

# ESTIMATION OF TRADITIONAL FOOD INTAKE IN INDIGENOUS COMMUNITIES IN DENENDEH AND THE YUKON

Malek Batal<sup>1</sup>, Katherine Gray-Donald<sup>2</sup>, Harriet V. Kuhnlein<sup>2,3</sup>, Olivier Receveur<sup>3,4</sup>

<sup>1</sup>Department of Nutrition and Food Science, American University of Beirut, Lebanon

<sup>2</sup>School of Dietetics and Human Nutrition, McGill University, Montreal, Canada

<sup>3</sup>Centre for Indigenous Peoples' Nutrition and Environment, McGill University, Montreal, Canada

<sup>4</sup>Université de Montréal, Faculté de médecine, Département de nutrition, Canada

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## ABSTRACT

**Objectives.** Chronic non-communicable diseases related to excessive or unbalanced dietary intakes are on the rise among some Indigenous populations in Canada. Nutritional problems of Indigenous peoples arise in the transition from a traditional diet to a market diet characterized by highly processed foods with reduced nutrient density. This study aimed at assessing traditional food intake of Indigenous people in 18 communities.

**Study design.** This study was cross-sectional with a sample size of 1,356.

**Methods.** This study used food frequency and 24-hour recall questionnaires to quantify traditional food intake in 18 communities in the McKenzie basin of the Northwest Territories (Denendeh and the Yukon).

**Results.** Typical daily intakes of groups of traditional food items were generated and intake of an extensive list of traditional food detailed for adult men and women. Per capita intake of traditional food items was also calculated.

**Conclusion.** Reliance on traditional food intake is still high in Denendeh, as well as in the Yukon. The detailed description of the traditional food system presented here allows an accurate identification of the contribution of traditional food items to nutrient and contaminant intake by Indigenous people for future studies. (*Int J Circumpolar Health* 2005;64(1):46-54.)

**Keywords:** Indigenous People; food intake; traditional food; Denendeh; Yukon; Canada.

## INTRODUCTION

While foods coming from the land are still a major contributor to the diet of Indigenous Peoples in Northern Canada, a steady shift towards a consistently increasing contribution of market food to the diet is being observed (1,2). This shift towards a diet characterized by the presence of less nutrient-dense foods providing large amounts of simple sugars and saturated fats has been linked to an increasing occurrence of chronic diseases among the First Nations in the Canadian North (3,4). Although contact with the European society affected life in the North in different ways, one major consistent shift is the gradual dietary change towards a less healthy diet (5), characterized by a decrease in protein, iron, and zinc (6) and inadequate intakes of vitamin A, calcium, folate and dietary fiber (7,8).

Several studies on the traditional food intake have been done both in Denendeh (6-8) and in the Yukon (9-12), where the frequency of traditional food use was documented in four Yukon communities among 122 adults and food patterns were examined through the estimated frequency of use at the household (household traditional food frequency questionnaire) and individual levels (four 24-hour recalls). The mean frequency of consumption of all traditional food types combined was 409 times annually. The contribution of traditional food to energy intake varied between 12% and 32%. Examining the percentage of days with some traditional food intake, the importance of traditional food was emphasized where it appeared that traditional food was consumed on 30% and 90% of the days in the summer and winter, respectively (13).

The present paper illustrates the average daily intake of several types of traditional foods and describes, in detail, the consumption of traditional foods based on food frequency and 24-hour recall data from two adjacent regions in Northern Canada, namely, Denendeh and the Yukon.

## MATERIALS AND METHODS

An extensive cross-sectional study was carried out in eight Denendeh (Western portion of the Northwest Territories) and 10 Yukon communities among First Nation Peoples in 1994 (7) and 1995 (14), respectively, from which we report in this article the average daily intake of several types of traditional food and describe, in detail, the consumption of traditional food based on food frequency data. The methodology of data collection has been detailed elsewhere (8, 14). Interviewing occurred in winter and fall 1994 for Denendeh and 1995 for the Yukon.

