percent of total energy of Dene/Métis and Yukon children in total, by season, gender, and community

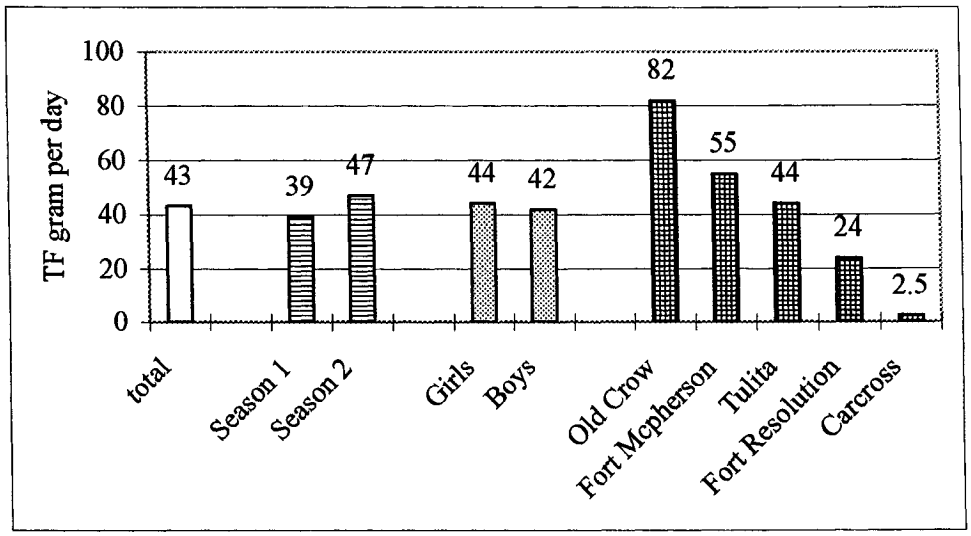

Figure 6-F-1-2 Traditional food (TF) intake (g/day) of Dene/Métis and Yukon children in total, by season, gender, and community

Figure 6-F-1-3 presents traditional food groups as percent of total energy from traditional food consumed by Dene/Métis and Yukon children. Traditional food items were classified into four groups: land animals, fish, birds, and berries. Most of the energy

intake came from land animals (87%), followed by fish (9%), birds (2%), and berries (2%).

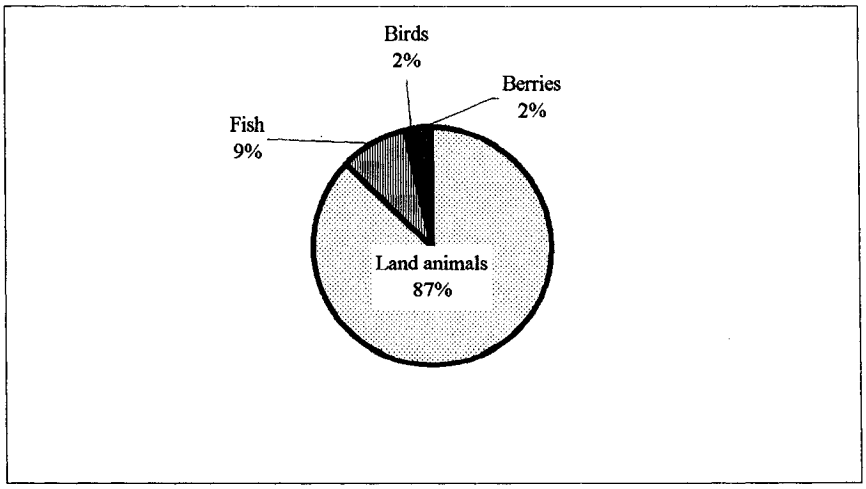

Figure 6-F-1-3 Traditional food (TF) groups as percent of total energy from TF consumed by Dene/Métis and Yukon children (all recalls)

Table 6-F-1-1 lists traditional food items mentioned in 24h recalls, percent of the recalls with each traditional food item, and percent of energy from traditional food. In total, 28 traditional food items were reported. The frequently mentioned species were caribou, moose, and whitefish, and accounted for 70% of total energy intake from traditional food, 15%, and 10%, respectively.

Table 6-F-1-1 Traditional food (TF) items mentioned in 24h recalls, percent of the recalls with each TF item, and percent of energy from TF

	Species	Part	Preparation	% of 24h recalls	% of energy
1	CARIBOU	FLESH	FRIED	28	26
2	CARIBOU	MEAT	BOILED	24	24
3	MOOSE	FLESH	FRIED	6.4	5.4
4	MOOSE	FLESH	BOILED	6.4	7.6
5	CARIBOU	MEAT	DRIED	5.9	6.8
6	CARIBOU	RIBS	COOKED	5.5	4.7
7	CARIBOU	FAT	RAW	3.5	4.0
8	WHITEFISH	FLESH	BAKED	2.5	2.7
9	WHITEFISH	FLESH	FRIED	2.5	2.4
10	CARIBOU	HEART	COOKED	2.0	1.6
11	CARIBOU-B	FLESH	BAKED	1.5	2.0
12	WHITEFISH	FLESH	SMOKED/DRIED	1.5	5.3
13	MOOSE	FLESH	ROASTED	1.5	1.6
14	DUCK	FLESH	BOILED	1.0	0.6
15	BISON	FLESH	COOKED	1.0	0.3
16	LAKE TROUT	FLESH	BOILED	1.0	0.7
17	BLACKBERRIES	BERRIES	RAW	0.5	0.3
18	BLUEBERRIES	BERRY	RAW	0.5	0.1
19	INCONNU	FLESH	SMOKE/DRIED	0.5	0.3
20	MOOSE	FLESH	BAKED	0.5	0.5
21	RABBIT (ARCTIC HARE)	FLESH	BOILED	0.5	0.1
22	CRANBERRIES	BERRY	RAW	0.5	0.5
23	MOOSE	BONE MARROW	COOKED	0.5	0.1
24	LOCHE	FLESH	BAKED	0.5	0.4
25	SPRUCE HEN	FLESH	BAKED	0.5	0.3
26	SALMON	FLESH	COOKED	0.5	0.2
27	CRANBERRY	BERRY	JAM	0.5	0.5
28	WHITEFISH BROAD	FLESH	DRIED	0.5	1.0

6-F-2) Market food use

All of the 24h-recall days (n =409) contained market food items, and 158 market food items coded were mentioned in the recalls. Figure 6-F-2-1 presents market food groups as percent of total energy from market food consumed by Dene/Métis and Yukon children. Four major groups in CFGHE, dairy, fruit and vegetables, grains, and meat and alternatives, contributed a half of the energy intake. The rest of the groups, fat, sweet, mixed dishes, and extra, belong to the "other" food category in CFGHE. Grains (20%), fat (20%), and sweet (20%) foods were the greatest energy source, followed by mixed dishes (14%), meat and alternatives (10%), fruit and vegetables (8%), dairy (8%), and extra (0.2%).

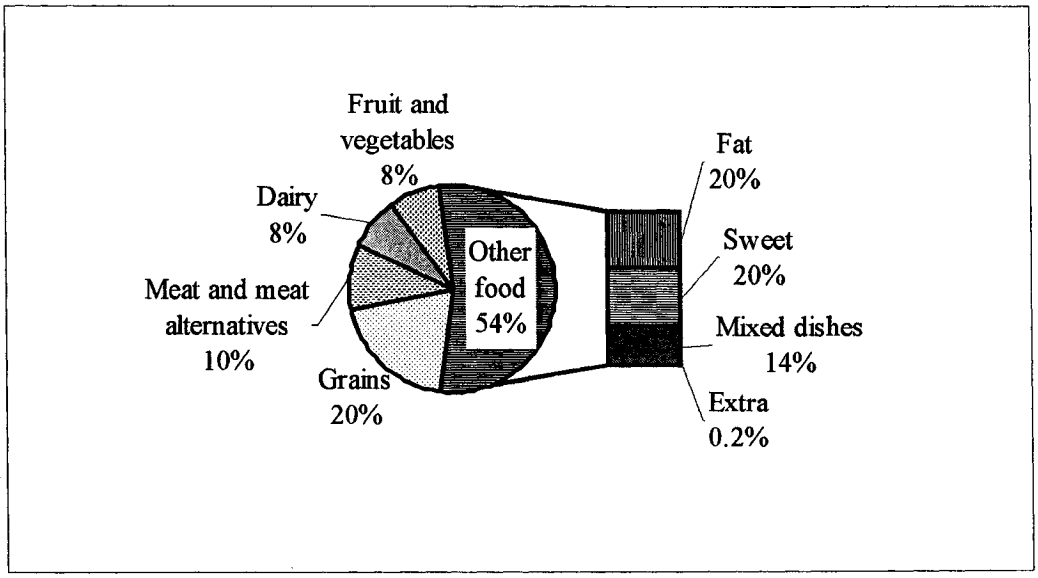

Figure 6-F-2-1 Market food (MF) groups as percent of total energy from MF consumed by Dene/Métis and Yukon children

6-F-3) Main contributors to selected nutrient intakes

Table 6-F-3-1 lists 10 main food items contributing to selected nutrient intakes. Most of them were market food items, but some traditional food items were listed in protein, iron, zinc, copper, magnesium, vitamin D, phosphorus, and vitamin E.

6-F-4) Nutrient density of traditional food and market food

Table 6-F-4-1 shows the nutrient content per 1000kcal of traditional food (TF) and market food (MF) items consumed by Dene/Métis and Yukon children and TF/MF ratio. These values were compiled from analysis of 24h-recalls. This comparison describes the difference in nutrient content between traditional food and market food items. Traditional food items were more than three times higher in zinc, protein, vitamin B6, riboflavin, iron, copper, phosphorus, and vitamin D contents, and less than three times higher in vitamin E, potassium, omega-3 fatty acids, magnesium, and selenium. However, they were lower in omega-6 fatty acids, fat, saturated fat, manganese, especially folate, sodium, calcium, vitamin A, vitamin C, and carbohydrate contents.

Table 6-F-3-1 Ten main food items contributing to energy and selected nutrient intakes and percent of total energy/nutrient intake

Rank	Energy	%	Protein	%	Fat	%
1	Potato chips	5.9	Caribou [2]	14	Potato chips	11
2	White bread	5.5	2% milk	9.7	Frankfurters	8.9
3	2% milk	5.0	Beef	9.3	Beef	8.0
4	Macaroni / cheese	4.9	Chicken [3]	8.5	Macaroni / cheese	7.2
5	French fries	4.7	Macaroni / cheese	5.2	French fries	7.0
6	Unfortified powdered drinks	4.5	White bread	4.8	2% milk	5.0
7	Beef [1]	4.0	Pizza	3.4	Chicken	4.4
8	Corn flakes	3.6	Frankfurters	3.3	Butter	4.1
9	Soft drinks, cola	3.6	Moose [4]	3.1	Pizza	2.7
10	Frankfurters	3.4	Spaghetti / meat balls / tom sauce	2.2	Chocolate milk candy	2.4

Rank	Saturated fat	%	Sucrose	%	Total sugar	%
1	Macaroni / cheese	10	Soft drinks, cola	20	Unfortified powdered drinks	17
2	Frankfurters	8.9	Unfortified powdered drinks	13	Soft drinks, cola	15
3	Beef	8.4	Sugar granulated beet or Cane	11	Sugar granulated beet or Cane	8.1
4	Potato chips	7.7	VitC fortified powered drinks	5.9	VitC fortified powered drinks	8.0
5	Butter	6.8	Soft drinks, gingerale	5.7	Apple juice, canned	6.1
6	2% milk	6.7	Jellies	4.9	Soft drinks, gingerale	4.5
7	French fries	5.6	Apple juice, canned	4.3	Jellies	4.3
8	Chocolate milk candy	3.6	Yellow cake	2.9	Lemonade, frozen	3.0
9	Cheddar cheese	3.5	Chocolate milk candy	2.6	Maple syrup	2.7
10	Chicken	3.1	Maple syrup	2.5	Chocolate milk candy	2.4

Rank	Iron	%	Zinc	%	Copper	%
1	Corn flakes	16	Caribou	14.3	Caribou	9.7
2	Caribou	11	Beef	14.1	Pizza	7.3
3	Wheat flakes	8.8	2% milk	8.7	Soup / noodle	5.0
4	White bread	6.7	Moose	4.4	White bread	4.6
5	Beef	4.4	Chicken	4.2	Chocolate milk candy	4.3
6	Pizza	4.2	Maple syrup	4.1	Wheat flakes	3.8
7	Unfortified powdered drinks	2.9	Macaroni / cheese	4.0	Potato chips	3.6
8	Macaroni / cheese	2.4	Frankfurters	3.8	Unfortified powdered drinks	3.6
9	Spaghetti / meat balls / tom sauce	2.1	Spaghetti / meat balls / tom sauce	3.0	French fries	3.3
10	Chicken	2.1	Pizza	2.8	Spaghetti / meat balls / tom sauce	3.0

