

ORIGINAL ARTICLE

Importance of traditional foods for the food security of two First Nations communities in the Yukon, Canada

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ABSTRACT

Objectives. This study sought to evaluate food consumption patterns in the context of food security in two Yukon First Nations communities.

Study design. Twenty-nine members of Vuntut Gwitchin households in Old Crow and 33 members of Tlingit households in Teslin participated in individual interviews.

Methods. Food frequency questionnaires were used to quantify traditional food consumption throughout the spring 2007 and winter 2008 and to identify potential temporal trends through a comparison with data from the early 1990s. Additional questions, including the Health Canada Household Food Security Survey Module, sought to assess food security concerns in each community.

Results. Overall frequency of traditional food consumption did not change in either community from the 2 time-point analyses. There was, however, a difference in frequency of consumption of certain groups of foods, and this highlighted the degree to which environmental variability affects the availability of foods.

Conclusion. The importance of traditional foods in the diet of Yukon First Nations has not changed over the past 15 years. However, limited availability of food species, access to harvesting equipment and decrease in available time to go out on the land to harvest are food security challenges facing households today.

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Keywords: traditional food use, food security, Yukon First Nations, environmental change, food frequency questionnaire, temporal change

INTRODUCTION

Traditional foods are central to the health and culture of the Aboriginal peoples of Canada and are widely recognized as contributing to physical, social and spiritual well-being (1,2). Harvesting and preparation activities bring individuals in the community together, helping to maintain social relationships, facilitate knowledge transfer and sustain spiritual connections with the land (1,3). Regular engagement in hunting, fishing, berry picking and plant harvesting contributes to fitness and overall health (1,4,5). Even when consumed in small quantities, traditional foods contribute large amounts of essential nutrients to the diet so that individuals have significantly higher micro-nutrient intakes on days when traditional foods are consumed than days where traditional foods are not part of the diet (2,4–11).

Food security has been defined as existing “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (12), with availability, access and appropriate use considered to be the 3 pillars of food security (13). There are 2 aspects of food insecurity: moderate food insecurity involves not having the kinds and variety of foods that an individual wants, while severe food insecurity occurs when an individual does not have enough food to eat. A 2001 study identified that 10% of Yukon households were severely food insecure and another 11% were moderately food insecure for a total of 21% of households, which is significantly higher than the Canadian average of 15% (14).

With respect to the culturally specific role that foods play in Aboriginal communities, food security in a northern and First Nations context can be defined as “the continual and predict-

able availability and access to food derived from northern environments through Indigenous cultural practices” (15). While a switch to market foods can be an adaptation strategy to supplement decreasing traditional food use, it can also be a health concern when the replacement foods are high in preservatives, sodium, carbohydrates and saturated fats.

The nutrition transition, which has been shown to disproportionately affect Indigenous peoples, is believed to be a significant risk factor for the global rise in chronic diseases such as obesity, diabetes and cardiovascular diseases (16,17). There are limited baseline data on the pattern of traditional food use within Canada. Wein and Freeman (18) documented the frequency of traditional food use of 3 Yukon First Nations living in 4 different communities from the fall of 1991 to the summer of 1992. Frequency of food use was found to be highest in the Vuntut Gwitchin First Nation community of Old Crow and the Tlingit community of Teslin. The study concluded that traditional foods, particularly caribou, moose and salmon, are important components in the diet of Yukon First Nations. Since then, environmental and socio-economic pressures in the Canadian North have continued to create concern for the integrity of traditional food systems (4).

This study seeks to evaluate food consumption patterns in the context of food security in the Yukon First Nations communities of Teslin and Old Crow. The quantity of traditional foods consumed in 2007–2008 will be described and the frequency compared to data from 1991–1992 (18) in order to identify a potential temporal trend in traditional food consumption. Aspects of food security, including access to and availability of traditional foods, will be explored in order to identify challenges facing each community.

MATERIALS AND METHODS

Communities

Old Crow is the home of the Vuntut Gwitchin First Nation and is the northernmost community in the Yukon (Fig. 1), located 128 kilometres north of the Arctic Circle (19). Traditionally a nomadic people following the migrations of the Porcupine Caribou Herd, the Vuntut Gwitchin have occupied Crow Flats for centuries, and their permanent settlement on the banks of the Porcupine River since the 1950s has provided them with continuous access to the semi-annual migration of the Porcupine Caribou Herd (19,20). Old Crow is a fly-in community with a population of 253 (21).

The Tlingit community of Teslin is located in southern Yukon, 183 kilometres southeast

of the territorial capital of Whitehorse along the Alaska Highway (22). The ancestors of the Teslin Tlingit moved inland from the Pacific coast in the eighteenth century (23). The settlement of Teslin began as a trading post in the early 1900s and became permanent after the completion of the Alaska Highway in 1942 (22). Teslin Village has a population of 297 (21).

Ethics and research agreements

The Canadian Institutes of Health Research Guidelines for Health Research Involving Aboriginal People (24) were followed, and ethical approval for the study was obtained through the University of Northern British Columbia's Review Ethics Board. Individual informed consent was obtained from each participant.

