# FIRST NATIONS FOOD, NUTRITION & ENVIRONMENT STUDY

## Results from Quebec 2016

University of Ottawa | Université de Montréal | Assembly of First Nations 2019

# "Healthy Environment and Healthy Foods for Healthy First Nations"

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# FOREWORD FROM THE NATIONAL CHIEF

Greetings,

First Nations are committed to respecting and upholding environmental integrity. Climate change is creating increased challenges to First Nations' traditional harvesting practices. Barriers to traditional food sources resulting from climate change can increase food insecurity. The First Nations Food, Nutrition and Environment Study (FNFNES) demonstrates how traditional food consumption has a major and positive impact on the daily nutritional outcomes for First Nations people. The AFN's advocacy on behalf of First Nations rights and Treaty rights include safe and reliable access to traditional food sources.

The FNFNES serves as a point-in-time indicator of a changing world and seeks to capture the environmental and nutritional health of First Nations people. The FNFNES is a ten-year project mandated by the Chiefs-in-Assembly and developed in a partnership between First Nations and academia. The study seeks to quantify the health of traditional food sources, the quality and amount of food sources First Nations consume daily, and the quality of water in our territories.

Studies like FNFNES can assist First Nations in making informed decisions about the environment and environmental stewardship. It also provides a benchmark for other environmental changes that may take place over time.

I extend my thanks and appreciation to everyone who made this report possible. This includes, foremost, the First Nations participants, as well as the National Coordinator, the research assistants, Health Canada, and the Principle Investigators.

Kinanâskomitin,
**Perry Bellegarde**
National Chief
Assembly of First Nations

# FOREWORD FROM THE QUEBEC-LABRADOR REGIONAL CHIEF

Greetings,

First Nations in Quebec are committed to maintaining and enhancing their relationship with the environment as stewards of the land. As Quebec Regional Chief of the Assembly of First Nations (AFN), it is an honour and a privilege to be an advocate for First Nations. As we seek to reconnect with our cultures, traditional foods and food security is essential to our cultures as First Nations. As an advocate for the rights of First Nations in Quebec, the use of this data becomes crucial in producing better health outcomes that will lead to stronger First Nations overall.

For this reason, I am pleased to present the First Nations Food, Nutrition and Environment Study (FNFNES) as an example of what partnerships can accomplish. Cooperation between First Nations and academic researchers were essential to the success of this project. In building towards a collective vision of First Nations knowledge of and interaction with the environment, projects with baseline data like FNFNES can serve as an important place marker for projects operated by and for First Nations.

Congratulations to all the First Nations who were involved in the completion of this project and a thank you to all our partners who made this possible.

**Ghislain Picard**
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Odanak First Nation. Photo by Maude Bradette-Laplante.

Unamen Shipu. Photo by Lara Steinhouse.