Rank	Magnesium	%	Calcium	%	Vitamin D	%
1	2% milk	14	2% milk	34	2% milk	50
2	Potato chips	6.3	Macaroni / cheese	11	Cocoa	9.7
3	Wheat flakes	5.2	Pizza	7.9	Whitefish [5]	5.8
4	Caribou	4.9	White bread	4.5	Eggs [6]	4.4
5	White bread	4.8	Cheddar cheese	4.3	White bread	4.1
6	French fries	4.8	Cheese, american pasturized	3.1	Margarine	3.6
7	Macaroni / cheese	3.9	Bannock	2.2	Chocolate milk candy	3.2
8	Pizza	3.4	Wheat flakes	2.0	Whole milk	2.6
9	Oats	2.8	Ice cream	2.0	Lake trout, flesh	2.1
10	Beef	2.6	Soup / noodle	1.6	Skim milk	1.9

Rank	Phosphorus	%	Vitamin A	%	Vitamin E	%
1	2% milk	18	2% milk	21	Potato chips	26
2	Caribou	7.1	Macaroni / cheese	12	Macaroni / cheese	4.7
3	Macaroni / cheese	6.6	Carrots, boiled	8.9	Caribou	4.5
4	Beef	4.3	Pizza	7.3	2% milk	4.1
5	Pizza	3.7	Butter	5.6	Margarine	3.1
6	Chicken	3.6	Eggs	4.9	Cookies	3.1
7	White bread	3.5	Soup / noodle	4.8	Apples	3.0
8	Wheat flakes	3.2	Cheddar cheese	2.8	Eggs	2.7
9	Potato chips	3.1	Carrots	2.5	Beef	2.3
10	Cheese, american pasturized	2.5	Ice cream	2.3	Bannock	2.1

Rank	Folate	%	Dietary fiber	%	Sodium	%
1	Wheat flakes	16	Wheat flakes	13	Soup / noodle	11
2	White bread	14	White bread	10	Macaroni / cheese	7.8
3	Pizza	5.2	Potato chips	9.5	Frankfurters	7.6
4	Spaghetti / tomato sauce / cheese	4.8	French fries	8.9	Corn flakes	7.2
5	Spaghetti / meat balls / tomato sauce	4.3	Pizza	4.5	White bread	6.5
6	Rice, white	4.1	Apples	4.0	Pizza	5.5
7	Soup / noodle	3.3	Corn flakes	3.1	Wheat flakes	4.0
8	Corn flakes	3.2	Oats	3.0	SOUP / VEG / BEEF	3.5
9	2% milk	3.1	Spaghetti / meat balls / tomato sauce	2.7	Potato chips	3.4
10	Potato chips	2.9	Oranges	2.4	2% milk	3.3

Rank	n-6	%	n-3	%
1	Potato chips	23	Potato chips	14
2	Chicken	7.2	Frankfurters	6.3
3	White bread	5.7	White bread	5.6
4	Frankfurters	4.5	Salad dressing, mayonnaise type	5.1
5	Spaghetti / meat balls / tomato sauce	3.8	Mayonnaise	4.9
6	Pizza	3.2	2% milk	4.8
7	Bannock	3.1	Butter	4.0
8	French fries	3.1	Caribou	3.7
9	Mashed potatoes	3.0	Chicken	3.5
10	Eggs	2.5	Margarine	3.4

[1] Beef: beef chuck blade, corned beef (canned), beef cured, beef hamburger, beef round
[2] Caribou: caribou meat (boiled), caribou meat (dried), caribou flesh (fried), caribou-B flesh (baked), caribou heart (cooked), caribou ribs (cooked)
[3] Chicken: chicken boned (canned), chicken fryers
[4] Moose: moose flesh (boiled), moose flesh (baked), moose flesh (fried), moose flesh (roasted)
[5] Whitefish: whitefish flesh (baked), whitefish flesh (fried), whitefish flesh (smoked/dried)
[6] Eggs: whole eggs (boiled), whole eggs (scrambled)

Table 6-F-4-1 Nutrient content per 1000kcal of Traditional food (TF) and Market food (MF) items consumed by Dene/Métis and Yukon children and TF/MF ratio [1]

Nutrients	TF items (28 items)	MF items (158 items)	TF/MF
Zinc (mg)	27 (2.1-39)	4.3 (0.8-20)	6.3
Protein (g)	191 (9.1-217)	31 (0.4-75)	6.2
Vitamin B6 (mg)	4.3 (0.9-11)	0.8 (0.1-2.3)	5.4
Riboflavin (mg)	3.3 (0.2-12)	0.7 (0.1-1.6)	4.7
Iron (mg)	29 (3.0-60)	7.0 (1.1-15)	4.1
Copper (μg)	1917 (199-3971)	583 (191-1159)	3.3
Phosphorus (mg)	1550 (129-2257)	517 (125-1015)	3.0
Vitamin D (μg)	5.4 (0-141)	1.8 (0-39)	3.0
Vitamin E (mg)	3.8 (0.7-14)	1.6 (0-4.3)	2.4
Potassium (mg)	2509 (696-3598)	1121 (169-2811)	2.3
n-3 (g)	1.1 (0.4-5)	0.5 (0.01-2.6)	2.2
Magnesium (mg)	188 (72-378)	103 (21-198)	1.8
Selenium (μg)	49 (0.5-412)	39 (4.5-120)	1.3
n-6 (g)	2.6 (0.4-5)	4.4 (0.1-15)	0.59
Fat (g)	20 (8.6-92)	35 (0.2-69)	0.57
Saturated fat (g)	6.0 (0.8-27)	13 (0-25)	0.46
Manganese (μg)	0.5 (0.1-32)	1.2 (0.3-3.6)	0.42
Folic acid (μg)	47 (6.1-386)	187 (6.5-822)	0.25
Sodium (mg)	333 (41-525)	1651 (72-7972)	0.20
Calcium (mg)	55 (13-230)	386 (51-1098)	0.14
Vitamin A(μg RAE)	27 (0 – 419)	255 (2.2 – 1173)	0.11
Vitamin C (mg)	5.1 (0-51)	75 (1.0-381)	0.07
Carbohydrate (g)	6.6 (0-218)	145 (64-257)	0.05
Sucrose (g)	NA	46 (0.7-211)	NA
Total sugar (g)	NA	65 (3.4-248)	NA
Dietary fiber (g)	NA	5.7 (0.7-14)	NA

[1] Mean (range)

6-G) Data analysis

Since two participating communities, Old Crow and Carcross, had the smallest number of participants, they were grouped with the nearest communities in terms of latitude to perform data analysis by locations. The five participating communities were grouped into three: the north, the central, and the south regions. The north region included Old Crow and Fort Mcpherson. The central region was Tulita only. Carcross and Fort Resolution were grouped into the south region.

6-G-1) Risk of obesity and season, gender, and region

Table 6-G-1-1 shows the logistic regression analysis of factors (season, gender, and region) with obesity in Dene/Métis and Yukon children. BMI ($\geq 85^{th}$ versus $< 85^{th}$ percentile of BMI-for- age in the 2000 CDC Growth Charts) was the dependent variable. There was no significant difference in the risk of obesity between two seasons (two time points). The risk of obesity was 30% lower in boys than girls but the difference was not significant. Compared to the south region, the risk of obesity was 40% lower in the north region and 50% lower in the central region. The difference was not significant between the north and the south regions, although the difference was significant between the central and the south regions.

Table 6-G-1-1 Logistic regression analysis of factors (season, gender, and region) with obesity [1] in Dene/Métis and Yukon children

	Odds ratio	95% confidence interval
Season (season 1 = 0, season 2 = 1)	0.959 [2]	0.626 - 1.469
Gender (Girls = 0, Boys =1)	0.713 [3]	0.459 - 1.108
Region (South = 0, North = 1)	0.630 [4]	0.393 - 1.010
(South = 0, Central = 1)	0.461 [4]	0.254 - 0.836

1 BMI (≥ 85th versus < 85th percentile of BMI-for- age in the 2000 CDC Growth Charts)

2 Odds ratio adjusted for gender, region, and age

3 Odds ratio adjusted for season, region, and age

4 Odds ratio adjusted for season, gender, and age

6-G-2) Nutrient intake on days with and without traditional food

Table 6-G-2-1 shows the macronutrient intake as percent of total energy on days with and without traditional food. At the adjusted alpha level (0.006), the days with traditional food were significantly higher in protein but significantly lower in fat. At the

alpha 0.05 level, the days with traditional food were significantly higher in omega-3 fatty acids, and significantly lower in carbohydrate.

Table 6-G-2-2 shows the micronutrient intake and food weight on days with and without traditional food. At the adjusted alpha level (0.003), the days with traditional food were significantly higher in iron, zinc, copper, phosphorus, vitamin E, riboflavin, and vitamin B6, and significantly lower in sodium and dietary fiber. At the alpha 0.05 level, the days with traditional food were significantly higher in magnesium.

Table 6-G-2-3 shows the percent of total energy intake from market and traditional food groups on days with and without traditional food. The intake of meat and alternate products was significantly lower at the adjusted alpha level (0.004), and the intake of dairy foods was significantly lower at alpha 0.05 level in the days with traditional food.

Table 6-G-2-1 Macronutrient intake as percent of total energy on days with and without traditional food (TF) [1]

Energy source	Days with TF (n=148)	Days without TF (n=261)	P-value [3]
	%		
Energy [2]	1904 ± 60	1972 ± 46	0.20
Carbohydrate	53 ± 0.9	56 ± 0.7	0.01 *
Sucrose	17 ± 0.8	18 ± 0.6	0.46
Total sugar	24 ± 1.1	25 ± 0.8	0.93
Protein	19 ± 0.4	13 ± 0.3	<.0001 **
Fat	30 ± 0.7	32 ± 0.6	0.002 **
Saturated fat	11 ± 0.3	12 ± 0.3	0.07
n-6	3.7 ± 0.2	3.9 ± 0.1	0.19
n-3	0.5 ± 0.02	0.4 ± 0.02	0.009 *

[1] Least square means ± SEM, adjusted for season, region, day of the week, age, and gender

[2] kcal

[3] With and without TF effect based on ANCOVA adjusting for season, region, day of the week, age, and gender after rank transformation of raw values, * (P<0.05), ** (P<0.006)

Table 6-G-2-2 Micronutrient intake and food weight on days with and without traditional food (TF) [1]

Nutrients	Days with TF (n=148)	Days without TF (n=261)	P-value [2]
Vitamin A(μg RAE)	483 ± 24	448 ± 18	0.08
Iron (mg)	17 ± 0.4	14 ± 0.3	<.0001 **
Zinc (mg)	12 ± 0.4	9.0 ± 0.3	<.0001 **
Copper (μg)	1303 ± 32	1112 ± 24	<.0001 **
Calcium (mg)	706 ± 34	744 ± 26	0.31
Magnesium (mg)	211 ± 4.6	201 ± 3.5	0.007 *
Phosphorus (mg)	1185 ± 26	1030 ± 19	<.0001 **
Sodium (mg)	2612 ± 124	3196 ± 94	<.0001 **
Potassium (mg)	2354 ± 65	2305 ± 49	0.14
Vitamin D (μg)	4.0 ± 0.3	3.3 ± 0.3	0.89
Vitamin E (mg)	3.7 ± 0.1	3.1 ± 0.1	<.0001 **
Vitamin C (mg)	121 ± 9.4	142 ± 7.1	0.10
Folic acid (μg)	306 ± 15	340 ± 11	0.12
Riboflavin (mg)	1.8 ± 0.05	1.4 ± 0.04	<.0001 **
Vitamin B6 (mg)	2.1 ± 0.06	1.7 ± 0.05	<.0001 **
Dietary fiber (g)	9.2 ± 0.4	11 ± 0.3	0.001 **
Selenium (μg)	75 ± 2.5	75 ± 1.9	0.62
Manganese (μg)	2.2 ± 0.09	2.2 ± 0.07	0.56
Food weight (g)	1700 ± 40	1683 ± 31	0.39
Dry food weight (g)	419 ± 2.0	417 ± 1.5	0.20

[1] Least square means ± SEM, adjusted for energy intake, season, region, day of the week, age, and gender

[2] With and without TF effect based on ANCOVA adjusting for energy intake, season, region, day of the week, age, and gender after rank transformation of raw values, * (P<0.05), ** (P<0.003)

Table 6-G-2-3 Percent of total energy intake from market and traditional food groups on days with and without traditional food (TF) [1]

	Days with TF (n=148)	Days without TF (n=261)	P-value [2]
Market food groups			
Dairy	6.9 ± 0.7	8.5 ±0.5	0.02 *
Fruit and vegetables	7.5 ± 0.8	7.4 ± 0.6	0.18
Grains	17.5 ± 1.1	18.0 ± 0.8	0.77
Meat and alternates	6.9 ± 0.9	11.8 ± 0.7	<.0001 **
Mixed dishes	12.0 ± 1.4	13.9 ± 1.1	0.17
Sweet	19.2 ± 1.2	17.9 ± 0.9	0.26
fat	17.9 ± 1.3	21.3 ± 1.0	0.08
Extra	0.1 ± 0.06	0.2 ± 0.05	0.45
Traditional food groups			
Berries	0.2 ± 0.08	0	-
Birds	0.1 ± 0.05	0	-
Fish	1.5 ± 0.3	0	-
Land animals	10.2 ± 0.4	0	-

[1] Least square means ± SEM, adjusted for season, region, day of the week, age, and gender

[2] With and without TF effect based on ANCOVA adjusting for season, region, day of the week, age, and gender after rank transformation of raw values, * (P<0.05), ** (P<0.004)

6-G-3) Macronutrient intake and season, gender, BMI category, and region

Table 6-G-3-1, Table 6-G-3-2, and Table 6-G-3-3 show the macronutrient intake as percent of total energy by season, gender, and BMI category, respectively. In season 1, carbohydrate was significantly lower, while fat and saturated fat were significantly higher. Boys had significantly higher energy intake. The percent of energy intake from total sugar was significantly higher in girls. A significant difference was observed in energy intake among the BMI categories. The normal weight category children took more energy than the risk of overweight children. A few differences were observed in the macronutrient intake at the alpha 0.05 level by season, gender, and BMI category, but no difference was found at the adjusted alpha level (0.005).