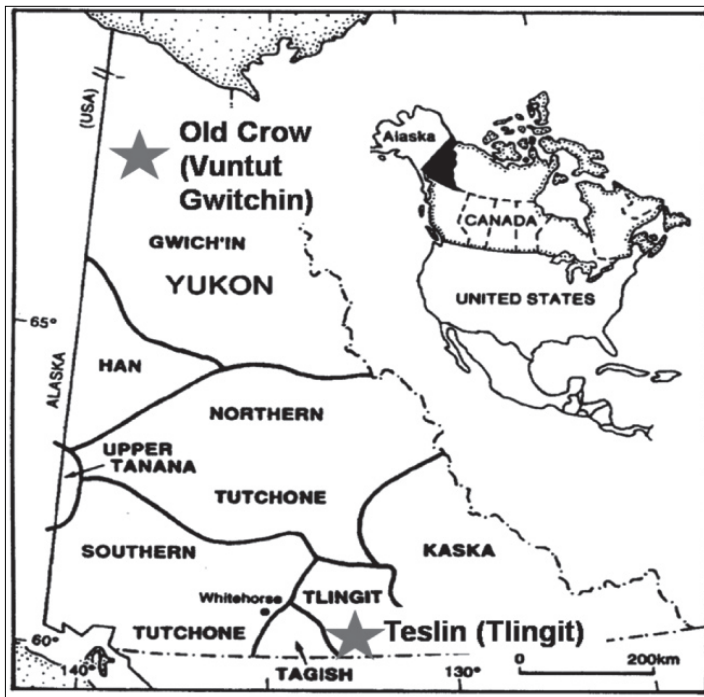


Figure 1. First Nations traditional territory map of the Yukon (Wein & Freeman, 1995, p. 162. Reprinted with permission from the Arctic Institute of North America).

Data collection

Interviews were conducted in the spring (March–May) of 2008 in Old Crow and in the summer (June–August) of 2008 in Teslin by 3 research assistants from the respective communities. Thirty-three households representing about 30% of households in each community were randomly selected from a household list provided by the respective community governments, and 1 eligible male and 1 eligible female were invited to participate from each household. Eligibility criteria were age of 19 or older, written consent and membership in either a Vuntut Gwitchin household in Old Crow or a Tlingit household in Teslin. Due to difficulties in making contact with households in Teslin, as many of the occupants were not home during the data collection period, an additional 24 households were randomly selected for a total of 57 households in Teslin only. During the interviews the participants answered a food frequency questionnaire (FFQ) and additional questions on food security. The interviews were conducted in English and coded for confidentiality.

Food frequency questionnaires

The study methods were intended to yield food frequency data directly comparable to that collected for the fall 1991 through summer 1992 by Wein and Freeman (18). The FFQ utilized the same list of traditional foods developed by Yukon First Nations elders and leaders for the 1991–1992 study. The FFQ asked how often the participant consumed each of 78 foods from 5 groups (mammals, birds, fish, berries, other plants) in each of the 4 seasons in order to capture seasonal variability and inquired separately about muscle, liver and kidney for caribou and moose only. Colour photographs of each species were available to assist in participant recall. Participants were invited to add a food not listed. Seasons were

divided into equal lengths of 90 days each. In addition to reporting frequency of food use, the FFQ asked participants for their average edible cooked portion size for each traditional food in order to calculate the quantity of foods consumed. Plastic food models of various shapes, sizes and thicknesses were used as a guide to standardize portion sizes. If consumed as a liquid infusion, plant quantity was reported for the amount of actual plant matter used for the infusion.

Food security

Participants were asked questions on their access to traditional foods. A multi-step coded question asked participants for their perceptions of their current traditional food consumption in comparison to 15 years ago. In the final section, participants were asked the 18 multiple choice questions of the Households Food Security Survey Module (HFSSM), which has been used in the Canadian Community Health Survey (14,25).

Data analysis

All data were entered into Epi Info v. 3.4.3 (Centers for Disease Control and Prevention; Atlanta, United States) data entry files and were then analyzed by the statistical software package SPSS v. 16.0 (SPSS, Inc., Chicago, United States). Grams per person per day (g/person/day) for each food was calculated by multiplying the individual's annual frequency of consumption by their average reported portion size and dividing it by 360 days. Descriptive statistics for g/person/day consumption were reported in terms of all participants surveyed as well as for consumers only. Participants that reported consuming a quantity of traditional foods in excess of three times the standard deviation of their respective community's average of g/person/day were considered outliers, and 3 outliers from Old Crow and 1 from Teslin were excluded

from the data analysis. When 2 individuals from 1 household participated, only the female's responses were included in the analysis of the food security sections, in which participants were asked to speak on behalf of their entire household.

Frequency and quantity (g/person/day, all participants and consumers only) of consumption were compared for caribou muscle, liver and kidney, each of the 5 groups and total food consumption by age and gender. The non-parametric Kruskal-Wallis was used to compare these measures between age groups (19–40, 41–60, 61+), and the non-parametric Mann-Whitney U was used to compare gender (female, male). One male declined to give his age and is therefore not included in age-specific analyses. The comparison of frequency of food consumption between that reported in Wein and Freeman (18) and the collected data was performed using the Mann-Whitney U test. A p-value of 0.05 was used as the criteria for significance in all statistical tests performed.

RESULTS

Participants

Nearly one-third of First Nations households in each community participated in the study (Table I). Twenty-nine individuals (15 males, 14 females) and 33 individuals (19 males, 14 females) partici-

pated in the interviews. Participants from Old Crow were an average age of 49.7±16.0 years and had an average of 2.5±1.6 persons in the household (range 1–6). Teslin participants were an average of 43.7±17.6 years and had an average of 2.4±1.4 individuals in the household (range of 1–7).

Food frequency and quantity

Forty-five traditional foods were reported to be consumed in Old Crow (Table IIa) and 60 in Teslin (Table IIb). All participants in both communities reported consuming at least 1 food from the groups of wild game and fish during the year surveyed, and nearly all participants reported having berries. Caribou meat, blueberry, chinook (king, spring) salmon, salmonberry and low bush cranberry were the foods consumed in the largest quantities (g/person/day, all participants) in Vuntut Gwitchin households. Foods eaten in the largest quantities by participants in Tlingit households were moose meat, lake trout, caribou meat, chinook salmon and blackberry.