A random sample of 10% of the households, or 25 households, whichever was the larger, was drawn in each community from existing band membership lists. One man and one woman within each household were invited to participate. Participation rates were high, averaging more than 90% of contacted people. Dietary interviews started in late September, around the peak of the fall hunt, and again in late February, time of the reported lowest traditional food use. Two hundred and ninety nine male respondents and 309 female respondents participated in Denendeh, while 347 male respondents and 401 female re-

spondents participated in the Yukon. The age distributions of the samples closely reflected those of the populations: in Denendeh, 52% were 20-40 years, 30% were 41-60 years, and 18% were more than 60 years, while in the Yukon, 59% were 20-40 years, 26% were 41-60 years, and 15% were more than 60 years.

Respondents were asked the frequency of consumption of 58 traditional foods in Denendeh and 93 items in the Yukon, three months prior to the visit. To facilitate recall, each interviewer was provided with an illustrated index of all traditional food types listed in the questionnaire. The list of traditional food types had been derived through preparatory workshops held with representatives from the communities. For each type, the different modes of food preparation, and a list of parts/organs consumed, were specified as separate questions.

After completing the traditional food frequency questionnaire, the respondent was asked to remember, in detail, the types and quantities of foods consumed on the day pri-

or to the visit. Locally available bowls, cups and spoons, as well as a 2-dimensional representation of bannock serving sizes were used to facilitate serving size estimation. Alcohol intake was not investigated in these studies. Alcohol consumption is prohibited in some communities and it can, therefore, be expected that reports of alcohol consumption would not be reliable.

The format of the interviews was developed in consultation with members of the Dene Nation, the Métis Nation for Denendeh, and with members of the Council for Yukon Indians (now the Council for Yukon First Nations) in the Yukon. The project was approved by the McGill University Human Ethics Review Committee.

Median daily intakes of land animal meat, dried land animal meat, fish flesh, fish organ, and bird meat were calculated from 24-hour recalls. Twenty four-hour recall data on daily intakes were not available for all the food items listed in the food frequency questionnaire. Estimates of median daily intakes for groups of

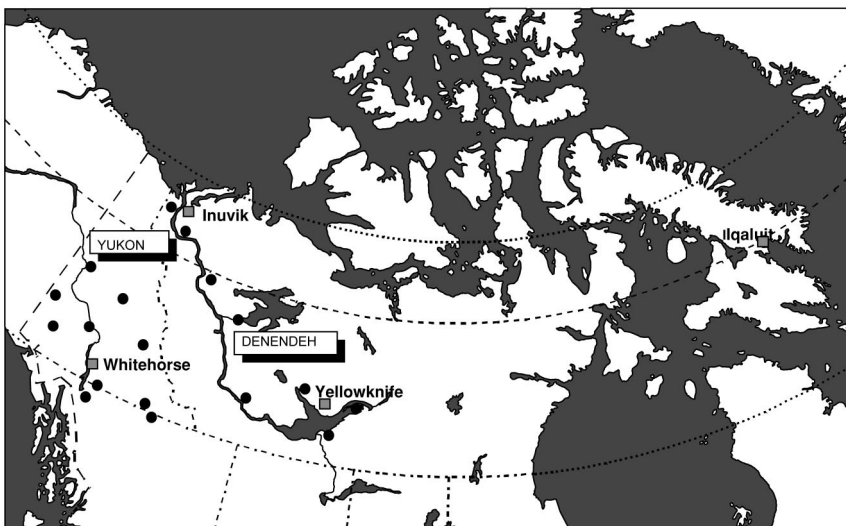


Figure 1. Surveyed communities.

traditional food items, rather than individual food items, were therefore calculated and used in the quantification of the food frequency questionnaire, whereby all food items

belonging to the same group were assigned the same estimated daily intakes. Fish and bird consumption was also accounted for, but estimates for dried fish were not available.

**Table I.**

Median daily intake, by sex, for consumers in grams of traditional food from 24-hr recalls in Denendeh and the Yukon. This table presents the most common foods consumed. A complete list of all traditional foods consumed is available upon request.