Some significant differences were observed in the macronutrient intake as percent of total energy by region (Table 6-G-3-4). Three nutrients, energy, protein, and fat were significantly different at the adjusted alpha level (0.005). The north region had significantly lower energy and fat intakes than the central and the south regions. The north and the central regions had significantly greater percent intake from protein than the

south. At the alpha 0.05 level, the north region had a significantly lower saturated fat intake than the south region.

Table 6-G-3-1 Macronutrient intake as percent of total energy by season [1]

Dietary component	Season 1 (n=194)	Season 2 (n=215)	P-value [3]
Energy [2]	1935 ± 56	1961 ±47	0.75
Carbohydrate	54 ± 0.8	56 ± 0.7	0.01 *
Sucrose	17 ± 0.8	18 ± 0.7	0.39
Total sugar	24 ± 1.0	25 ± 0.8	0.40
Protein	15 ± 0.4	15 ± 0.4	0.38
Fat	32 ± 0.7	30 ± 0.6	0.01 *
Saturated fat	12 ± 0.3	11 ± 0.3	0.01 *
n-6	3.7 ± 0.2	4.0 ± 0.1	0.16
n-3	0.5 ± 0.02	0.5 ± 0.02	0.69

[1] Least square means ± SEM, adjusted for region, day of the week, gender, and age

[2] Kcal

[3] Season effect based on ANCOVA adjusting for region, day of the week, sex, and age after rank transformation of raw values, * (P<0.05)

Table 6-G-3-2 Macronutrient intake as percent of total energy by gender [1]

Dietary component	Girls (n=242)	Boys (n=167)	P-value [3]
Energy [2]	1840 ± 46	2056 ±56	0.002 *
Carbohydrate	56 ± 0.7	54 ± 1.8	0.06
Sucrose	18 ± 0.6	17 ± 0.8	0.27
Total sugar	26 ± 0.8	23 ± 1.0	0.04 *
Protein	15 ± 0.4	15 ± 0.4	0.68
Fat	31 ± 0.6	32 ± 0.7	0.17
Saturated fat	11 ± 0.3	12 ± 0.3	0.06
n-6	4.0 ± 0.1	3.7 ± 0.2	0.32
n-3	0.5 ± 0.02	0.5 ± 0.02	0.48

[1] Least square means ± SEM, adjusted for season, region, day of the week, and age

[2] Kcal

[3] Gender effect based on ANCOVA adjusting for season, region, day of the week, and age after rank transformation of raw values, * (P<0.05)

Table 6-G-3-3 Macronutrient intake as percent of total energy by BMI category [1]

	Normal weight (n= 267)	Risk of overweight (n= 53)	Overweight (n= 75)	P-value [3]
Energy [2]	1994 ± 45 a	1728 ± 97 b	1896 ± 80 ab	0.015 *
Carbohydrate	55 ± 0.7	54 ± 1.5	55 ± 1.2	0.79
Sucrose	18 ± 0.6	16 ± 1.4	17 ± 1.1	0.29
Total sugar	25 ± 0.8	24 ± 1.7	24 ± 1.4	0.81
Protein	15 ± 0.3	17 ± 0.7	15 ± 0.6	0.06
Fat	31 ± 0.5	30 ± 1.2	32 ± 1.0	0.25
Saturated fat	12 ± 0.2	11 ± 0.5	12 ± 0.4	0.39
n-6	3.8 ± 0.1	3.6 ± 0.3	4.0 ± 0.2	0.59
n-3	0.5 ± 0.02	0.5 ± 0.04	0.5 ± 0.03	0.40

[1] Least square means ± SEM, adjusted for season, region, day of the week, gender, and age

[2] Kcal

[3] BMI category effect based on ANCOVA adjusting for season, region, day of the week, gender, and age after rank transformation of raw values, * (P<0.05), ** (P<0.005). Values in the same row with different letter are statistically different based on Tukey test (P<0.05)

Table 6-G-3-4 Macronutrient intake as percent of total energy by region [1]

	North (n=169)	Central (n=89)	South (n=151)	P-value [3]
Energy [2]	1719 ± 57 a	2069 ±74 b	2057 ± 61 b	<.0001 **
Carbohydrate	56 ± 0.8	54 ± 1.1	55 ± 0.9	0.27
Sucrose	17 ± 0.8	18 ± 1.0	18 ± 0.9	0.61
Total sugar	25 ± 1.0	24 ± 1.3	24 ± 1.1	0.68
Protein	17 ± 0.4 a	15 ± 0.6 a	14 ± 0.5 b	<.0001 **
Fat	29 ± 0.7 a	32 ± 0.9 b	33 ± 0.7 b	0.0001 **
Saturated fat	11 ± 0.3 a	12 ± 0.4 ab	12 ± 0.3 b	0.01 *
n-6	3.8 ± 0.2	3.8 ± 0.2	4.0 ± 0.2	0.40
n-3	0.5 ± 0.02	0.4 ± 0.03	0.5 ± 0.02	0.72

[1] Least square means ± SEM, adjusted for season, day of the week, gender, and age

[2] Kcal

[3] Region effect based on ANCOVA adjusting for season, day of the week, gender, and age after rank transformation of raw values, * (P<0.05), ** (P<0.005). Values in the same row with different letter are statistically different based on Tukey test (P<0.05)

6-G-4) Micronutrient intake and season, gender, BMI category, and region

Table 6-G-4-1 and Table 6-G-4-2 show the micronutrient intake and food weight by season and gender, respectively. Potassium and vitamin C intakes were significantly higher in season 1. Boys took significantly more iron and sodium than girls, while vitamin C and vitamin E intakes were significantly higher among girls. Few differences in

the micronutrient intake were observed at the alpha 0.05 level by season and gender, and any difference was found at the adjusted alpha level (0.002).

Table 6-G-4-3 shows the micronutrient intake and food weight by BMI category. Two nutrients, iron and vitamin B6 had a significant difference at the adjusted alpha level (0.002). The overweight children had lower iron intake compared to the normal weight and the risk of overweight children. Vitamin B6 intake was highest in the risk of overweight children, followed by the normal weight children and then the overweight children. At the alpha 0.05 level, significant difference was found in traditional food consumption. The overweight children consumed less traditional food compared to the normal weight and the risk of overweight children.

A regional difference in the micronutrient intake was prominent (Table 6-G-4-4). Three nutrients, iron, copper, and manganese, and traditional food consumption had a significant difference at the adjusted alpha level (0.002). Traditional food consumption and iron intake were higher in the north and the central regions than the south region. Copper intake was higher in the north region compared to the other regions. Manganese intake was the highest in the north, followed by the south and then the central region.

At the alpha 0.05 level, a significant difference was found in eight nutrients: zinc, calcium, magnesium, phosphorus, sodium, vitamin C, riboflavin, and vitamin B6. Sodium was lower but vitamin B6 was higher in the north and the central regions compared to the south region. The north region was higher in zinc and riboflavin compared to the south region, and was higher in magnesium and phosphorus than the other regions. Calcium was lower in the central region compared to the north and the south regions, and vitamin C was higher in the central region than the north region.

Table 6-G-4-1 Micronutrient intake and food weight by season [1]

Nutrients	Season 1 (n=194)	Season 2 (n=215)	P value [2]
Vitamin A (μg RAE)	463 ± 22	459 ± 19	0.41
Iron (mg)	15 ± 0.4	15 ± 0.3	0.97
Zinc (mg)	10 ± 0.4	10 ±0.3	0.83
Copper (μg)	1166 ± 30	1193 ± 26	0.71
Calcium (mg)	770 ± 31	691 ± 27	0.34
Magnesium (mg)	210 ± 4.2	199 ± 3.6	0.07
Phosphorus (mg)	1120 ± 24	1050 ± 21	0.09
Sodium (mg)	2975 ± 117	3004 ± 99	0.44
Potassium (mg)	2379 ± 60	2266 ± 51	0.03 *
Vitamin D (μg)	3.8 ±0.3	3.2 ±0.3	0.05
Vitamin E (mg)	3.3 ±0.1	3.3 ±0.1	0.77
Vitamin C (mg)	138 ± 8.7	131 ± 7.4	0.04 *
Folic acid (μg)	317 ± 14	340 ± 12	0.22
Riboflavin (mg)	1.6 ± 0.05	1.5 ± 0.05	0.75
Vitamin B6 (mg)	1.9 ± 0.06	1.8 ± 0.05	0.26
Dietary fiber (g)	11 ± 0.4	9.9 ± 0.3	0.28
Selenium (μg)	74 ± 2.3	76 ± 2.0	0.37
Manganese (μg)	2.1 ± 0.09	2.3 ± 0.07	0.45
Food weight (g)	1699 ± 37	1679± 31	0.69
Dry food weight (g)	416 ± 12	420 ± 10	0.10
TF weight (g)	41 ± 6.2	47 ± 5.3	0.24
TF dry weight (g)	16 ± 2.4	18 ± 2.1	0.29

[1] Least square means ± SEM, adjusted for energy intake, region, day of the week, age, and gender

[2] Season effect based on ANCOVA adjusting for energy intake, region, day of the week, age, and gender after rank transformation of raw values, * ($P<0.05$)

Table 6-G-4-2 Micronutrient intake and food weight by gender [1]

Nutrients	Girls (n = 169)	Boys (n = 89)	P value [2]
Vitamin A (μg RAE)	463 ± 18	458 ± 22	0.80
Iron (mg)	14 ± 0.3	16 ± 0.4	0.02 *
Zinc (mg)	9.9 ± 0.3	10 ±0.4	0.66
Copper (μg)	1199 ± 25	1160 ± 30	0.18
Calcium (mg)	704 ± 26	757 ± 32	0.07
Magnesium (mg)	206 ± 3.5	203 ± 4.3	0.50
Phosphorus (mg)	1060 ± 20	1109 ± 25	0.21
Sodium (mg)	2853 ± 97	3126 ± 118	0.01 *
Potassium (mg)	2363 ± 50	2282 ± 60	0.18
Vitamin D (μg)	3.5 ±0.3	3.5 ±0.3	0.08
Vitamin E (mg)	3.4 ±0.1	3.3 ±0.1	0.04 *
Vitamin C (mg)	143 ± 7.2	126 ± 8.8	0.02 *
Folic acid (μg)	334 ± 12	322 ± 14	0.57
Riboflavin (mg)	1.5 ± 0.04	1.5 ± 0.05	0.77
Vitamin B6 (mg)	1.7 ± 0.05	1.9 ± 0.06	0.06
Dietary fiber (g)	11 ± 0.5	9.9 ±0.6	0.15
Selenium (μg)	74 ± 1.9	76 ± 2.3	0.94
Manganese (μg)	2.3 ± 0.07	2.1 ± 0.09	0.27
Food weight (g)	1723 ± 31	1665± 38	0.10
Dry food weight (g)	419 ± 1.5	416 ± 1.8	0.74
TF weight (g)	43 ± 5.1	45± 6.2	0.67
TF dry weight (g)	16 ± 2.0	18 ± 2.5	0.51

[1] Least square means ± SEM, adjusted for energy intake, season, region, day of the week, and age

[2] Gender effect based on ANCOVA adjusting for energy intake, season, region, day of the week, and age after rank transformation of raw values, * ($P<0.05$)

Table 6-G-4-3 Micronutrient intake and food weight by BMI category [1]