Comparison between 1991–1992 and 2007–2008

In 2008, members of Vuntut Gwitchin households reported consuming traditional foods a median of 582 times per year, not significantly different from the frequency of 443 times reported in 1992 (Table IIIa). Caribou, Labrador tea, chinook salmon, blueberry and salmonberry were the most frequently consumed individual foods (median) in 2008,

Table I. Household participation.

	Old Crow	Teslin
First Nations households in the community (n)	92	90
First Nations households randomly selected (n)	33	57
Households contacted (n)	28	30
Households interviewed (n)	27	27
Refusals (n)	1	3
Non-responsive households (n)	5	27
Participation rate (households interviewed/ households randomly selected)	82%	47%
Participation rate (households interviewed/ households contacted)	96%	90%
% of First Nations households represented (households interviewed/households in the community)	29%	30%

Table IIa. Quantity of traditional food consumed by adults in Vuntut Gwitchin households (n=26).

Traditional food	Consumers [n (%)]	Median Mean + SD (g/day – all)		Median Mean + SD (g/day – consumers)		Mean + SD (g/meal)
Total	26 (100)	259	372 + 271	259	372 + 271	
Mammals	26 (100)	90.7	124 + 99.9	90.7	124 + 99.9	
Caribou meat	26 (100)	75.4	86.9 + 81.7	75.4	86.9 + 81.7	204 + 185
Moose meat	24 (92)	3.1	15.8 + 35.8	3.2	16.5 + 35.5	211 + 164
Caribou kidney	19 (73)	3.1	6.6 + 8.6	7.4	9.0 + 8.9	130 + 143
Caribou liver	16 (62)	1.2	5.6 + 9.5	5.4	9.0 + 10.8	150 + 159
Rabbit	19 (73)	1.0	3.1 + 5.2	2.1	4.2 + 5.6	258 + 151
Muskrat	12 (46)	0.0	2.6 + 3.8	5.1	5.7 + 3.8	244 + 119
Moose kidney	10 (39)	0.0	1.8 + 4.1	1.9	4.6 + 5.7	147 + 105
Moose liver	7 (27)	0.0	1.6 + 4.1	3.0	5.8 + 6.5	128 + 91.4
Porcupine	8 (31)	0.0	0.2 + 0.4	0.6	0.7 + 0.3	135 + 70.1
Beaver	4 (15)	0.0	0.1 + 0.4	0.8	0.9 + 0.4	185 + 76.5
Black bear	1 (4)	0.0	0.1 + 0.3	1.5	1.5	177
Arctic ground squirrel	1 (4)	0.0	0.0 + 0.1	0.5	0.5	94.7
Birds	19 (73)	8.4	28.6 + 35.1	24.6	39.1 + 35.8	
Duck	17 (65)	5.9	15.3 + 22.8	15.8	23.4 + 24.8	335 + 172
Goose	14 (54)	1.0	8.3 + 13.5	10.3	15.4 + 15.3	278 + 169
Grouse	4 (15)	0.0	3.5 + 17.4	1.0	23.0 + 48.9	338 + 264
Ptarmigan	6 (23)	0.0	1.4 + 3.5	4.6	6.1 + 5.0	217 + 30.6
Fish	26 (100)	72.6	112 + 109	72.6	112 + 109	
All salmon	26 (100)	38.1	56.6 + 52.1	38.1	56.6 + 52.1	
Chinook (king)	26 (100)	16.1	27.8 + 27.3	16.1	27.8 + 27.3	202 + 80.4
Coho (silver)	18 (69)	3.6	12.5 + 19.9	8.3	18.1 + 21.8	207 + 87.9
Chum (dog)	16 (62)	3.2	9.7 + 16.9	8.6	15.8 + 19.2	186 + 49.7
Sockeye (red)	4 (15)	0.0	6.6 + 25.4	21.7	42.7 + 57.6	169 + 46.2
Other fish	22 (84)	34.2	55.1 + 77.8	39.2	65.1 + 80.7	
Lake whitefish	15 (58)	3.7	12.1 + 20.6	17.9	21.0 + 23.7	160 + 62.5
Fish eggs	19 (73)	3.5	11.9 + 17.9	13.3	16.3 + 19.2	154 + 99.2
Burbot (ling cod)	8 (31)	0.0	11.5 + 43.7	6.6	37.3 + 75.6	178 + 131
Arctic grayling	15 (58)	1.4	7.8 + 12.1	8.4	13.6 + 13.3	189 + 95.1
Fish liver	13 (50)	0.2	7.4 + 13.1	10.3	14.8 + 15.4	200 + 161
Broad whitefish	5 (19)	0.0	2.2 + 8.6	3.0	11.2 + 18.2	254 + 226
Round whitefish	3 (12)	0.0	1.5 + 5.9	7.9	12.6 + 15.2	118 + 0.00
Inconnu	3 (12)	0.0	0.4 + 1.3	2.6	3.1 + 2.8	143 + 84.2
Long nose sucker	2 (8)	0.0	0.3 + 1.3	4.3	4.3 + 2.8	94.7 + 0.00
Jackfish (N. pike)	1 (4)	0.0	0.03 + 0.2	0.8	0.8	143
Berries	25 (96)	64.8	81.0 + 85.0	71.0	84.3 + 85.1	
Blueberry	24 (93)	18.7	27.9 + 27.9	21.7	30.3 + 27.8	281 + 184
Salmonberry	25 (96)	19.2	27.1 + 28.1	20.7	28.2 + 28.1	269 + 186
Low bush cranberry	18 (69)	8.9	22.1 + 30.8	28.6	35.9 + 32.4	233 + 87.0
Rosehip	7 (27)	0.0	2.8 + 7.6	12.2	10.4 + 12.2	180 + 120
Strawberry	1 (4)	0.0	0.3 + 1.7	8.9	8.9	118
Raspberry	2 (8)	0.0	0.3 + 1.3	4.4	4.4 + 2.1	237 + 167
Black currant	2 (8)	0.0	0.2 + 0.9	3.2	3.2 + 1.7	118 + 83.6
Red currant	3 (12)	0.0	0.1 + 0.4	0.5	1.0 + 0.9	138 + 68.3
Other plants	24 (92)	12.0	22.2 + 31.8	12.0	24.0 + 32.5	
Arctic dock (Old Crow rhubarb)	18 (69)	6.9	12.9 + 24.0	11.8	18.6 + 28.0	335 + 141
Wild onion	9 (35)	0.0	4.2 + 12.6	3.9	12.1 + 19.8	87.2 + 63.7
Labrador tea ^a	24 (92)	2.0	3.6 + 4.8	2.0	3.9 + 4.9	18.8 + 11.6
Spruce	13 (50)	0.0	1.2 + 2.4	1.1	2.4 + 3.0	15.8 + 11.0
Mushroom	2 (8)	0.0	0.2 + 0.7	2.5	2.5 + 0.7	148 + 41.8
Willow	2 (8)	0.0	0.1 + 0.4	1.2	1.2 + 1.0	59.1 + 0.1
Balsam fir	1 (4)	0.0	0.0 + 0.0	0.1	0.1	2.0