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# TABLE OF CONTENTS

# ACRONYMNS AND ABBREVIATIONS

**The following acronyms and abbreviations are used in this report:**

| | |
|---|---|
| **AI** | Adequate Intake |
| **AFN** | Assembly of First Nations |
| **AMDR** | Acceptable Macronutrient Distribution Ranges |
| **AO** | Aesthetic Objective |
| **BMI** | Body Mass Index |
| **BW** | Body weight |
| **CALA** | Canadian Association for Laboratory Accreditation |
| **CCHS** | Canadian Community Health Survey |
| **CI** | Confidence Interval |
| **CIHR** | Canadian Institutes of Health Research |
| **CWS** | Community Water System |
| **DDE** | Dichlorodiphenyldichloroethylene |
| **DRI** | Dietary Reference Intakes |
| **EAR** | Estimated Average Requirements |
| **EHO** | Environmental Health Officer |
| **FFQ** | Food Frequency Questionnaire |
| **FNFNES** | First Nations Food, Nutrition and Environment Study |
| **FNIHB** | First Nations and Inuit Health Branch (Indigenous Services Canada) |
| **FS** | Food Security |
| **GUDI** | Groundwater under direct influence of surface water |
| **HCBs** | Hexachlorobenzene |
| **HH** | Household |
| **IWS** | Individual Water System |
| **IR** | Indian Reservation |
| **IQR** | Interquartile range |
| **MAC** | Maximum acceptable concentration |
| **Max** | Maximum or highest value |
| **Min** | Minimum or lowest value |
| **mM** | Molar Concentration-one thousandth of a mole |
| **n** | Number of participants surveyed or number of food, water or hair samples analyzed |
| **PAH** | Polycyclic aromatic hydrocarbons |
| **PBDE** | Polybrominated diphenyl ethers |
| **PCB** | Polychlorinated biphenyls |
| **PFC** | Perfluorinated compounds |
| **PFOS** | Perfluorooctanesulfonic acid or perfluorooctane sulfonate |
| **PI** | Principal Investigator |
| **POP** | Persistent Organic Pollutant |
| **PPCP** | Pharmaceuticals and personal care products |
| **PPM** | Parts per million |
| **PSU** | Primary Sampling Unit |
| **PWS** | Public Water System |
| **QA/QC** | Quality Insurance/Quality Control program |
| **RDA** | Recommended Dietary Allowance |
| **SAS** | Statistical Analysis System: software developed by SAS institute |
| **SIDE** | Software for Intake Distribution Estimation |
| **SCC** | Standards Council of Canada |
| **SE** | Standard error (see Glossary) |
| **SHL** | Socio/Health/Lifestyle Questionnaire |
| **SSU** | Secondary Sampling Unit |
| **TDI/PTD** | Tolerable Daily Intake/Provisional Tolerable Daily Intake |
| **TDS** | Total Diet Studies |
| **TF** | Traditional food |
| **TSU** | Tertiary Sampling Unit |
| **TWS** | Trucked Water System |
| **TPWS** | Trucked Public Water System |
| **UL** | Tolerable Upper Intake Level |
| **USDA** | United States Department of Agriculture |

# GLOSSARY

**The following are definitions or illustrations of terms used in this report:**

- **Aesthetic objective (AO):** The level of substances in drinking water or characteristics of drinking water (such taste, odour, or colour) that can affect its acceptance by consumers. Aesthetic objective levels are below levels considered to be harmful to health.
- **Acceptable Macronutrient Distribution Ranges (AMDR):** Expressed as a percentage of energy intake (total calories), the AMDRs are the range of intake for protein (10-35%), fat (20-35%), and carbohydrates (45-65%), associated with a reduced risk of chronic disease and provide adequate amounts of these nutrients.
- **Adequate Intake (AI):** An AI is derived for a nutrient if there is inadequate evidence to establish an Estimated Average Requirement (EAR).
- **Arithmetic mean:** See mean.
- **Average:** See mean.
- **Background level:** The level of chemical (or other substances) that are normally found in the environment.
- **Body burden:** This refers to the total amount of any chemicals currently present in the human body at any given time. Some chemicals only stay present in the body for a short period of time while others remain within the body for 50 years or more.
- **Body Mass Index (BMI):** Calculated by dividing the weight (in kilograms) by the square of the height (in metres), this index is used to define normal weight (range of 18.5-24.9), overweight (25-29.9) and obesity (30 and over). Overweight and obesity are degrees of excess body weight carrying increasing risks of developing health problems such as diabetes and heart disease.
- **Bootstrapping:** A computer-based statistical method used to estimate a statistical parameter (e.g. standard error) by random sampling with replacement from the original dataset.
- **Cistern:** A water holding tank that provides storage for treated drinking water.
- **Coefficient of variation (CV):** A measure of the relative magnitude of the standard deviation. The standard deviation is the typical or average distance a value is to the mean. CV=standard deviation/mean. Data that is more spread out will have a higher CV. CV's over 33% are often considered unreliable
- **Confidence Interval:** A range or interval of scores that reflects the margin of error (due to sampling and measurement errors) associated with the mean value of the parameter (characteristic of a population) under study. A 95% CI means that the true mean value falls within this interval 95% of the time.
- **Dietary Reference Intakes (DRI):** A set of nutrient-based reference values that are used to assess and plan the diets of healthy individuals and groups. The DRIs include the Estimated Average Requirements (EARs), the Recommended Dietary Allowance (RDA), the Adequate Intake (AI) and the Tolerable Upper Intake Level (UL).
- **Ecozone:** Regions/areas identified based on the distribution patterns of plants, animals, geographical characteristics and climate.
- **Estimated Average Requirement (EAR):** The estimated median daily nutrient intake level necessary to meet the nutrient needs of half of the healthy individuals in a gender or age group. It is a primary reference point used to assess the nutrient adequacy of groups
- **Food security:** Physical and economic access by all people to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Household food security can be estimated by a questionnaire.
- **Guideline value:** In Canada, guideline values are set for the protection of environmental and human health. For example, there are guidelines for human tissues (such as blood and hair), animal tissues (fish, mammals and birds), drinking water, recreational water, soil, as well as for the protection of aquatic life. These values are based on the most current scientific data available for the parameter of interest.