Nutrients	Normal weight (n= 267)	Risk of overweight (n= 53)	Overweight (n= 75)	P value [2]
Vitamin A (μg RAE)	463 ± 18	452 ± 39	455 ± 32	0.6
Iron (mg)	15 ± 0.3 a	16 ± 0.7 a	13 ± 0.6 b	0.0004 **
Zinc (mg)	9.9 ± 0.3	11 ± 0.6	9.9 ± 0.5	0.06
Copper (μg)	1188 ± 24	1160 ± 53	1139 ± 43	0.42
Calcium (mg)	729 ± 25	742 ± 55	731 ± 45	0.68
Magnesium (mg)	204 ± 3.4	209 ± 7.5	203 ± 6.1	0.38
Phosphorus (mg)	1080 ± 20	1143 ± 43	1067 ± 35	0.16
Sodium (mg)	3101 ± 94	2765 ± 205	2779 ± 168	0.18
Potassium (mg)	2318 ± 48	2415 ± 105	2286 ± 87	0.11
Vitamin D (μg)	3.6 ± 0.3	3.2 ± 0.6	3.3 ± 0.5	0.13
Vitamin E (mg)	3.4 ±0.1	3.5 ±0.2	3.1 ± 0.2	0.36
Vitamin C (mg)	136 ± 7.0	126 ± 15	132 ± 13	0.61
Folic acid (μg)	323 ± 11	321 ± 25	346 ± 20	0.61
Riboflavin (mg)	1.5 ± 0.04	1.7 ± 0.09	1.5 ± 0.08	0.26
Vitamin B6 (mg)	1.8 ± 0.05 a	2.1 ± 0.1 b	1.6 ± 0.09 c	<.0001 **
Dietary fiber (g)	10 ± 0.3	9.8 ± 0.6	10 ± 0.5	0.77
Selenium (μg)	73 ± 1.9	78 ± 4.1	78 ± 3.3	0.46
Manganese (μg)	2.2 ± 0.07	2.0 ± 0.1	2.1 ± 0.1	0.15
Food weight (g)	1691 ± 30	1621 ± 66	1716 ± 54	0.53
Dry food weight (g)	418 ± 1.5	417 ± 3.2	415 ± 2.6	0.35
TF weight (g)	45 ± 4.9 a	71 ± 11 a	25 ± 8.7 b	0.026 *
TF dry weight (g) [3]	17 ± 1.9	27 ± 4.2	10 ± 3.4	0.034 *

[1] Least square means ± SEM, adjusted for energy intake, season, region, day of the week, age, and gender

[2] BMI category effect based on ANCOVA adjusting for energy intake, season, region, day of the week, age, and gender after rank transformation of raw values, * ($P<0.05$), ** ($P<0.002$). Values in the same row with different letter are statistically different based on Tukey test ($P<0.05$)

[3] Values for TF dry weight are not significantly different at p-value 0.05 level: normal and risk of overweight ($p=0.71$), normal and overweight ($p=0.058$), and risk of overweight and overweight ($p=0.053$)

Table 6-G-4-4 Micronutrient intake and food weight by region [1]

Nutrients	North (n = 169)	Central (n = 89)	South (n = 151)	P value [2]
Vitamin A (μg RAE)	475 ± 23	421 ± 30	486 ± 23	0.06
Iron (mg)	16 ± 0.4 a	15 ± 0.5 a	13 ± 0.4 b	<.0001 **
Zinc (mg)	11 ± 0.4 a	9.9 ± 0.5 ab	9.5 ± 0.4 b	0.03 *
Copper (μg)	1292 ± 31 a	1111 ± 40 b	1135 ± 33 b	0.001 **
Calcium (mg)	761 ± 40 a	637 ± 52 b	794 ± 34 a	0.01 *
Magnesium (mg)	211 ± 4.4 a	197 ± 5.6 b	205 ± 4.7 b	0.03 *
Phosphorus (mg)	1148 ± 25 a	1029 ± 32 b	1077 ± 27 b	0.003 *
Sodium (mg)	2881 ± 121 a	2713 ± 156 a	3375 ± 129 b	0.002 *
Potassium (mg)	2216 ± 62	2358 ± 80	2392 ± 66	0.31
Vitamin D (μg)	4.2 ±0.3	2.9 ±0.4	3.5 ±0.4	0.58
Vitamin E (mg)	3.4 ±0.1	3.1 ±0.2	3.5 ± 0.1	0.18
Vitamin C (mg)	117 ± 9.0 a	144 ± 12 b	143 ± 9.6 ab	0.04 *
Folic acid (μg)	349 ± 14	294 ± 19	342 ± 15	0.14
Riboflavin (mg)	1.6 ± 0.05 a	1.5 ± 0.07 ab	1.5 ± 0.06 b	0.043 *
Vitamin B6 (mg)	1.9 ± 0.06 a	1.9 ± 0.08 a	1.7 ± 0.07 b	0.002 *
Dietary fiber (g)	10 ± 0.4	9.9 ±0.5	11 ± 0.4	0.86
Selenium (μg)	74 ± 2.4	72 ± 3.1	78 ± 2.5	0.85
Manganese (μg)	2.5 ± 0.08 a	1.9 ± 0.1 b	2.2 ± 0.09 c	<.0001 **
Food weight (g)	1726 ± 39	1647 ± 50	1695 ± 41	0.51
Dry food weight (g)	420 ± 1.9	417 ± 2.4	416 ± 2.0	0.41
TF weight (g)	70 ± 6.4 a	44 ± 8.3 a	18 ± 6.8 b	<.0001 **
TF dry weight (g)	27 ± 2.5 a	18 ± 3.3 a	6.5 ± 2.7 b	<.0001 **

[1] Least square means ± SEM, adjusted for energy intake, season, day of the week, age, and gender

[2] Region effect based on ANCOVA adjusting for energy intake, season, day of the week, age, and gender after rank transformation of raw values, * (P<0.05), ** (P<0.002). Values in the same row with different letter are statistically different based on Tukey test (P<0.05)

6-G-5) Food use by season, gender, BMI category, and region

Table 6-G-5-1, Table 6-G-5-2, and Table 6-G-5-3 show the percent of total energy intake from market and traditional food groups by season, gender, and BMI category, respectively. The intake of dairy foods was higher, but the intake of grains was lower in season 1. Girls consumed significantly more fruit and vegetables but less dairy foods than boys. The overweight children consumed less traditional food than the children at risk of overweight. A few significant differences were observed in the use of market and traditional foods by season, gender, and BMI category at the alpha 0.05 level, while no differences were found at the adjusted alpha level (0.004).

The consumption of food groups greatly varied by region (Table 6-G-5-4). A significant difference was found in three food groups, land animals, meat and alternates, and fat, at the adjusted alpha level (0.004). The consumption of land animals was highest

in the north region, followed by the central and then the south regions. Fat group was lower in the north region compared to the other regions. The central region consumed more meat and alternate items than the north and the south regions. At the alpha 0.05 level, three market food groups had a significant difference: grains, mixed dishes, and sweet. The north region had higher consumption of grain products compared to the other regions, and had higher sweet food consumption than the south region. The consumption of mixed dishes in the south region was higher than the central region.

Table 6-G-5-1 Percent of total energy intake from market and traditional food groups by season [1]

	Season 1 (n=194)	Season 2 (n=215)	P-value [2]
Market food groups			
Dairy	9.2 ± 0.7	6.7 ±0.6	0.003 *
Fruit and vegetables	7.6 ± 0.7	7.3 ± 0.6	0.97
Grains	16.4 ± 1.0	20.0 ± 0.8	0.03 *
Meat and alternates	11.2 ± 0.9	8.9 ± 0.7	0.05
Mixed dishes	12.9 ± 1.3	13.6 ± 1.1	0.49
Sweet	17.9 ± 1.1	18.8 ± 0.9	0.35
fat	20.4 ± 1.3	19.8 ± 1.1	0.88
Extra	0.1 ± 0.06	0.2 ± 0.05	0.98
Traditional food groups			
Berries	0.04 ± 0.07	0.1 ± 0.06	0.21
Birds	0.08 ± 0.05	0.04 ± 0.04	0.45
Fish	0.7 ± 0.2	0.4 ± 0.2	0.58
Land animals	3.4 ± 0.5	4.2 ± 0.5	0.19

[1] Least square means ± SEM, adjusted for region, day of the week, age, and gender

[2] Season effect based on ANCOVA adjusting for region, day of the week, age, and gender after rank transformation of raw values, * ($P<0.05$)

Table 6-G-5-2 Percent of total energy intake from market and traditional food groups by gender [1]

	Girls (n = 169)	Boys (n = 89)	P-value [2]
Market food groups			
Dairy	7.4 ± 0.5	8.5 ± 0.7	0.02 *
Fruit and vegetables	8.5 ± 0.6	6.4 ± 0.7	0.03 *
Grains	17.8 ± 0.8	18.7 ± 1.0	0.34
Meat and alternates	10.6 ± 0.7	9.5 ± 0.9	0.19
Mixed dishes	12.7 ± 1.1	13.8 ± 1.3	0.72
Sweet	19.0 ± 0.9	17.7 ± 1.1	0.42
fat	19.6 ± 1.0	20.6 ± 1.2	0.57
Extra	0.2 ± 0.05	0.2 ± 0.06	0.17
Traditional food groups			
Berries	0.1 ± 0.06	0.03 ± 0.07	0.89
Birds	0.04 ± 0.04	0.08 ± 0.05	0.44
Fish	0.4 ± 0.2	0.7 ± 0.3	0.48
Land animals	3.7 ± 0.5	3.9 ± 0.5	0.62

[1] Least square means ± SEM, adjusted for region, day of the week, age, and season

[2] Gender effect based on ANCOVA adjusting for region, day of the week, age, and season after rank transformation of raw values, * (P<0.05)

Table 6-G-5-3 Percent of total energy intake from market and traditional food groups by BMI category [1]

	Normal weight (n= 267)	Risk of overweight (n= 53)	Overweight (n= 75)	P-value [2]
Market food groups				
Dairy	8.0 ± 0.5	8.8 ± 1.1	7.4 ± 0.9	0.73
Fruit and vegetables	7.1 ± 0.6	7.5 ± 1.3	8.9 ± 1.1	0.34
Grains	17.7 ± 0.8	18.6 ± 1.7	20.2 ± 1.4	0.59
Meat and alternates	9.7 ± 0.7	9.9 ± 1.5	11.7 ± 1.3	0.27
Mixed dishes	13.9 ±1.0	11.6 ± 2.2	11.7 ±1.9	0.49
Sweet	18.9 ± 0.9	17.2 ± 1.9	16.6 ± 1.6	0.26
fat	20.0 ± 1.0	19.2 ± 2.2	20.7 ± 1.8	0.79
Extra	0.2 ± 0.05	0.1 ± 0.1	0.1 ± 0.09	0.38
Traditional food groups				
Berries	0.08 ± 0.06	0.1 ± 0.1	0.006 ± 0.1	0.52
Birds	0.08 ± 0.04	0.02 ± 0.08	0.04 ± 0.07	0.67
Fish	0.7 ± 0.2	0.7 ± 0.4	0.08 ± 0.4	0.16
Land animals	3.7 ± 0.4 ab	6.3 ± 0.9 a	2.6 ± 0.8 b	0.03*

[1] Least square means ± SEM, adjusted for season, region, day of the week, age, and gender

[2] BMI category effect based on ANCOVA adjusting for season, region, day of the week, age, and gender after rank transformation of raw values, * (P<0.05). Values in the same row with different letter are statistically different based on Tukey test (P<0.05)

Table 6-G-5-4 Percent of total energy intake from market and traditional food groups by region [1]

	North (n = 169)	Central (n = 89)	South (n = 151)	P-value [2]
Market food groups				
Dairy	7.8 ± 0.7	6.7 ± 0.9	9.4 ± 0.7	0.14
Fruit and vegetables	6.2 ± 0.8	7.8 ± 1.0	8.4 ± 0.8	0.18
Grains	21.1 ± 1.0 a	16.1 ± 1.3 b	17.4 ± 1.1 b	0.04 *
Meat and alternates	8.3 ± 0.9 a	12.8 ± 1.2 b	9.1 ± 1.0 a	0.001**
Mixed dishes	13.2 ± 1.3 ab	10.4 ± 1.7 a	16.2 ± 1.4 b	0.04 *
Sweet	19.7 ±1.1 a	19.4 ± 1.4 ab	15.9 ± 1.2 b	0.03 *
fat	16.5 ± 1.3 a	21.8 ± 1.7 b	22.0 ± 1.4 b	0.003 **
Extra	0.1 ± 0.06	0.2 ± 0.07	0.1 ± 0.07	0.75
Traditional food groups				
Berries	0.2 ± 0.07	0.03 ± 0.09	0.03 ± 0.08	0.58
Birds	0.08 ± 0.05	0.1 ± 0.06	0.005 ± 0.05	0.35
Fish	0.8 ± 0.2	0.2 ± 0.3	0.7 ± 0.3	0.37
Land animals	6.0 ± 0.6 a	4.4 ± 0.7 b	0.9 ± 0.6 c	<.0001 **

[1] Least square means ± SEM, adjusted for season, day of the week, age, and gender

[2] Region effect based on Kruskal–Wallis nonparametric ANCOVA adjusting for season, day of the week, age, and gender after rank transformation of raw values, * ($P<0.05$), ** ($P<0.004$). Values in the same row with different letter are statistically different based on Tukey test ($P<0.05$)

6-H) Food choice questionnaire

6-H-1) Number of food choice questionnaires

Table 6-H-1-1 shows the number of food choice questionnaires from Dene/Metis and Yukon women for data analysis. In total, 49 questionnaires were collected from Fort Mcpherson, Old Crow, Fort Resolution, and Carcross in season 2. Tulita women were not asked to participate due to a lack of interest in the community.