^a Quantity calculations reported for dried tea leaves.

Importance of traditional foods in food security

Table IIb. Quantity of traditional foods consumed by adults in Teslin Tlingit households (n=32).

Traditional food	Consumers [n (%)]	Median Mean + SD (g/day – all)		Median Mean + SD (g/day – consumers)		Mean + SD (g/meal)
		Median	Mean + SD	Median	Mean + SD	
All traditional foods	32 (100)	182	185 + 105	182	185 + 105	
Mammals	32 (100)	82.2	104 + 79.8	82.2	104 + 79.8	
Moose meat	32 (100)	77.0	87.6 + 64.5	76.9	87.6 + 64.5	228 + 147
Caribou meat	20 (63)	1.3	10.2 + 21.5	2.5	16.3 + 25.5	290 + 139
Moose kidney	23 (72)	0.8	1.2 + 1.8	1.1	1.6 + 2.0	181 + 118
Mountain sheep	13 (41)	0.0	1.1 + 2.2	1.3	2.7 + 2.8	166 + 80.0
Beaver	22 (69)	0.7	0.9 + 1.0	0.7	1.3 + 1.0	227 + 181
Moose liver	16 (50)	0.0	0.6 + 0.7	0.3	1.1 + 0.7	187 + 133
Black bear	6 (19)	0.0	0.4 + 1.4	0.2	2.1 + 2.9	98.6 + 107
Porcupine	14 (44)	0.0	0.4 + 0.6	0.7	0.9 + 0.7	253 + 207
Groundhog	10 (31)	0.0	0.4 + 0.6	1.0	1.2 + 0.6	323 + 205
Rabbit	10 (31)	0.0	0.3 + 0.7	0.7	1.1 + 0.8	272 + 254
Caribou kidney	5 (16)	0.0	0.1 + 0.3	0.7	0.8 + 0.5	171 + 89.3
Caribou liver	5 (16)	0.0	0.1 + 0.3	0.7	0.7 + 0.4	171 + 89.3
Muskrat	2 (6)	0.0	0.1 + 0.4	1.2	1.2 + 1.2	414 + 418
Arctic ground squirrel	5 (16)	0.0	0.1 + 0.4	1.3	0.9 + 0.5	238 + 143
Elk	1 (3)	0.0	0.1 + 0.3	2.0	2.0	237
Deer	2 (6)	0.0	0.1 + 0.2	0.9	0.9 + 0.3	181 + 78.0
Lynx	1 (3)	0.0	0.0 + 0.2	1.3	1.3	473
Birds	27 (84)	1.0	4.6 + 10.4	1.3	5.4 + 11.2	
Duck	19 (59)	0.5	2.6 + 6.8	0.8	4.3 + 8.5	296 + 267
Geese	10 (31)	0.0	1.3 + 4.0	1.5	4.2 + 6.4	384 + 322
Grouse	19 (59)	0.2	0.5 + 0.7	0.7	0.9 + 0.8	196 + 195
Ptarmigan	4 (13)	0.0	0.1 + 0.5	1.2	1.2 + 0.9	418 + 337
Gull eggs	1 (3)	0.0	0.0 + 0.0	0.1	0.1	47.3
Fish	32 (100)	19.4	42.2 + 43.1	19.4	42.2 + 43.1	
Salmon	27 (84)	4.1	10.2 + 13.0	4.3	12.1 + 13.4	
Chinook	22 (69)	2.0	7.8 + 12.3	2.3	11.3 + 13.5	252 + 194
Sockeye	8 (25)	0.0	1.6 + 4.6	4.2	6.5 + 7.6	158 + 50.3
Chum	10 (31)	0.0	0.7 + 1.5	1.7	2.2 + 2.1	145 + 48.4
Coho	4 (13)	0.0	0.1 + 0.4	0.5	0.8 + 0.8	149 + 58.5
Other fish	32 (100)	11.4	32.0 + 38.2	11.4	32.0 + 38.2	
Lake trout	32 (100)	6.6	16.8 + 26.3	6.6	16.8 + 26.3	236 + 163
Lake whitefish	20 (63)	2.0	5.5 + 10.0	2.8	8.8 + 11.6	275 + 233
Fish eggs	23 (72)	0.6	5.2 + 13.7	1.0	7.2 + 15.8	137 + 135
Arctic grayling	17 (53)	0.2	1.2 + 3.1	0.7	2.3 + 4.0	170 + 134
Broad whitefish	10 (31)	0.0	0.9 + 2.2	2.0	2.9 + 3.1	147 + 44.9
Inconnu	14 (44)	0.0	0.5 + 0.9	0.7	1.2 + 1.0	171 + 58.9
Dolly varden	2 (6)	0.0	0.5 + 2.8	8.1	8.1 + 10.9	296 + 251
Burbot	5 (16)	0.0	0.5 + 1.5	3.9	3.2 + 2.5	207 + 160
Fish liver	7 (22)	0.0	0.3 + 1.1	0.5	1.2 + 2.2	47.3 + 25.1
Round whitefish	3 (9)	0.0	0.2 + 0.6	2.0	2.0 + 0.0	123 + 0.0
Jackfish	5 (16)	0.0	0.2 + 0.7	2.0	1.5 + 1.1	143 + 51.2
Rainbow trout	4 (13)	0.0	0.1 + 0.3	0.7	0.8 + 0.3	206 + 58.5
Arctic char	1 (3)	0.0	0.0 + 0.1	0.7	0.7	118
Halibut	1 (3)	0.0	0.0 + 0.1	0.3	0.3	118