- **Groundwater:** Water located beneath the ground surface such as in porous soil spaces and fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water.

- **Groundwater under the direct influence of surface water (GUDI):** groundwater that shows surface water characteristics. This can include water from a well that is not a drilled well or does not have a watertight casing and is up to 6 m in depth below ground level.

- **Hazard Quotient (HQ):** The HQ approach is used in contaminant exposure analyses to estimate risks of adverse health effects to COPCs. An HQ is calculated by dividing the estimated exposure to a COPC (ug/kg body weight/day) by the TDI. If the HQ is ≤ 1, the risk of an adverse health effect is not likely. If HQ is >1, there can be an increased health risk exposure from the contaminant.

- **Individual Water System (IWS):** A system serving individual homes that each have their own pressurized water supply (e.g. a well), or is connected to a piped distribution system that has less than five housing units and does not include any public access buildings.

- **Interquartile range (IQR):** A statistical term used to describe the distribution around the median (25% above and below the median).

- **Maximum Acceptable Concentration (MAC):** The concentration or level of a particular substance at which exposure to may cause harmful effects on health.

- **Mean (arithmetic):** A statistical term used to describe the value obtained by adding up all the values in a dataset and dividing by the number of observations. Also known as 'average'.

- **Mean, geometric (GM):** To calculate a geometric mean, all observations [i.e. values] are multiplied together, and the nth root of the product is taken, where n is the number of observations. Geometric mean of skewed distribution such as hair mercury concentrations usually produces an estimate which is much closer to the true center of the distribution than would an arithmetic mean.

- **Median:** A statistical term used to describe the middle value obtained when all values in a dataset are placed in numerical order; at most half the observations in a dataset are below the median and at most half are above the median.

- **Organochlorines:** A group of organic compounds with a similar chemical structure. There are naturally occurring and man-made organochlorines. Organochlorine compounds have been used for a variety of purposes including pesticides (DDT, chlordane, toxaphene, solvents, material purposes (PVC pipes) insulators (PCB). Some organochlorines have been banned or their use restricted due to their harmful impacts and classification as a POP. See Appendix A for more detail.

- **Oral Slope Factor:** An upper bound, approximating a 95% confidence limit, on the increased cancer risk from a lifetime oral exposure to an agent. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg-day, is generally reserved for use in the low-dose region of the dose-response relationship, that is, for exposures corresponding to risks less than 1 in 100.

- **Persistent Organic Pollutant (POP):** Groups of chemicals that persist in the environment and in the bodies of humans and other animals long after their use. See Appendix A for more detail.

- **Public Water System (PWS):** A community water system with five or more connections that has a distribution system (piped) and may also have a truck fill station.

- **Recommended Dietary Allowance (RDA):** The estimated average daily nutrient intake level that meets the needs of nearly all (98%) healthy individuals in an age or gender group.

- **Semi Public Water System (SPWS):** A well or cistern serving a public building(s) or where the public has a reasonable expectation of access and has less than 5 connections.

- **Standard deviation (SD):** A measure of the usual distance or spread of the data values about the mean value (the average of a set of numbers) in a data set. The SD is higher when the data have greater variability.