6-H-2) Profile of Dene/Métis and Yukon women and their households

Table 6-H-2-1 shows the profile of Dene/Métis and Yukon women and their households. The average year that the women lived in the communities was 33, and ranged from 3 months to 63 years. Approximately 70% of the women had full-time, half-time, or seasonal jobs. A household consisted of, on average, 4.9 family members (1.9 adults and 2.9 children). The number of adults with full-time jobs was approximately one per household, and with part-time jobs as one in every two households, and with seasonal jobs was one in every 10 households.

Table 6-H-1-1 Number of food choice questionnaire from Dene/Metis and Yukon women

	Season 2
Fort Mcpherson	17
Old Crow	7
Tulita	0
Fort Resolution	20
Carcross	5
Total	49

Table 6-H-2-1 Profile of Dene/Métis and Yukon women and their household

Years lived in the community (women) [1]	33 ± 13 (0.08 – 63)
Employment status (women) [2]	
No	31%
Full-time (>30hours per week)	47%
Part-time (<30hours per week)	20%
Seasonally (part of the year)	2%
Number of people per household [1]	4.9 ± 1.5 (2 – 8)
Number of adults per household [1]	1.9 ± 0.6 (1 – 3)
Number of children per household [1]	2.9 ± 1.2 (1 – 6)
Number of adults per household with [1]	
Full-time (>30hours per week)	0.9 ± 0.9 (0 – 4)
Part-time (<30hours per week)	0.4 ± 0.5 (0 – 2)
Seasonally (part of the year)	0.1 ± 0.4 (0 – 1)

[1] Mean ± SD (range)

[2] Percent of respondents

6-H-3) Traditional and market food use

Table 6-H-3-1 shows the traditional food use in households and satisfaction of traditional food availability and market food affordability. Half of the women reported that traditional food use stayed the same compared to five years ago, and 30% had come to use less and 20% more. Mean wild meat use per week per household was 3.5 times, and ranged from 0 to 15 times. Two thirds of the women reported a satisfaction with traditional food availability in amount and variety and market food affordability in amount, variety, and quality.

Table 6-H-3-2 shows the types of market food women would buy more if they were less expensive. Although many of the women reported satisfaction with market food affordability (Table 6-H-3-1), 90% of the women mentioned that they would buy fresh

fruit and vegetables and dairy products if they were less expensive. Store bought meat, juice, and bread were mentioned by more than 50% of the women.

Table 6-H-3-1 Traditional food (TF) use in households and satisfaction of TF availability and market food (MF) affordability

TF use compared to 5 years ago [1]	
More	24 %
Less	29 %
Same	47 %
Mean (range) wild meat use per week	3.5 (0 – 15) times
TF amount [1]	
Satisfied	69 %
Not satisfied	31 %
TF variety [1]	
Satisfied	69 %
Not satisfied	31 %
Amount of MF household afford to buy [1]	
Satisfied	71 %
Not satisfied	29 %
Variety of MF household afford to buy [1]	
Satisfied	63 %
Not satisfied	37 %
Quality of MF household afford to buy [1]	
Satisfied	65 %
Not satisfied	35 %

[1] Percent of respondents (single choice per respondent)

Table 6-H-3-2 Market food types women want to buy more if they are less expensive [1]

Fresh fruit and vegetables	98 %
Dairy products	94 %
Store bought meat	69 %
Juice	69 %
Bread	55 %
Pop and potato chips	27 %
Ready made cakes, cookies, and desserts	16 %
Frozen prepared foods	14 %
Ready made foods	14 %
Other (sea food, craft dinner)	4 %

[1] Percent of respondents (multiple choices per respondent)

6-H-4) Traditional and market food choice

Table 6-H-4-1 shows information related to market food purchase at stores. Sixty percent of the women reported buying market food at stores other than Northern or Co-op stores. Most of the women (90%) purchased groceries. The women most frequently mentioned themselves as the family member influenced what was purchased at shops (88%), followed by children (76%), husband or boyfriend (63%), parents (10%), and other (4%). Eighty percent of the women reported that children influenced market food purchase.

Table 6-H-4-1 Information related to market food (MF) purchase at stores

Stores for MF [1]	
Northern or Co-op stores	41 %
Other	59 %
MF shopper [1]	
Women	90 %
Other	10 %
Influence of family members on MF purchase at stores [2]	
Women	88 %
Children	76 %
Husband or boyfriend	63 %
Parents	10 %
Other (friend, sister)	4 %
Influence of Children on MF purchase at stores [1]	
None	18 %
A little	39 %
Somewhat	22 %
A lot	20 %

[1] Percent of respondents (single choice per respondent)

[2] Percent of respondents (multiple choices per respondent)

Table 6-H-4-2 shows the questions regarding daily eating, the corresponding answers, and percent of respondents. Many factors influenced food choice in daily situations (question 1 and 2), while some factors were specifically mentioned over the other factors, such as cost (93%, 67% in question 1, 65% in question 2), health (91% in question 1), children's preference (67% in question 1, 69% in question 2) and acceptability (79% in question 1), traditional food and market food availability (87% in question 1, 69% and 63% in question 2), women's preference (63% in question 1, 51% in

question 2), time of the meal (63% in question 2), preparation way and time (53% and 53% in question 1), and the taste of food (53% in question 1).

These factors related to the frequently mentioned concerns at meal times and factors affecting what they actually ate (question 3 and 4). "If the meal is healthy (97% in question 3, 87% in question 4)" was a major concern of the women, and was reported as the primary influence on what the family ate. Other major concerns reported were "if children have a filling meal (91%)," "if a family is eating balanced meal (91%)," "if a family enjoys food (81%)," and "if children eat what has been prepared (65%)." Other frequently mentioned factors affecting what they ate were as follows: family's preference (67%), women's knowledge on healthy eating (63%) and their preference (59%), and children's preference (61% and 51%). More than half of the women reported that the diet of their family was fine, while 45% reported that the diet could use some improvement (question 5).

Table 6-H-4-2 Questions regarding daily eating, corresponding answers, and percent of respondents [1]

Question1: When you are deciding what to buy at the store, you mainly think about:	
Cost	93 %
Whether it is healthy for your family	91 %
What will go with the TF you have at home	87 %
Whether the kids will eat it	79 %
Whether it is a favorite of the kids	67 %
Whether it is the best value for my money in terms of quantity	67%
Whether you like it	63 %
Whether it tastes good	53 %
Preparation way	53 %
Preparation time	53 %
Whether your partner likes it	44 %
Other (needs)	2 %
Question 2: The main factors that affect what you eat in your house from day to day are:	
What the kids want to eat	69 %
What is available at the store	69 %
Cost	65 %
The time of the meal (less time at lunch, more time at dinner)	63 %
What TF you have at home	63 %
What you feel like having	51 %
Work	48 %
What your partner wants to eat	38 %
Whether the food is quick and easy to make	36 %
The kid's schedules	36 %
The time of the month (more treats in the week after payday)	24 %
Question 3 : At meal times your main concerns are:	
That the food is healthy	97 %
That the kids have a filling meal	91 %
That the family is eating a balanced meal	91 %
That the everyone enjoys what they are eating	81 %
That the kids are eating what has been prepared	65 %
The taste of the food	38 %
How much time there is to prepare and eat a meal	32 %
Question 4: The main influences on the foods that you and your family have at meals are:	
Your concerns about whether the meal is healthy	87 %
What everyone likes to eat	67 %
Your knowledge about what is healthy to eat	63 %
Appeal of the food to kids	61 %
What you are craving	59 %
What the kids like to eat	51 %
Who is cooking the meal (such as yourself, your parents)	49 %
The day of the week (more time on the weekends)	46 %
The time of the meal (less time at lunch, more time at dinner)	36 %
Whether you need something quick and easy to make	36 %
The taste of the food	30 %

Question 5 : Do you think that the diet of your family is : [2]	
Fine	55 %
Could use some improvement	45 %

[1] Percent of respondents (multiple choices per respondent)

[2] Percent of respondents (single choice per respondent)

Table 6-H-4-3 shows the questions regarding traditional food use, the corresponding answers, and percent of respondents. The frequently reported reasons affecting traditional food use at home (question 1) were related to market food, such as "that you think it is better than store bought meat (89%)" and "that it is tastier (79%) and less expensive (77%) compared to store bought food." The factors related to culture and traditional food availability also influenced food choice, such as "that you grew up with it (77%)" and "whether there is any stored at home (75%)."

Frequently reported factors affecting traditional food availability at household (question 2) were as follows: "having a hunter in a house (81%)," "having family and friends that can share with you (67%)," "that traditional food is getting harder to find and get (61%)," and "the climate change (48%) and how that is affecting migration routes (46%)."

The major reasons that a family did not eat more traditional food (question 3) were that they were satisfied with what they ate (59%), work (59% and 40%), less accessibility to traditional food (48%), and concerns about contaminants (40%). The women reported that more availability and accessibility of traditional food (87% and 73%), less concern about contaminants (42%), and more time (34%) and ways (34%) to prepare traditional food would contribute to more traditional food use in household (question 4).

The often mentioned reasons for why the children ate less wild meat than the adults did growing up (question 5) were related to urbanization, such as more time spent in town (75%), women's work outside of home (71%), less opportunity to hunt and learn to cook traditional food (69%), less accessibility to traditional food (61%), and fussier in town about what children want to eat (53%).

Table 6-H-4-3 Questions regarding traditional food (TF) use, corresponding answers, and percent of respondents [1]

Question 1 : The main reasons that influence how often you serve TF at home are:	
You think that it is better for your family than store bought meat	89 %
You prefer it to store bought meat	79 %
It is less expensive than buying something from the store	77 %
Your grew up with it	77 %
Whether there is any stored at home	75 %
How often your family requests it	44 %
Whether the kids want to have it or something from the store	34 %
You cannot cook it many ways, so you appreciate the variety from the store	30 %
How often your partner requests it	28 %
Whether you have the time to make it	20 %
The time it takes to prepare it	18 %
The need to maintain the relationship with each other and the animals	14 %
You did not grow up with it so it is not that important	8 %
Other (when it is available)	2 %
Question 2: What makes a difference in the amount of TF I have at home is:	
Having a hunter in your house	81 %
Having family and friends that can share with you	67 %
That TF is getting harder to find and get	61 %
The climate change and how that is affecting migration routes	48 %
Work because it makes it harder to get TF	46 %
Your concern about the safety of eating TF	40 %
Your schedule, it limits the time I have to get it, preserve it, and prepare it	24 %
The limited knowledge you have about cleaning, preserving, and preparation	16 %
Question 3 : Your family does not eat more TF in your household because;	
Your family has enough to satisfy your needs	59 %
Work keeps you from getting out on the land more often	59 %
It is hard to get around here	48 %
You cannot just go out hunting/fishing very easily after work	40 %
You are concerned about the safety of TF	40 %
Your family gets tired of it and need a change	38 %
You enjoy having a variety of store bought meats	34 %
It costs too much to go hunting/fishing more often	32 %
You prefer to get your food from the store	22 %
You do not have a husband, friends or family who can provide more	20 %
That is all we can get	18 %
The kids are not used to eating it	8 %
You and your family have not grown up with it	6 %
Other (insufficient funds to go hunting, they only eat TF)	4 %

Question 4 : Would serve more TF if;	
I had more stored at home	87 %
It was easier to get	73 %
I was less concerned about contaminants	42 %
I had more time to prepare it	34 %
I knew more ways to prepare it	34 %
The kids were not so fussy	32 %
No, I am happy with how much TF we eat now	26 %
Other (if we had more wild meat to eat, if a place in storage is available)	4 %
Question 5 : Children eat less wild meat than we did growing up because:	
Kids spend more time in town than we did	75 %
Women work outside of the home more now and have less time to make TF	71 %
Kids have less opportunity to hunt, learn to prepare/cook TF	69 %
Wild meat is harder to get now	61 %
Kids are fussier in town about what they want to eat	53 %
We have less at home because it is harder to get out hunting/fishing	48 %
People make more money and so eat more MF	42 %
No, I think they eat the same amount	42 %
Kids are not used to eating it	40 %
Parents serve MF more often because that is what the kids ask for	38 %
Other (we are single mothers who can not go out hunt)	2 %

[1] Percent of respondents (multiple choices per respondent)

Table 6-H-4-4 shows questions regarding children's eating habits, the corresponding answers, and percent of respondents. What children want to eat (question 1) was reported to depend on several factors, such as what their caregivers cook (71%), their body need (69%), information from TV (67%) and school (59%), and the appearance (67%) and texture (55%) of food. More than 80% of the women thought that children should eat more (question 2) fruit and vegetables and wild meat, but less candies, pops, chips, and prepared convenience foods (79%). More than 50% of the women reported that the children should eat more dairy products and the same amount of meat. Overall, more than a half of the women (53%) were not concerned about the children's food choice, 39% were a little bit concerned, and a small number of women (8%) were very concerned.