Berries	30 (94)	16.4	33.1 + 43.3	16.7	35.3 + 43.9	
Blackberry	27 (84)	2.3	7.6 + 13.1	3.0	9.0 + 13.9	155 + 106
Raspberry	27 (84)	1.0	5.2 + 13.4	1.8	6.1 + 14.4	130 + 130
Low bush cranberry	18 (56)	0.2	5.0 + 9.6	5.0	8.9 + 11.4	91.4 + 97.8
Strawberry	22 (69)	0.2	4.5 + 10.4	1.0	6.5 + 12.0	98.5 + 115
High bush cranberry	16 (50)	0.0	4.2 + 8.3	4.2	8.4 + 10.2	140 + 138
Blueberry	15 (47)	0.0	3.2 + 6.5	4.9	6.8 + 8.2	172 + 77.2
Soapberry	19 (59)	0.4	2.1 + 3.0	3.0	3.5 + 3.2	140 + 109
Saskatoon	6 (19)	0.0	0.7 + 1.6	3.8	3.5 + 1.8	118 + 80.3
Rosehip	7 (22)	0.0	0.5 + 1.5	1.4	2.2 + 2.7	68.8 + 74.7
Red currant	2 (6)	0.0	0.2 + 0.7	2.5	2.5 + 1.5	185 + 199
Black currant	3 (9)	0.0	0.1 + 0.3	0.7	0.7 + 0.6	5.0 + 2.5
Other plants	21 (66)	0.1	2.02 + 4.5	0.8	2.9 + 5.2	
Wild rhubarb	6 (19)	0.0	1.2 + 4.1	3.1	6.6 + 7.9	256 + 142
Labrador tea ^a	7 (22)	0.0	0.4 + 1.5	0.1	1.9 + 2.8	10.4 + 9.9
Balsam fir	16 (50)	0.0	0.1 + 0.2	0.0	0.2 + 0.3	3.8 + 3.6
Mushroom	5 (16)	0.0	0.1 + 0.5	0.7	1.1 + 1.3	65.6 + 59.9
Spruce	4 (13)	0.0	0.0 + 0.2	0.3	0.3 + 0.4	1.4 + 0.9
Pine	3 (9)	0.0	0.0 + 0.2	0.6	0.5 + 0.2	7.7 + 12.2
Dandelion	1 (3)	0.0	0.0 + 0.2	1.0	1.0	355
Bear root	2 (6)	0.0	0.0 + 0.1	0.3	0.3 + 0.4	126 + 157
Birch	1 (3)	0.0	0.0 + 0.0	0.0	0.01	4.3

^a Quantity calculations reported for dried tea leaves.

Table IIIa. Frequency of food use by adults in Vuntut Gwitchin households in 1992 and in 2008^a.

Traditional food	1992 Annual frequency		2008 Annual frequency		Mann-Whitney U
	Median	Mean + SD	Median	Mean + SD	
All traditional foods	443	529.2 + 345	582	749 + 558	315.5
Mammals	285	298 + 186	193	245 + 160	330.0
Caribou	264	241 + 136	162	204 + 136	328.5
Moose	12.0	29.3 + 41.8	10.5	31.7 + 49.0	403.0
Muskrat	1.0	6.6 + 18.0	0.0	4.3 + 6.2	398.0
Rabbit**	6.0	18 + 35.3	1.0	4.2 + 5.7	236.5
Birds	12.0	26.6 + 31.8	15.0	31.9 + 43.0	391.0
Duck	6.0	14.3 + 16.7	8.0	15.7 + 21.5	379.0
Geese	1.0	8.6 + 17.1	1.5	11.9 + 21.1	379.5
All fish**	45.0	83.1 + 96.4	138	200 + 174	207.0
All salmon**	24.0	28.1 + 35.6	67.5	90.4 + 77.1	134.0
Chinook**	6.0	16.4 + 32.8	30.0	47.6 + 41.4	141.0
Coho	3.0	7.0 + 8.6	7.5	19.8 + 26.9	315.0
Chum	2.0	4.4 + 6.5	6.0	19.2 + 30.1	307.0
Other fish	24.0	55.0 + 83.5	66.5	110 + 118	284.5
Lake whitefish**	0.0	0.8 + 2.0	6.0	26.3 + 37.8	200.5
Fish eggs	3.0	13.7 + 25.4	15.0	26.2 + 28.5	287.5
Fish liver	3.0	9.0 + 15.7	0.5	18.8 + 34.8	394.5
Arctic grayling	0.0	4.0 + 9.5	3.0	16.5 + 22.8	290.5
Broad whitefish**	6.0	20.2 + 32.8	0.0	2.0 + 5.6	84.5
Berries**	39.0	50.2 + 48.5	87.0	138 + 156	218.0
Blueberry	24.0	23.1 + 21.0	36.0	44.8 + 49.3	285.0
Salmonberry**	3.0	6.8 + 12.5	36.0	44.6 + 49.4	124.0
Low bush cranberry	6.0	16.5 + 19.4	16.5	37.4 + 52.5	379.5
Other plants*	24.0	71.4 + 111	93.0	134 + 184	266.0
Labrador tea*	6.0	57.9 + 107	46.5	71.3 + 82.4	246.0
Spruce**	0.0	0.7 + 2.3	0.5	32.2 + 80.8	277.0
Arctic dock	3.0	7.4 + 9.4	7.5	13.3 + 19.6	348.5