Food	Denendeh		The Yukon	
	Female (n=299) Median daily intake (g)	Male (n=309) <sup>a</sup> Median daily intake (g) <sup>b</sup>	Female (n=401) Median daily intake (g)	Male (n=347) Median daily intake (g)
<b>Land Animals</b>				
Caribou Barrenland meat, baked	225 (n=168)	317 (n=169)	281 (n=6)	338 (n=1)
Caribou meat, dried	90 (n=46)	90 (n=35)	36 (=1)	47 (n=1)
Caribou fat, raw	56 (n=21)	60 (n=14)	--	--
Caribou woodland meat, baked	337 (n=23)	337 (n=29)	113 (n=15)	197 (n=12)
Moose meat, baked	225 (n=68)	282 (n=78)	225 (n=137)	245 (n=139)
Moose meat, smoked/dried	49 (n=10)	64 (n=11)	120 (n=15)	170 (n=17)
Rabbit meat, baked/boiled	169 (n=11)	225 (n=12)	189 (n=12)	214 (n=14)
<b>Fish</b>				
Loche flesh, baked	450 (n=10)	337 (n=14)	--	--
Trout flesh, baked	225 (n=7)	225 (n=14)	225 (n=7)	337 (n=4)
Whitefish flesh, baked	225 (n=43)	225 (n=59)	225 (n=1)	225 (n=2)
<b>Birds</b>				
Canada goose meat, boiled	133 (n=1)	--	--	--
Ptarmigan flesh, baked	117 (n=7)	300 (n=4)	--	--
Black duck flesh, baked	225 (n=3)	281 (n=4)	113 (n=1)	225 (n=1)

<sup>a</sup> Total number of subjects in the sample

<sup>b</sup> Number of consumers of the specific traditional food

--: Not reported as being consumed

**Table II.**

Median weight of daily servings of traditional food in Denendeh and the Yukon (from 24-hr recall).

	Denendeh		Yukon	
	Females (n=299) Median (g/day)	Males (n=309) Median (g/day)	Females (n=401) Median (g/day)	Males (n=347) Median (g/day)
Land animal meat	225 (n=275)	291 (n=294)	225 (n=194)	263 (n=188)
Land animal meat, dried	88 (n=56)	88 (n=46)	113 (n=17)	145 (n=18)
Land animal organs	162 (n=14)	295 (n=10)	169 (n=8)	86 (n=6)
Fish meat	225 (n=69)	225 (n=93)	184 (n=26)	225 (n=19)
Fish meat, dried	113 (n=7)	126 (n=4)	--	--
Fish organ	58 (n=8)	56 (n=7)	363 (n=2)	338 (n=2)
Bird meat	133 (n=11)	294 (n=8)	113 (n=1)	225 (n=1)
Plants	160 (n=2)	112 (n=1)	40 (n=9)	28 (n=5)

## RESULTS

Completed 24-hour recalls were available from 299 men and 309 women from Denendeh and 347 men and 401 women from the Yukon. Completed food frequency questionnaires were available from 285 men and 299 women and 342 men and 394 women from both regions, respectively.

Daily per capita intake (grams per person per day) of the various traditional food items within the fish, land mammals, birds and plants groups was generated by season (summer/winter) and gender, using estimated median daily servings from Table II. The food types mentioned in the food frequency questionnaire, and that were consumed at least once, were included; other types were omitted from the tables. Least square means of the various traditional food items consumed were used, adjusting for community and age group. Adjustment gave equal weight to each community, independently of the number of respondents from each community, and to each age group, independently of the size of the sample from that group in relation to the other age groups. Total traditional food estimates, in grams per day, were generated by adding up all the food items consumed after converting the dried meat to fresh by multiplying dried meat weight by conversion factors identified from the literature and from the analysis of the food samples collected in the Centre for Indigenous Peoples' Nutrition and Environment laboratory.

Based on 24-hour recall data, 17 different land animal species and parts, three species of birds and two species of plants were consumed in Denendeh, while these figures were respectively 20, 1 and 7 in the Yukon.

Different food types from Table I were grouped with the values averaged in table II, showing that a typical serving for land animal meat was 225 g for females in both regions and 291 g, and 263 g for males in Denendeh and the Yukon, respectively. Fish flesh consumption was equal for men and women (225 g) in Denendeh, but was 225 g for men and 184 g for women in the Yukon. Bird flesh consumption was also higher for men than women in both Denendeh (294 g and 133 g, respectively) and in the Yukon (225 g and 113 g, respectively). While consumption of dried meat was equal for men and women (88 g) in Denendeh, it was considerably lower for women (113 g vs. 145 g for males) in the Yukon.