Table 6-H-4-4 Questions regarding children's eating habits, corresponding answers, and percent of respondents [1]

Question 1 : What children want to eat is mainly influenced by :			
What their parents/grandparents cook			71 %
What their bodies need			69 %
What they see on TV			67 %
The appearance of the food			67 %
What they learn in school			59 %
The texture of food			55 %
The packaging on the store foods			36 %
What their friends have			30 %
Other (they eat what is put before them: healthy, nutritious, and balanced meals)			2 %
Question 2 : Please tell me whether you believe your children should eat more, the same or less of:			
Fruits and vegetables		Pops	
More	84 %	More	2 %
Same	16 %	Same	9 %
Less	0 %	Less	89 %
Dairy products		Chips	
More	69 %	More	4 %
Same	29 %	Same	7 %
Less	2 %	Less	89 %
Meat		Wild meat	
More	29 %	More	84 %
Same	52 %	Same	14 %
Less	19 %	Less	2 %
Prepared convenience foods			
More	2 %	Other (more fish)	2 %
Same	19 %		
Less	79 %		
Candies			
More	2 %		
Same	2 %		
Less	96 %		
Question 3 : Would you say that overall, what your kids usually choose to eat is : [2]			
Pretty good, and you are you are not concerned			53 %
Alright, you are a bit concerned			39 %
Not good (too much junk foods, eating candy, pop, and chips before a meal)			8 %

[1] Percent of respondents (multiple choices per respondent)

[2] Percent of respondents (single choice per respondent)

Table 6-H-4-5 shows questions regarding women's eating habits, the corresponding answers, and percent of respondents. The women frequently mentioned factors that influenced food choice, such as "concerns of health (83%)", "knowledge about what is nutritious (73%)," "what you grew up eating (67%)," "whether you are working (51%)," and "who is cooking the meal (46%)."

Table 6-H-4-5 Questions regarding women's eating, corresponding answers, and percent of respondents [1]

Question 1 : I think what really affects what women eat is:	
Concerns about health	83 %
Knowledge about what is nutritious	73 %
What you grew up eating	67 %
Whether you are working	51 %
Who is cooking the meal	46 %
What you are craving	44 %
Other (moose meat availability)	2 %

[1] Percent of respondents (multiple choices per respondent)

Table 6-H-4-6 shows the questions regarding powdered drinks selection, the corresponding answers, and percent of respondents. Approximately 60% of the women mentioned that they would choose Koolaid over Northern/Co-op crystals (question 1). This decision was based on several factors, such as cost (33%), children's preference (31%), and the vitamin content (27%).

Table 6-H-4-6 Questions regarding powdered drinks selection, corresponding answers, and percent of respondents [1]

Question 1: If you could only choose between Koolaid and Northern/Co-op crystals, which one would you take?	
Koolaid	57 %
Northern/Co-op	41 %
Neither	2 %
Question 2: Which of these factors would influence your decision the most strongly?	
Price	33 %
Whether the kids like it	31 %
The vitamins	27 %
Other (less sugar, healthy, cheap and variety of flavors)	6 %
Brand	4 %

[1] Percent of respondents (single choice per respondent)

Table 6-H-4-7 shows the information related to traditional medicine use and special meals. Sixty percent of the women mentioned use of any traditional medicine, and a total of 12 items were reported. More than 80% of the women reported cooking special dishes for elders.

Table 6-H-4-7 Information related to traditional medicine use and special meals [1]

Question 1: How often do you drink/eat traditional medicine?	
≥ 3 times per week	12 %
< 3 times per week but ≥ 1 time per week	4 %
< 1 time per week but ≥ 1 time per 2 months	20 %
< 1 time per 2 months but ≥ 1 time per 6 months	14 %
< 1 time per 6 months but ≥ 1 time per year	4 %
Other (once in a while, when we are sick)	6 %
No answer	2 %
Never use	37 %
Question 2: What traditional medicine do you usually have?	
Gum juice	19 %
Rat root	6 %
Labrador tea	4 %
Spruce cones	4 %
Wood gum	4 %
Labrador tea(Indian)	4 %
Balsam	4 %
Pitch	4 %
Wood gum juice	4 %
Spruce juice	4 %
Red willow	2 %
Smudge	2 %
No answer	2 %
Never use	35 %
Question 3: How often do you cook a special meal for a grandma/grandpa or any elder that you want to sit down with? [2]	
≥ 3 times per week	2 %
< 3 times per week but ≥ 1 time per week	14 %
< 1 time per week but ≥ 1 time per 2 months	49 %
< 1 time per 2 months but ≥ 1 time per 6 months	16 %
Never	18 %

[1] Open-ended question

6-H-5) Needs and plans for better eating

Table 6-H-5-1 shows the questions regarding needs and plans for better eating, corresponding answers, and percent of respondents. The frequently reported factors for better eating (question 1) were "more education for children (87%) and more information for parents (87%) about healthy food choices." Also mentioned were "more access to traditional food (83%)," "more variety at the store (63%)," and "more control over what the store sales (53%)."

More than a half of the women agreed that all the answers (plans) given for the question about suggested plans for better eating in the communities were applicable (question 2), especially "workshops on healthy eating (83%)," and "a community garden (83%)."

Table 6-H-5-1 Questions regarding needs and plans for better eating, corresponding answers, and percent of respondents [1]

Question 1 : In order for families to eat better we need:	
More teaching in school about healthy food choices	87 %
More information for parents and children about healthy food choices	87 %
More access to traditional food	83 %
More variety at the store	63 %
More control over what the store sells	53 %
None of the above, everything if fine the way it is	10 %
Other (TF available at local stores, affordable cost/prices, community hunt)	2 %
Question 2 : I would like to see the following things initiated in our community:	
Workshops on healthy eating	83 %
A community garden	83 %
More programs to teach people about how to preserve and prepare traditional food	77 %
Equipment that people could use for preparing that preserving traditional food (such as sausage making equipment)	73 %
More community hunts	73 %
A lunch school program	69 %
More subsidies for hunting	69 %
A breakfast school program	67 %
A ban on junk food in school	65 %
A community run store	61 %
Community control on availability of junk food	53 %
None of the above, everything if fine the way it is	4 %

[1] Percent of respondents (multiple choices per respondent)

[7] Discussion

7-A) Anthropometry

The anthropometric data show no evidence of undernutrition in Dene/Métis and Yukon children (Table 6-C-1-1). However, obesity is a concern for the children. On average of two seasons, 32% of Dene/Métis and Yukon children were above the 85th percentile of the 2000 CDC reference. These findings were similar to the results from previous studies with other Canadian Native children (Bernard et al, 1995; Trifonopoulos, 1995; Potvin et al, 1999; Hanley et al, 2000).

Higher percentage of girls (34%) than boys (28%) were above the 85th percentile (Table 6-C-1-1), which was in agreement to studies conducted with Mohawk children (33% for girls and 30% for boys) (Trifonopoulos, 1995; Potvin et al, 1999) and Sandy Lake First Nation children (34% for girls and 28% for boys) (Hanley et al, 2000).

The children were taller and heavier than the 2000 CDC children (Table 6-C-2-1 and Table 6-C-2-2), suggesting an earlier onset of puberty in Dene/Métis and Yukon children than in the CDC children. This trend agreed with the study with Mohawk children (Trifonopoulos, 1995).

These anthropometric results need to be reported with caution since the 2000 CDC reference was mostly based on White, Black, and Hispanic children living in the United States (CDC, 2003). The CDC reference may not be appropriate for Dene/Métis and Yukon children because of racial difference. CDC recommends the use of the 2000 Growth Charts for all racial and ethnic groups based on studies reported that differences in growth observed among racial and ethnic groups resulted from environmental factors, such as socioeconomic status, poverty, and availability of health and nutrition services, rather than genetic influence (Habicht et al, 1974; Graitcer and Gentry, 1981; Mei et al,1998). Some studies reported need for a specific reference for each racial or ethnic group (Lusky et al, 2000; Yanai et al, 1997; Cronk and Roche, 1982). However, there is no specific reference available for the Canadian Native children.

The risk of obesity varied by gender and regions (Table 6-G-1-1). The risk of obesity was 30% lower in boys than girls. Compared to the south region, the risk of obesity

was 40% lower in the north region and 50% lower in the central region. However, the difference in the risk of obesity was significant only between the south and the central regions.

Considering the understanding of obesity in a population, data on physical activity and television viewing may have been helpful. Several studies have reported that low levels of physical activity and high levels of television viewing were associated with obesity (Salbe et al, 2002, Hanley et al, 2000; Bernard et al, 1995; Janz et al, 2002).

7-B) Adequacy of nutrient intake

7-B-1) Energy intake

Although anthropometric data showed higher prevalence of obesity among Dene/Métis and Yukon children (Table 6-C-1-1), excessive energy intake was not observed; rather, a low energy intake was seen (Table 6-D-2-6). In addition, there was no association between energy intake and BMI category or region. (Table 6-G-3-3 and Table 6-G-3-4).

This discrepancy may be related to possible errors in 24h-recall collection as well as in analysis of food intake data (Willet, 1998). A number of sources of error in collecting dietary information using the 24h-recall method is known: 1) reliance on the subject's memory, 2) lack of adequate food descriptive detail, 3) quantification of portion sizes, and 4) lack of motivation of both subjects and interviewers. All these potential errors can result in underreporting. Several sources of error in converting food intakes to nutrient intakes are also known, such as coding of food intake data and the use of available food composition database for calculating nutrient intakes. Another possible error is that selected days for 24h-recall interviews were simply not associated with anthropometric information which is an outcome of dietary intake over time. It was not known which source(s) of error contributed to the discrepancy of this study.

A number of studies assessed the validity of food reporting methods by comparing reported energy intake with energy expenditure measured using doubly labeled water technique, and indicated bias to the underestimation of energy intake (Black et al, 1993; Macdiarmid and Blundell, 1998; Subar et al, 2003; Livingstone and Black, 2003).

Livingstone and coworkers (1990) reported serious discrepancies between reported energy intake and energy expenditure measured by doubly labeled water technique among the individuals ranging from -55% to +40%, with a mean value of -20%. Underreporting observed in the present study may be due to the limitation(s) of the 24h-recall method.

Compared to other studies on dietary intake of school children, reported energy intake of the Dene/Mé-is and Yukon children 10 to 12 years of age (mean energy intake, 1840kcal for girls and 2056kcal for boys) (Table 6-G-3-2) (median usual energy intake, 1725 kcal for girls and 1886 kcal for boys) (Table 6-D-2-1 and Table 6-D-2-2) were not remarkably low. The study with Native school children 8 to 15 years of age in Northern Alberta reported mean energy intake 1750 kcal for girls and 2079 kcal for boys (Wein et al, 1993a). The studies with Mohawk children 10 to 12 years of age reported mean energy intake 2212 kcal for girls and 2166 kcal for boys in 1994 (Trifonopoulos et al, 1998) and 2100 kcal for girls and 2202 kcal for boys in 1998 (Jimenez, 2000). The study with the US children participated in 1994 to 1996 Continuing Survey of Food Intake by Individuals (CSFII) (Suitor and Gleason, 2002) reported median usual intake 1854 kcal for girls and 2199 kcal for boys (9 to 13 years of age).

7-B-2) Micro- and macronutrient intakes

Of the 20 nutrients from the diet compared to the DRI values (Table 6-D-2-1, Table 6-D-2-2, Table 6-D-2-3, and Table 6-D-2-4), more than half of the nutrients were found to be probably inadequate (vitamin A, calcium, phosphorus(girls, boys in season 2), vitamin D, vitamin E, dietary fiber, omega-6 fatty acids, omega-3 fatty acids, and magnesium(girls in season 2)) or possibly adequate (folate, zinc, protein, vitamin C, magnesium(girls in season 1, boys), and phosphorus(boys in season 1)) (Table 6-D-2-5), suggesting the necessity of dietary improvement of Dene/Métis and Yukon children.

However, potentially two factors may have contributed to the observed lower nutrient intakes of Dene/Métis and Yukon children. The DRI values were designed to be achieved by nutrient intakes both from diet and supplement, although here only dietary nutrient intakes were compared to the DRI values. The information on supplement use was not sufficient to incorporate in the present study (Figure 6-E-2). Specific questions on

supplement use, such as frequency and brand name, should also be asked.