^a Only results where median frequencies are greater than zero for a least one timepoint are shown.

*Significant difference, $p < 0.05$, Mann-Whitney U.

**Significant difference, $p < 0.01$, Mann-Whitney U.

Table IIIb. Frequency of traditional food use by adults in Teslin Tlingit households between 1992 and 2008^a.

Traditional food	1992 Annual frequency		2008 Annual frequency		Mann-Whitney U
	Median	Mean + SD	Median	Mean + SD	
Total	498	593 + 452	386	496 + 490	336.0
Mammals	217	233 + 158	165	170 + 95.9	322.0
Moose	186	202 + 123	150	148 + 79.5	318.0
Caribou	0.0	5.7 + 13.4	1.0	14.2 + 28.9	310.5
Beaver	2.0	7.9 + 24.0	1.0	1.7 + 2.2	325.5
Rabbit**	1.0	4.6 + 10.6	0.0	0.5 + 0.9	245.0
Birds	4.0	13.3 + 26.4	2.0	5.0 + 7.6	341.0
Duck	1.0	6.3 + 18.0	1.0	2.8 + 6.6	357.5
Grouse	1.0	3.2 + 5.6	1.0	1.1 + 1.5	304.5
All fish*	101	123 + 106	49.5	72.6 + 83.1	245.5
Salmon*	27.0	38.4 + 32.1	10.0	20.6 + 30.5	238.5
Chinook**	24.0	32.7 + 28.8	4.0	15.3 + 28.3	194.0
Other fish*	58.0	84.7 + 89.2	22.0	52.0 + 63.1	245.5
Lake trout	15.0	19.7 + 20.3	9.5	23.7 + 35.7	365.5
Lake whitefish*	9.00	22.6 + 42.3	3.00	8.7 + 16.4	279.5
Fish eggs	6.00	8.4 + 8.9	2.00	8.3 + 17.0	284.0
Arctic grayling**	3.0	5.4 + 5.9	1.0	1.9 + 2.8	229.5
Burbot**	1.0	2.1 + 2.3	0.0	1.4 + 5.6	216.5
Rainbow trout	0.0	1.2 + 4.8	1.0	0.2 + 0.8	368.5
Berries	70.0	166 + 242	149	162 + 185	353.0
Low bush cranberry	0.0	27.9 + 76.9	4.0	33.7 + 62.9	343.0
High bush cranberry	3.0	15.6 + 30.3	0.5	27.5 + 61.1	371.5
Raspberry	2.0	24.8 + 38.6	7.5	27.3 + 42.7	321.5
Strawberry	3.0	14.0 + 26.0	2.5	25.2 + 50.6	378.0
Blackberry*	24.0	28.6 + 28.5	10.0	13.7 + 14.8	249.0
Soapberry	4.0	18.8 + 50.0	2.5	6.5 + 8.3	370.0
Other plants*	12.0	57.1 + 123	5.0	86.8 + 299	257.0
Balsam fir	0.0	31.4 + 101	0.5	29.0 + 88.2	365.0
Spruce**	1.0	6.1 + 20.0	0.0	22.7 + 88.5	241.5
Wild rhubarb**	1.0	8.7 + 20.4	0.0	1.8 + 5.2	228.5

^a Only results where median frequencies are greater than zero for at least one timepoint are shown.

*Significant difference, p<0.05, Mann-Whitney U.

**Significant difference, p<0.01, Mann-Whitney U.

Table IV. Median, mean and standard deviation g/day of traditional food consumption for adults in Old Crow and Teslin.

Gender/Age	Old Crow (g/day)			Teslin (g/day)		
	n	Median	Mean + SD	n	Median	Mean + SD
Women						
19–40	5	172	259 + 229	7	210	198 + 84.2
40–60	3	399	334 + 153	3	169	165 + 72.2
61+	6	479	479 + 340	4	142	159 + 114
Men						
19–40	3	254	482 + 483	10	163	196 + 127
40–60	5	133	240 + 232	5	257	188 + 153
61+	3	492	490 + 6.3	3	187	172 + 51
Total	26 ^a	259	367 + 271	32	182	185 + 105

^a One male from Old Crow declined to give his age and therefore is only included in the total analysis.

with caribou, blueberry, moose, Labrador tea and broad whitefish the most frequently consumed in 1992. Frequency in the consumption of salmon, all fish, berries and other plants was shown to significantly increase in Old Crow between 1992 and 2008. There was a decrease in the consumption of broad whitefish but an increase in the consumption of lake whitefish and chinook salmon, which led to an increase in the overall frequency of fish use. Statistically significant increases in salmon-berries, spruce and Labrador tea contributed to the increases in the categories of berries and other plants.