Table II also shows the frequency of use of traditional foods. For example, almost all the women in Denendeh (275 out of 299) and about half in the Yukon (194 out of 401) consumed land animal meat on a given day in the spring and fall. Similarly, 294 of 309 men in Denendeh and 188 of 347 men in the Yukon consumed land animal meat.

Table III combines all traditional food items susceptible to be consumed in Denendeh and the Yukon and the calculated per capita daily intake of these foods. The food items are presented under four headings: fish, land animals, birds and plants. For the sake of comparability, summary estimates were generated. These are: total fresh, total dried and total fresh and dried, except for plants and birds, for which no "fresh" and "dried" distinctions were made, because the consumption of dried plants was not investigated in the questionnaire and the consumption of dried birds was extremely rare). The summary estimate 'total fresh and dried' is the sum of all fresh items and all dried

**Table III.**

Per capita food use in Denendeh and the Yukon by season and sex (grams/person/day).

Food	Summer		Winter	
	Female Mean <sup>b</sup> (Std. Error)	Male Mean (Std. Error)	Female Mean (Std. Error)	Male Mean (Std. Error)
<b>DENENDEH</b>	<b>(n=147)</b>	<b>(n=144)</b>	<b>(n=152)</b>	<b>(n=141)</b>
<b>Fish</b>				
Fish (fresh)	77 (6)	76 (6)	51 (5)	74 (6)
Fish (dried)	10 (2)	9 (2)	3 (1)	4 (1)
Total fish (with conversion)*	113 (9)	109 (9)	64 (6)	91 (7)
<b>Land animals</b>				
Land Animals (fresh)	124 (7)	152 (7)	145 (9)	185 (10)
Land Animals (dried)	20 (2)	15 (2)	30 (2)	26 (3)
Total Land Animals (with conversion)*	168 (11)	185 (10)	204 (12)	242 (13)
<b>Birds</b>				
Birds (fresh)	17 (2)	34 (2)	6 (2)	17 (2)
Birds (dried)	0 (0)	0 (0)	0 (0)	0 (0)
Total Birds (considered as fresh only)	17 (2)	34 (2)	6 (2)	17 (2)
<b>Plants</b>				
Total Plants	19 (2)	10 (2)	8 (1)	5 (1)
Total Wet TF	237 (12)	273 (11)	210 (12)	282 (13)
Total Dried TF	30 (3)	24 (3)	34 (3)	31 (3)
Total TF (with conversion)*	317 (17)	339 (17)	282 (16)	355 (17)
<b>THE YUKON</b>	<b>(n=209)</b>	<b>(n=182)</b>	<b>(n=185)</b>	<b>(n=160)</b>
<b>Fish</b>				
Fish (fresh)	93 (8)	99 (8)	24 (3)	29 (4)
Fish (dried)	12 (2)	15 (2)	3 (1)	3 (1)
Total fish (with conversion)*	137 (13)	156 (14)	36 (5)	42 (6)
<b>Land animals</b>				
Land Animals (fresh)	158 (10)	179 (10)	103 (9)	118 (9)
Land Animals (dried)	28 (3)	30 (4)	13 (2)	13 (2)
Total Land Animals (with conversion)*	230 (17)	256 (17)	136 (12)	150 (13)
<b>Birds</b>				
Birds (fresh)	9 (2)	14 (2)	3 (1)	4 (1)
Birds (dried)	0 (0)	0 (0)	0 (0)	0 (0)
Total Birds (considered as fresh only)	9 (2)	14 (2)	3 (1)	4 (1)
<b>Plants</b>				
Total Plants	19 (2)	13 (2)	8 (1)	4 (1)
<b>Total Wet TF</b>	281 (17)	305 (17)	139 (10)	154 (11)
<b>Total Dried TF</b>	40 (5)	45 (5)	16 (2)	16 (2)
<b>Total TF (with conversion)*</b>	396 (27)	439 (28)	183 (14)	199 (15)

\* Dried traditional food converted to wet traditional food.