The possible underreporting of energy intake, as discussed before, may contribute to these estimated lower nutrient intakes since lower nutrient intakes were found in low energy reporters compared to adequate energy reporters (Pryer et al, 1997; Briefel et al, 1997; Price et al, 1997; Hirvonen et al, 1997). However, the relationship between specific food items or nutrients and underreporting are not clear (Livingstone and Black, 2003).

Even if nutrient intakes from supplements were incorporated and underreporting did not occur, some nutrients (especially those in the probably inadequate group) may remain low because of the very low estimated intakes. Large percentage of the children were under the requirements of these nutrients. In fact, the nutrients in probably inadequate group (vitamin A, calcium, vitamin D, and dietary fiber) were frequently mentioned in the articles described in the literature review section (2-B) as risk nutrients. The adequacy of vitamin E, omega-6 fatty acids, and omega-3 fatty acids was not examined in these articles. The Sahtu study (Kuhnlein et al, 1995b) and the Dene/Métis adult study (Receveur et al, 1997) examined adequacy of magnesium intake, and concluded that magnesium intake was not a concern for the subjects according to their criteria.

A more significant concern was that all children had intakes of vitamin E below the EAR level. However, vitamin E deficiency is known to be rare for humans, and normally occurs only as a result of either genetic abnormalities in hepatic alpha-Tochoperol Transfer Protein (alpha-TTP) or protein-energy malnutrition (IOM, 2000b). Two large dietary surveys in the US, the 1994 to 1996 Continuing Survey of Food Intakes by Individuals (CSFII) and the Third National Health and Nutrition Examination Survey (NHANES III), found low vitamin E intake for the populations, and suggested sources of measurement error for the low intake as follows: 1) underreported energy intake and fat, a major source of vitamin E, intake, 2) uncertainties about the particular fats or oils consumed, especially when food labels provide no specific fat or oil information for the product, and 3) wide variation in the vitamin E content of food sources in the databases due to small sample size. Numerous studies reported low vitamin E intake (Arab et al, 2003; Suitor and Gleason, 2002; Stang et al, 2000; Beitz et al, 2002; Fitzgerald et al, 2002; Christie et al, 2002).

Considering this information, the vitamin E deficiency may not be a concern for Dene/Métis and Yukon children, and possibly because errors for estimation of vitamin E intake may have occurred in the present study. However, increased vitamin E intake is recommended for the children since adequate intake may reduce the risk of later chronic diseases, such as heart disease, cancer, diabetes, and cataracts (IMO, 2000b).

Excessive nutrient intake was not observed among Dene/Métis and Yukon children, although zinc in season 2 (4%) and copper (1%) had small percent above the UL for boys (Table 6-D-2-3 and Table 6-D-2-4). The DRIs set the UL values for zinc and copper intakes from diet, supplement, and drinking water. However, adverse health effect of these excess intakes was based on studies on supplement or drinking water, and there is no study reporting adverse health effect of excess zinc and copper intakes from diet (IMO, 2001). Considering these fact, excess zinc and copper intakes may not be a problem for boys. One notice is that risk of excessive intakes of magnesium, folate and vitamin E were not estimated since the UL applies to intakes from supplements or fortification sources for these nutrients. It is ideal to estimate nutrient intake from diet, supplement, and drinking water.

Regarding macronutrient intakes (Table 6-D-3-1 and Table 6-D-3-2), excessive or inadequate energy intake from carbohydrate and fat were found in more than 20% of Dene/Métis and Yukon children, suggesting that this proportion needs to be improved. Protein intake was likely to be adequate. Lower energy intakes from omega-6 fatty acids and omega-3 fatty acids were observed in a high percentage of children, indicating these nutrient intakes need to be increased.

Excessive energy intakes from total sugar and saturated fat were found in more than 40% of the children, suggesting the necessity to lower these. However, there was a possibility of overestimation of total sugar intake as mentioned in the results section (6-D-3).

7-C) Food use

7-C-1) Traditional food use

The contribution of traditional food in terms of total energy intake was only 4.3%

for Dene/Métis and Yukon children (Figure 6-F-1-1). This percentage was close to the traditional food intake of Northern Alberta children (3%) (Wein et al, 1992), although the percentage was smaller compared to Sahtu Dene/Métis adults (32%) (Morrison et al, 1995), Dene/Métis adults in 16 communities (22%) (Receveur et al, 1997), Yukon adults in 10 communities (14%) (Receveur et al, 1998a), and Yukon adults in four communities (17%) (Wein and Freeman, 1995). This is in agreement with other studies (Wein et al, 1992; Morrison et al, 1995) which indicate that younger people consumed less traditional food compared to older people.

A prominent difference in traditional food use was observed among communities (Figure 6-F-1-1 and Figure 6-F-1-2). Children in Northern Dene/Métis and Yukon communities consumed more traditional food than southern Dene/Métis and Yukon communities. This is in agreement with the Dene/Métis adult study (Receveur et al, 1997) and the Yukon study in four communities (Wein and Freeman, 1995). The suggested reasons for the difference were similar in both studies, and included traditional food resource availability, population size, road access and availability of affordable market food, proximity to animal migration routes, and prevalent fishing and hunting practices.

Twenty-eight traditional food items were consumed by Dene/Métis and Yukon children, and traditional meat, especially land animals, contributed to a large part (87%) of total energy intake from traditional food (Table 6-F-1-1 and Figure 6-F-1-3). The number of traditional food items consumed was small compared to the Yukon adult study, which observed at least 43 traditional food items in the communities (Wein and Freeman, 1995). This smaller number may be explained by the fact that the present study conducted 24h-recall interviews in two seasons, while the Yukon adult study conducted 24h-recalls over four seasons (Wein and Freeman, 1995). The Sahtu Dene/Métis (Morrison et al, 1995) study and the Dene/Métis adult study (Receveur et al, 1997) also reported a high contribution of land animals to total energy intake from traditional food, 61% and 81%, respectively.

7-C-2) Market food use

Market foods were found to be the major part of the diet of Dene/Métis and Yukon

children. However, a half of the energy intake from market foods came from fat, sweet, mixed dishes, and extra items which are categorized in the "other" food category by CFGHE (Figure 6-F-2-1), suggesting a necessity of dietary improvement for the children. The "other" food category is recommended to be consumed in moderation since some of these foods are higher in fat, calories, and/or salt (Health Canada, 2003). High consumption of fat and sweet groups agreed with the excessive total sugar and saturated fat intakes observed in macronutrient intakes of Dene/Métis and Yukon children (Table 6-D-3-1 and Table 6-D-3-2).

The "other" food category remarkably contributed to energy intake, and therefore also contributed to selected nutrient intakes (Table 6-F-3-1). For example, potato chips were listed as a good source for energy as well as many nutrients: fat, saturated fat, copper, vitamin E, magnesium, phosphorus, folate, dietary fiber, sodium, omega-6 fatty acids and omega-3 fatty acids. Another example was macaroni and cheese which was listed as a good source of energy, protein, fat, saturated fat, iron, zinc, magnesium, calcium, phosphorus, vitamin A, vitamin E, and sodium.

7-D) Data analysis

7-D-1) Days with and without traditional food

Although traditional food intake of the children was less than 5%, several traditional food items, such as caribou, moose, and whitefish made important contribution to some selected nutrient intakes of Dene/Métis and Yukon children (Table 6-F-3-1). Traditional food intake also contributed to a number of nutrient intakes, especially less fat, sodium, and dietary fiber, but more protein, iron, zinc, copper, phosphorus, vitamin E, riboflavin, and vitamin B6 (Table 6-G-2-1 and Table 6-G-2-2).

These differences in nutrient contents between days with and without traditional food may be due to the replacement of traditional land animals with mainly market meat, alternate products, and less dairy products (Table 6-G-2-3). This finding partially agreed with the result of the Dene/Métis adult study which compared food use among three age groups (Receveur et al, 1997). The adult study found a significantly greater consumption of dairy, fruit and vegetables, market meat, mixed dishes, and sweet and fat groups in younger

people, and more consumption of grains, land animals, and fish groups in older people. This study suggested there was a replacement of traditional land animals with market meat.

7-D-2) Sources of variation for dietary intakes

A few differences were found in food use and nutrient intakes by season, gender, and BMI category. Higher consumption of grain products during season 2 (fall) may result in higher carbohydrate intake during the season (Table 6-G-5-1 and Table 6-G-3-1). Higher fat, saturated fat, and potassium intakes during season 1 (winter) may be explained by higher consumption of dairy products during the season (Table 6-G-3-1, Table 6-G-4-1, and Table 6-G-5-1).

Higher intakes of sugar, vitamin E, and vitamin C among girls may be due to their higher fruit and vegetable consumption (Table 6-G-3-2, Table 6-G-4-2, and Table 6-G-5-2). Boys had higher energy intake than girls, which may be explained by higher energy requirement for boys. Higher dairy product consumption among boys may contribute to their higher sodium intake.

Iron, zinc, and vitamin B6 intakes differed among BMI categories. The intakes were the highest in the children at risk of overweight category, followed by the normal weight children and then the overweight category children (Table 6-G-4-3). The variation may be explained by the difference in consumption of traditional food (expressed as gram weight), especially land animals among the BMI categories, because of the positive relation observed between these nutrient intakes and both traditional food consumption and land animals (Table 6-G-5-3). In fact, iron, zinc, and vitamin B6 were the nutrients higher in traditional food items than market food items (Table 6-F-4-1). Energy intake was also different among the BMI categories, and was already discussed in the energy intake section (7-B-1).

Regional differences in food use and nutrient intakes were prominent. Communities that were further north consumed more land animals (Table 6-G-5-4). The lowest consumption of fat rich items and the highest intakes of grain products and sweet food items were found in the north region. The central region was the lowest for mixed dish consumption and the highest for market meat and alternate consumption. The lowest

consumption of sweet food items and the highest consumption of mixed dishes were found in the south region.

These differences in food use, especially traditional food, were likely to affect the difference in nutrient intakes among regions. Higher iron, copper, vitamin B6, zinc, riboflavin, magnesium, and phosphorus intakes, and traditional food consumption (expressed as gram weight), but lower sodium and calcium intakes were found in the north and central regions compared to the south region (Table 6-G-4-4). In fact, these nutrient contents in the two regions related with the nutrient contents of traditional foods (Table 6-F-4-1). This is agreement with the findings from the data analysis of food use and nutrient intake by days with and without traditional food and BMI category. Energy intake was also different among the regions. This was already discussed in energy intake section (7-B-1). It is important to note that these nutrient differences occurred even when traditional food was consumed at a less than 5% of total energy intake.

Compared to the south region, the north region and especially the central region tended to have a lower risk of obesity (Table6-G-1-1). Therefore, the comparison in food use between the south and the other two regions may help explain the difference in the occurrence of obesity. For example, more consumption of grains, meat and alternates, sweet, and land animals, but less mixed dishes in the two regions may partially explain for the differences.

7-E) Food choice questionnaire interview

The result of anthropometric measurements and dietary intake interviews on Dene/Métis and Yukon children showed that excessive prevalence of overweight, inadequacy of some nutrients, and high use of the "other" food category in CFGHE were concerns for nutrition of children, suggesting a necessity for dietary improvement. The information from food choice questionnaire interviews may identify what factors affect food selection in the households. This information will help communities to plan for nutrition improvement for Dene/Métis and Yukon children and help identify target factor(s) that should be considered. The food choice questionnaire interviews for the mothers of Dene/Métis and Yukon children covered a wide range of information from household

demography to use of traditional medicine, although only factors affecting daily eating habits will be discussed in this section.

Some factors were frequently mentioned as having an influence on food purchase selection or day to day variations in daily eating over the other factors. Cost, health, children's preference and acceptability, traditional food and market food availability, and women's preference were frequently mentioned factors (Table 6-H-4-2).

Cost was mentioned as the primary factor affecting food choice at stores. In fact, high market food cost in the northern communities due to the long distance transportation by truck, ship, and especially air has been documented (Wein, 1994; Lawn et al, 1998; Campbell et al, 1997; Receveur and Kuhnlein, 1998b). For example, the cost for buying a nutritionally adequate diet in Old Crow, which is accessible only by air, was three times higher than the cost in Edmonton. Food cost was 1.8 times, 1.5 times, and 1.3 times higher in Haines Junction, Teslin, and Whitehorse, respectively, which are all accessible by truck, when compared to Edmonton (Wein, 1994). In fact, a high percentage of respondents mentioned that they would buy more market food items, especially fresh fruit and vegetables and dairy products, if they were less expensive (Table 6-H-3-2).