In 2008, members of Tlingit households consumed traditional foods a median of 386 times per year, with moose muscle meat, lake trout, blackberry, raspberry and low bush cranberry the most frequently consumed foods (Table IIIb). The annual frequency did not differ significantly from the 1992 median of 498, when moose, chinook salmon, blackberry, lake trout and lake whitefish were the most frequently consumed traditional foods. Frequency of consumption decreased between 1992 and 2008 within the categories of salmon, other fish and all fish, marked by decreases in consumption of chinook salmon, lake whitefish, arctic grayling, and burbot, round whitefish, jackfish and least cisco. Other plants as a group were consumed less frequently, marked by decreases in rhubarb, bear root, wild onion and willow. Frequency in the consumption of rabbit, bird eggs, blackberry and red currant decreased but there was no statistically significant change in the categories of mammals, birds and berries.

Age and gender

There was no statistically significant difference in overall quantity of consumption (g/person/day) of traditional foods by age and gender in either community (Table IV); however, Old Crow

median and mean consumption for men and women aged 61+ and mean consumption for men 19–40 is substantial at over 1 pound per day. Annual frequency of consumption of birds in Old Crow was the only category shown to differ significantly with both age and gender, with frequency increasing with age within each gender (data not shown). A statistically significant difference was found between genders for frequency and quantity (g/person/day, all participants) of caribou liver consumption, with Vuntut Gwitchin men consuming more than women. Frequency of bird consumption, g/person/day bird consumption (all participants) and g/person/day plant consumption (all participants) were shown to increase with age in Old Crow. In Teslin, men consumed significantly more birds (g/person/day, consumers only) than women. Women consumed berries more frequently and in greater quantities (g/person/day, consumers only). There was a statistically significant difference in age-related consumption of birds, with those aged 41–60 consuming more than those 19–40 and those 61+ consuming the least amount.

Food security

When asked for their perceptions of their own consumption of traditional foods over the past 15 years, the majority of households in Old Crow and Teslin reported consuming the same amount of mammals, ducks and geese, fish, berries and barks and saps between spring 2007 and winter 2008 as they did 15 years ago (data not shown). The percentage of households that reported consuming less traditional foods than they did 15 years ago was generally greater than the percentage that reported consuming more in both communities. When decreases in consumption of a group of traditional foods were reported, the main reason given in each community was the decreased availability or unavailability of that food. When many

participants reported not eating wild greens, bark and sap, roots and mushrooms, the reasons given were not liking the foods, never having tried it and, for mushrooms, uncertainty about which types were safe.

Eighty-five percent of Vuntut Gwitchin households reported that their traditional foods came from within their household or immediate family, while 15% reported others in the community were their main source of traditional foods. In Teslin, all households reported providing their own traditional foods, with half (52%) also receiving traditional foods from other households in the community and 15% purchasing traditional foods, specifically salmon, from an outfitter or another First Nation.

Seventy-four percent of households in both communities reported obtaining all the traditional foods that their households wanted. Of the other 26% of households in Old Crow, all wanted more caribou. When participants in Old Crow were asked what prevented their households from obtaining all the traditional foods that they wanted, two responded not having money for equipment and one reported not having money to hire someone to hunt for them. In Teslin, four households responded that they had no time to harvest, two that harvesting was too strenuous and one that harvesting restrictions were obstacles.

Results from the HFSSM identified only half (52%) of participating Vuntut Gwitchin households in Old Crow as food secure, with 37% shown to be experiencing moderate food insecurity and 11% experiencing severe food insecurity. Eight households in Teslin declined to answer enough questions of the HFSSM for their level of food security to be assessed. Out of the nineteen households that did complete this section, 95% were identified to be food secure and 5% moderately food insecure.

DISCUSSION

Validity of comparison

The percentage of First Nations households interviewed in Teslin and in Old Crow was comparable to the percentage interviewed by Wein and Freeman (18). The phrasing of the FFQ question to establish frequency per season in this study was “How often did *you* eat [each traditional food per each season]?” The phrasing of the question in the Wein and Freeman (1995) study was “How often does *anyone in your household* eat [each traditional food per each season]?”— which was intended to obtain the maximum frequency of *any* individual in the household. This introduces limitations with the comparison, as it may be difficult to recall another person’s food consumption. However, the respondent may likely have answered with details about his/her own food use, making the information directly comparable.

Limitations

The exclusion criterion of exceeding three times the standard deviation for total g/person/day traditional food consumption may artificially eliminate high-end consumers of traditional foods; however, this criterion was employed as the best method to protect against the biases presented by self-reporting and by use of the food models. Reporting bias in traditional food studies tends towards an overestimation of frequency (26). Food models were only to represent the cooked edible portions and not the bones; however, it is interesting to note that participants reported larger portions (g/meal) for small animals such as rabbit, groundhog, muskrat and various birds in comparison with caribou and moose (Tables IIa and IIb). This may be indicative of a bias towards overestima-

tion due to difficulty estimating size without bones, the form in which they are normally consumed.

Because of logistics variations, data sampling were collected in different seasons in the 2 communities when the abundance of wild food varied. The effects of this seasonal variability on household food security status could have the potential to influence the FFQ results. However, the design of our FFQ questions specifically asked the respondents about the frequency of their food use in each of the 4 seasons. This bias may not be very significant.