<sup>a</sup> per capita: frequency of consumption over all participants (obtained from food frequency questionnaire) multiplied by the median daily serving (obtained from 24-hour recalls).<sup>b</sup> Least square means (standard error) adjusting for community and age group.

items after their conversion to fresh by multiplying by the moisture content.

Large land animals were the most commonly consumed, with moose being the number one traditional food item.

Total per capita daily consumption of traditional foods in the Yukon was generally lower in winter. In terms of absolute amounts, men consumed more traditional foods than women (150 g and 136 g per day for men and women, respectively, for total land animal meat), except for plants, of which women consumed more (8 g and 4 g per day for women and men, respectively). However, this phenomenon was not observed in Denendeh, where the consumption of traditional foods, in terms of land animal meat, was higher in the winter for both men and women, and plant consumption was higher in the winter for men only. Since men consume more food in absolute amounts, the consumption of more plants by women in the Yukon could be indicative of a preference, or of better access to this traditional food item through participation in wild plant collection activities. Other, underlying factors could explain the differences seen between the two regions.

## DISCUSSION

Previous studies have used the food frequency questionnaire and 24-hour recall results separately, with little attempt to combine the findings from both methods. This is the first study in Northern Canada to use specific portion sizes to quantify food frequency estimations and that includes an exhaustive list of consumed traditional food items. Daily

per capita intakes of traditional food items were estimated from the 24-hour recall and food frequency questionnaires separately.

The serving sizes used to quantify the food frequency questionnaire were daily intakes in the same population and were collected during two different seasons. The usage of serving sizes generated in the same population provided an empirical example that illustrated the need to adjust portion size to the specific cultural group whenever the food frequency questionnaire method is used.

The two sets of figures were generally similar (for example, data from the 24-hour recall showed that, on average, women in Denendeh consumed 225g of land animal meat, while data from the food frequency questionnaire showed that they consumed 204g in winter) and reflected the high reliance of Indigenous people on traditional food. This study's estimates were generally in accordance with estimates from other investigations in the same regions (9, 15).

Dried traditional food is an important part of the diet. Converting the dry weight to wet weight shows that approximately 1/3 of land animal meat is consumed dried in the summer and winter in Denendeh, compared with 1/4 in the Yukon (Table III). These figures underline the nutritional role of dried traditional food and indicate a continued reliance on this form of food preservation.

The estimation of the traditional food intake of Indigenous people in this study provided an extensive description both of the quantity and of the different types (including small animals, rarely consumed items, and plants) of traditional foods consumed by a sample of respondents large enough to re-

flect the intake of the population, at least in the 18 communities investigated. However, the accurate evaluation of the quantity and type of organs consumed was deemed impossible, because of the difficulty in evaluating the usual daily intakes of the different organs. Nevertheless, organs can be important sources of nutrients in the diet of Indigenous people, especially for some "risk" nutrients, such as calcium and vitamin A (16, 17). Unlike that of animal flesh, the consumption of organs is dependent on the organ itself (liver versus nose, or fish intestine) and on the number of animals harvested (organ serving sizes are more likely to be obtained for the frequently consumed traditional food types). Also, consumption of the organs appears to be more subject to a set of cultural preferences (16, 17) and restrictions (taboos). A focus group, or a limited quantified food frequency questionnaire could be used if detailed information on organ consumption is warranted in estimating the benefits these organs provide in terms of nutrients and their potential risks (18).

## CONCLUSION

In this study, a method of quantification of the food frequency questionnaire was introduced where data from the 24-hour recall questionnaires, representing an average of intake over the seasons of highest and lowest consumption of traditional foods, were used to quantify the daily intakes of all the major food groupings consumed in two northern Canadian regions, Denendeh and the Yukon. No other daily intake figures available in the literature would have been as appropriate for this exercise.

This study also provides a detailed description of the traditional food system by reporting the intake of all traditional food items consumed and detailed based on the quantified food frequency questionnaire. The comprehensive description of the traditional food system presented here puts forth the accurate identification of the contribution of traditional food items to nutrient intake and contaminant exposure by Indigenous people in the surveyed communities.

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Malek Batal, PhD  
 Department of Nutrition and Food Sciences  
 American University of Beirut  
 P.O.Box: 11-0236  
 Beirut, Lebanon  
 Email: malek.batal@aub.edu.lb