Health was frequently mentioned as a factor affecting food purchase as well as at meal times (Table 6-H-4-2). Many women thought that children should have eaten more food items in four CFGHE categories, such as fruit, vegetables and dairy products, but less food items in the "other" food category in CFGHE, such as prepared convenience foods, candies, and pops (Table 6-H-4-4), suggesting that the women have good knowledge on healthy eating. Two studies, one conducted with First Nations and Métis near Wood Buffalo National Park (Wein et al, 1989) and the other conducted with Native school children and mothers in Northern Alberta (Wein et al, 1993b) also reported higher health value for four CFGHE categories but lower health value for the "other" food category in CFGHE among subjects.

These two studies also surveyed food preference of the Native people. The Wood Buffalo National Park study found preference to traditional food over market food among all age (from 13 to 86 years of age) and gender groups. The Northern Alberta study reported preference both traditional and market foods among the children and the mothers.

Traditional food availability in a household depended on several factors including the presence of a hunter in a household, having family and friends to share in traditional food, and availability of traditional food in the environment (Table 6-H-4-3). Wein and coworkers (1991a) found a correlation between frequency/amount of consumption of traditional food and presence of a hunter, trapper, or fisherman in household. Decreased traditional food availability in the environment was also reported in Dene/Métis and Yukon communities, such as fewer rabbits, caribou, moose, fish, and berries (Receveur et al, 1996; Receveur et al, 1998a).

Market food availability may be a concern for remote communities accessible only by air. Wein (1994) noted that the store in Old Crow had a smaller variety of food items and many of these items disappeared quickly. This was because of limited storage space in the store and limited availability of space on the aircraft for food.

These factors reported as having an influence on food selection provides suggestions for nutrition improvement planning for Dene/Métis and Yukon children. For example, considering community differences in cost of market food and traditional and market food availability, the nutrition improvement planning may need to be community specific. Maximum utilization of traditional food may be feasible and effective for northern Dene/Métis and Yukon communities where traditional food is available and where high cost as well as limited amount and number of market food is available. One notion is that although increased traditional food intake may lead to dietary improvement of the children, concern with dairy products, fruit, and vegetables may still remain. Traditional foods nutritionally equivalent to fruit, vegetables, and dairy products (organ meats, eggs, wild plants) were infrequently consumed by children, and rarely mentioned in the recalls (Table 6-F-1-1).

[8] Summary and conclusion

This study was a part of the project, Food Choice Decisions by Western Arctic Aboriginal Women and Children. The objectives of this study were two fold, 1) to describe anthropometry, nutrient intakes, and food use of Dene/Métis and Yukon children and to analyze the data, with focus on food sources (traditional and market food), season, gender, location, and BMI category, and 2) to describe factors which affect food choices of the children's households. Five null hypotheses were tested: there is no difference in nutrients intake and food use between days with and without traditional food, seasons, and gender, and among locations and BMI category groups

Anthropometric data showed no evidence of undernutrition in Dene/Métis and Yukon children. However, obesity is a concern for the children. On average, 32% of the children were above the 85th percentile of BMI-for-age in the 2000 CDC Growth Charts.

Although anthropometric data showed higher prevalence of obesity among Dene/Métis and Yukon children, excessive energy intake estimated from 24h-recalls was not observed. It is possible that bias resulted in the underestimation of energy intake due to the limitation(s) of 24h-recall method. However, mean and median energy intakes for these 10 to 12 year old children were similar to energy intakes reported by other studies with school children.

Of the 20 nutrients from the diet compared to the DRI values, more than a half of the nutrients needed improvement for Dene/Métis and Yukon children. Vitamin A, calcium, phosphorus, vitamin D, vitamin E, dietary fiber, omega-6 fatty acids, omega-3 fatty acids, and magnesium were especially risk nutrients. Excessive nutrient intake was not likely a problem for dietary intake. Regarding macronutrient intakes, imbalance of energy intake

from carbohydrate, fat, omega-3 fatty acids, and omega-6 fatty acids, and excessive total sugar and saturated fat were of concern.

Market foods were a major part of the diet of Dene/Métis and Yukon children. Half of the energy intake from market foods came from the "other" food category in CFGHE, which is a concern since these foods are higher in fat, calories, and/or salt, and are recommended to be consumed in moderation.

The contribution of traditional food in terms of total energy intake was only 4.3% for Dene/Métis and Yukon children. The prominent difference in traditional food use was observed among communities. Children in northern Dene/Métis and Yukon communities consumed more traditional food than southern Dene/Métis and Yukon communities. Twenty-eight traditional food items were consumed, and traditional meat, especially land animals, contributed to a large part (87%) of total energy intake from traditional food.

Traditional food intake contributed to difference in a number of nutrient intakes. Days with traditional food were lower in fat, sodium, and dietary fiber, but higher in protein, iron, zinc, copper, phosphorus, vitamin E, riboflavin, and vitamin B6. These differences in nutrient contents may be due to the replacement of traditional land animals with mainly market meat, alternate products and less dairy products.

Children in participating communities were grouped into regions, the north, the central, the south, to facilitate data analysis. A few differences were found in food use and nutrient intakes by season, gender, and BMI category, while regional differences in food use and nutrient intakes were prominent. The differences in food use, especially traditional food, were likely to affect the difference in nutrient intakes among regions. Considering these findings from data analysis, all the null hypotheses were rejected.

Compared to the south region, the north region and especially the central region

had a lower risk of obesity. Therefore, the comparison in food use between the south and the other two regions may help explain the difference in the occurrence of obesity. For example, more consumption of grains, meat and alternates, sweet, and land animals, but less mixed dishes in the two regions may partially explain for the differences.

In food choice questionnaire interviews, some factors were frequently mentioned as having an influence on food purchase selection or day to day variations in daily eating over the other factors. Cost, health, children's preference and acceptability, traditional food and market food availability, and women's preference were the frequently mentioned factors.

The result of anthropometric measurements and dietary intake interviews on Dene/Métis and Yukon children showed that obesity, inadequacy of some nutrients, imbalance of some macronutrients, excessive intake of sugar and saturated fat, and high use of the "other" food category in CFGHE were concerns, suggesting a necessity of a dietary improvement for children. Nutrition improvement planning in these communities should consider the factors as having influence on food selection reported through food choice questionnaire interviews.

Further research on the following topics are recommended for better understanding of anthropometry and diet of Dene/Métis and Yukon children, and therefore, better planning for health: 1) physical activity level and supplement use of children, 2) affordability and availability of market food among communities, 3) traditional food availability among communities, 4) food preference on traditional and market food of children and women, and 5) education for healthy eating by children and women.

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Appendices

(1) Ethics form

(2) Consent form – child participation

(3) Consent form – women

(4) Consent form – focus group interview – women

Food Choice Decisions by Western Arctic Aboriginal Women and Children

CONSENT FORM FOR CHILD PARTICIPATION

The purpose of our work is to find out how decisions of food selection are made by women and children in Dene communities and Yukon First Nation communities. The need for this project has arisen out of community concerns over the changing diet patterns of adults and children. This work will help to better understand the decision - making process of women and children and assist in nutrition education strategies whose goals include the reduction of risk of disease through diet.

This study is done by the Centre for Indigenous Peoples' Nutrition and Environment (CINE) in cooperation with Dene Nation and the Council of Yukon First Nations (CYFN). Funding is provided through the Northern Contaminants Programme (INAC). Your community leaders have agreed to include this area in the study. At the end of the study the leaders of the project will give a full report to the communities. The researchers will return to the communities and will be available to discuss results.

If you would allow your child to participate in this study, we ask you to sign and print your name on the following page. Your child will be asked about what food was eaten over the period of a day and some questions about food that he/she prefers to eat. The weight and height of your child will also be measured. All information will be confidential and never publicly attached to the name of your child. Number codes will be used on all forms. Upon completion of the interviews any documents containing names of children or parents will be destroyed.

In order to understand factors influencing food selection of families we are asking female caregivers to answer questions about food choices. This interview will take between 30-40 minutes. Please indicate whether you would be willing to consider consenting to an interview. If you are, we will return to your house this week to ask for your consent and interview you.

The local community interviewer will answer any questions you may have about this study or will refer them to the research supervisors.

Research Supervisors:

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Research Assistants

Norma Kassi, Whitehorse, Yukon
Karen Fediuk, CINE, Montreal

Centre for Indigenous Peoples' Nutrition and Environment

Interviewer, once you give the first page of the consent form to the respondent (to keep) , please initial this form: _____ (your initials). This acknowledges that you have read the consent form to the respondent in language that the respondent, to the best of your knowledge, understood and have provided the respondent with a written copy in English.

This bottom portion to be destroyed when interviews are completed

Do we have your permission to interview your child? Yes _____ No _____

Would you be interested in finding out more about the survey we are asking female caregivers to complete on family food choices? Yes_____ No_____

_____ Parent's signature

_____ Parent's name

_____ Child's name

_____ Community

Centre for
Indigenous Peoples'
Nutrition &
Environment

Food Choice Decisions by Western Arctic Aboriginal Women and Children

CONSENT FORM - Questionnaire and Focus Group Interview - Women

The purpose of this work is to find out how decisions of food selection are made by women and children in Dene/Métis communities and Yukon First Nations communities. This work will help to better understand the decision- making process of women and children and assist in nutrition education strategies whose goals include having better food available and reduction of risk of disease through diet.

This study is done by the Centre for Indigenous Peoples' Nutrition and Environment (CINE) in cooperation with Dene Nation and the Council of Yukon First Nations. Funding is provided through the Northern Contaminants Program (INAC). Your community leaders have agreed to include this area in the study.

At the end of the study the leaders of the project will give a full report to the communities. The researchers will return to the communities and will be available to discuss results from individuals.

If you would like to participate in this study, you are invited to join us for an afternoon to answer questions about how decisions are made about the food you eat. You will be paid $100.00 in compensation for your time. All information will be confidential and never publicly attached to your name. Number codes will be used on all forms.

At any time you can refuse to answer any or all of the questions and ask to terminate the interview. Any questions that you may have about this study will be answered by the Research Assistant, Karen Fediuk or the research supervisors.

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Research Assistants

Norma Kassi, Whitehorse, Yukon
Karen Fediuk, CINE, Montreal

Interviewer, once you give the copy of the consent form to the respondent, please initial this form: _____ (your initials). This acknowledges that you have read the consent form to the respondent in language that the respondent, to the best of your knowledge, understood and have provided the respondent with a written copy in English.

INTERVIEWER, KEEP THIS FORM ATTACHED TO THE FIRST QUESTIONNAIRE AND USE IT TO CHECK THE RECORD FOR COMPLETENESS. THE FIELD SUPERVISOR WILL CHECK IT AGAIN.

RESPONDENT'S ID _____

	CHECK WHEN COMPLETED	
	Interviewer	Supervisor
1. Food Choice Decision Questionnaire	_____	_____

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Do we have your permission to begin? Yes _____ No _____

_____Respondent's ID

_____ Respondent's signature

_____ Respondent's name

_____ Research assistant's name/signature

Food Choice Decisions by Western Arctic Aboriginal Women and Children

CONSENT FORM - Women

The purpose of our work is to find out how decisions of food selection are made by women and children in Dene communities and Yukon First Nation communities. The need for this project has arisen out of community concerns over the changing diet patterns of adults and children. This work will help to better understand the decision - making process of women and children and assist in nutrition education strategies whose goals include the reduction of risk of disease through diet.

This study is done by the Centre for Indigenous Peoples' Nutrition and Environment (CINE) in cooperation with Dene Nation and the Council of Yukon First Nations (CYFN).

Funding is provided through the Northern Contaminants Programme (INAC). Your community leaders have agreed to include this area in the study.

At the end of the study the leaders of the project will give a full report to the communities. The researchers will return to the communities and will be available to discuss results with individuals.

If you would like to participate in this study, it will take about 30-40 minutes to answer questions about how decisions are made about the food you eat. All information will be confidential and never publicly attached to your name. Number codes will be used on all forms.

At any time you can refuse to answer any or all of the questions and ask us to leave. The local community interviewer will answer any questions you may have about this study or will refer them to the research supervisors.

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Karen Fediuk & Norma Kassi

Centre for Indigenous Peoples' Nutrition and Environment

Interviewer, once you give the copy of the consent form to the respondent, please initial this form: _____ (your initials). This acknowledges that you have read the consent form to the respondent in language that the respondent, to the best of your knowledge, understood and have provided the respondent with a written copy in English.

INTERVIEWER, KEEP THIS FORM ATTACHED TO THE FIRST QUESTIONNAIRE AND USE IT TO CHECK THE RECORD FOR COMPLETENESS. THE FIELD SUPERVISOR WILL CHECK IT AGAIN. DISCARD THE TOP PORTION AFTER REVIEWED FOR COMPLETENESS.

RESPONDENT'S ID _____

	CHECK WHEN COMPLETED	
	Interviewer	Supervisor
1. Food Choice Decision Questionnaire	_____	_____

Cut here. Discard bottom portion after questionnaire checked for completeness

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Do we have your permission to begin? Yes _____ No _____

_____ Respondent's signature

_____ Respondent's name

_____ Community