Teslin interviews were conducted in the summer season, which may have contributed to the difficulties in contacting initially selected households (messages not returned, individuals out of town). Summer in Teslin is a busy time for a variety of reasons, including harvesting, non-harvesting travelling and seasonal employment due to increased tourism, so some participants were reached on the second or third contact. In both communities there was no reason to believe that the households sampled were different from those who did not participate, and thus the 29–30% of participating households from each community is considered to be a representative sample.

Frequency of food use

There was no decline in the frequency of traditional food use in Old Crow; rather, the frequency of consumption of certain categories was shown to increase. Consumption of traditional foods is generally higher in more remote communities such as Old Crow that have maintained a traditional lifestyle (18,27). Market foods in Old Crow are two and a half to three times the price as in the Yukon capital of Whitehorse (28–29), which may be one factor

in the maintenance of traditional foods in the diet. At the community meeting in Old Crow, the frequency for mammals and birds were confirmed, but differing views were expressed on the apparent increase in the frequency of consumption of fish and berries.

The overall frequency of traditional food use in Teslin did not change; however, frequency of consumption of all fish, salmon, other fish and other plants did decrease. Individuals at the community meeting emphasized the community's concerns about declining salmon populations. The increasing community concern was manifested in the Teslin Tlingit Council's implementation of 48-hour net closures in 1994 and some community members voluntarily reducing their annual catch (K. Melton, TTC Fish and Wildlife Officer, personal communication, 28 April 2009). These may be factors in the decreased frequency of consumption of chinook salmon between 1991–1992 and 2007–2008 as well as why 15% of households reported obtaining salmon from outfitters or other First Nations. The results of the FFQ were confirmed at the community meeting in Teslin.

Frequency of traditional food use has been found to be higher among males and increases with age in both genders (7–8,30), although clear trends have not been found when evaluating age and gender together. This study identified a few age- and gender-related differences in traditional food consumption but did not find general trends for either age or gender.

One theme that emerged from the community meetings, particularly in Old Crow, was the importance of recognizing the variability in environmental conditions that affects the availability of traditional food sources. This variability is even more pronounced in northern communities such as of Old Crow, where less

species are available than in more southerly communities such as Teslin. The Porcupine Caribou Herd has been the principal cultural and dietary resource of the Vuntut Gwitchin, and the herd's irregular 2007 fall migration left families without their usual stock of caribou for the winter of 2008. As a result, some families reported turning towards fish as a main protein source, which supports the increase in frequency of fish consumption identified. Community members emphasized that this was an anomaly and is not a general trend towards increased fish use; during the following summer of 2008 there was a Yukon-wide restriction on the First Nations subsistence harvest of chinook salmon due to low populations. In fact, the Vuntut Gwitchin Government bought and distributed chinook salmon to community members in order to supplement the meager 7 fish that had been caught as a result of the abnormally low run and high water levels (S. Graupe, VGG Director of Natural Resources, personal communication, 31 March 2009). Community members also noted that higher than average precipitation levels resulted in more berries than usual in 2007, and naturally people will harvest foods that are readily available.

Food security

Twenty-six percent of household in both Teslin and Old Crow reported not getting all the traditional foods that they wanted, which is a manifestation of moderate food insecurity. The 48% of Vuntut Gwitchin households identified as food insecure by the HFSSM is well above both the 2001 Yukon-wide average of 21% (14) and the 2004 data for Aboriginals off-reserve of 33% (25). The overall food insecurity level in Old Crow is comparable to that experienced in Nunavut (56%) (14), as these remote Arctic

communities face similar environmental and socio-economic challenges to traditional lifestyles. Only 1 household in Teslin was identified as moderately food insecure by the HFSSM; however, the 8 households that declined to answer the HFSSM section may have done so because they were experiencing food insecurity and found it difficult to discuss. Had they answered, the reported percentage of Tlingit households experiencing food insecurity in Teslin may be higher. The food security results for both Old Crow and Teslin were validated at their respective community meeting.

Food security in Aboriginal communities hinges on the vulnerability of traditional and market food systems, which are affected by their exposure and sensitivity to rapidly occurring environmental and socio-economic pressures and their capacity to adapt to these challenges (31–32). Climate change, contaminants, mining and drilling for oil are environmental issues challenging Athapaskan and Tlingit communities, and with the globalization of markets, now even remote Arctic communities feel the impacts of global food markets (2,33–35). Incorporating market foods into the diet can be an adaptation to traditional food insecurity; however, reliance on market foods introduces new vulnerabilities based on price, supply and quality, which can be very challenging in northern communities (36). The differing availability and accessibility of wage employment and market foods may be reflected in the food security results for Old Crow and Teslin. Teslin's location on the Alaska Highway en route to the Yukon capital of Whitehorse offers more opportunities for wage employment as well as both a lower cost and greater variety of market foods than the fly-in community of Old Crow (28–29). Not having enough time to harvest

was mentioned by 15% of Teslin participants as an obstacle to obtaining all the traditional foods that they wanted, which is an issue in communities where many members participate in some form of a wage economy, as the work week limits harvesters' ability to get out on the land (37–38). Thus, an increased ability to supplement with market foods likely contributes to Teslin's higher reported levels of food security. Still, Teslin and Old Crow are both actively pursuing culturally specific adaptations, including youth education and engagement to address the challenges to traditional food insecurity.

Conclusion

Traditional foods continue to be a vital component of the diet for Yukon First Nations communities. As environmental and socio-economic changes continually challenge northern First Nations communities, the availability of traditional foods is critical to maintaining their food security. Additional research is needed in order to identify trends in traditional food use, particularly as yearly environmental variability plays a large role in which foods are available and accessible.

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