- **Standard error (SE):** A measure of variation to be expected from sampling strategy, measurement error, and natural variability in the calculated parameter (The parameter can be a percentage or a mean (average) for example).

- **Surface water (SW):** All water situated above-ground (for example, rivers, lakes, ponds, reservoirs, streams, seas).



- **Tolerable Daily Intake (TDI) or Provisional Tolerable Daily Intake (PTDI):** The amount of a substance in air, food or drinking water that can be taken in daily over a lifetime without adverse health effects. TDIs or PTDIs are calculated on the basis of laboratory toxicity data to which uncertainty factors are applied. TDIS are presented as daily dose rates in units of mass of a particular chemical per kilogram of body weight of a person per day

- **Tolerable Upper Intake Level (UL):** An estimate of the highest average daily nutrient intake level that is likely to pose no adverse health effects.

- **Wastewater (WW):** Used water, including greywater (used water kitchen, laundry), blackwater (used water from bathroom containing human waste), or surface runoff or used water from an industrial, commercial or institutional facility that is mixed with blackwater.

- **Water treatment plant (WTP):** The facility that treats water so that it is clean and safe to drink.

- **Water treatment system (WTS):** Includes all water delivery components such as the raw water intake, water treatment plant, distribution system, hydrants, etc.

- **µg/g:** Micrograms (1 millionth or 1/1,000,000 of a gram) per gram; in the case of the mercury in hair results, this measurement represents the weight of mercury measured per gram of hair. In the food contaminant results, this represents the weight of contaminant per gram of food.

- **µg/L:** Micrograms (1 millionth or 1/1,000,000 of a gram) per litre; found in the drinking water results, this measurement represents the weight of trace metals measured per litre of water.

- **ng/g:** Nanograms (1 billionth or 1/1,000,000,000 of a gram) per gram; found in the food contaminant results, this measurement represents the weight of a contaminant measured per gram of food.

- **ppm:** Parts per million; A common unit typically used to describe the concentration of contaminants in food or environment. This is approximately equivalent to one drop of water diluted into 50 liters (roughly the fuel tank capacity of a small car).

- **ppb:** Parts per billion; this is approximately equivalent to one drop of water diluted into 250- 55 gallon containers.

- **pg/kg/day:** Pico grams (1 trillionth or 1/1,000,000,000,000 of a gram) per kilogram per day; in the food contaminant results, this represents the weight of contaminants per kilogram body weight that is being consumed per day. This value is used for risk assessment.

# EXECUTIVE SUMMARY

First Nations have expressed concerns about the impacts of environmental pollution on the quality and safety of traditionally-harvested foods. However, very little is known about the composition of First Nations' diets, or about the level of contaminants in traditional foods. The goal of this study is to fill this gap in knowledge about the diet of First Nations peoples living on-reserve, in the eight Assembly of First Nation (AFN) regions south of the 60th parallel in Canada. In addition, baseline information on human and veterinary pharmaceuticals in surface waters is being collected, especially where fish are being harvested or where water is being taken for drinking purposes. To ensure that the cultural and ecosystem diversity of First Nations in Canada is represented in this study, communities are selected using an ecozone framework. There are 11 ecozones within the eight AFN regions. In the AFN region of Quebec-Labrador, there are five ecozones: Taiga Shield, Hudson Plains, Boreal Shield, Mixedwood Plains and the Atlantic Maritime.

This study, called the First Nations Food, Nutrition and Environment Study (FNFNES) was implemented region by region across Canada over a 10-year period. Data collection started in 2008-2009 in 21 First Nations communities in British Columbia followed by 9 First Nations communities in Manitoba in 2010, 18 communities in Ontario (2011-2012), 10 communities in Alberta in 2013, 11 communities in the Atlantic region in 2014 and 13 communities in Saskatchewan in 2015. Reports for these six AFN regions are available on the FNFNES website (www.fnfnes.ca).

In the fall of 2016, FNFNES was undertaken in the Assembly of First Nations region of Quebec-Labrador. A total of 10 First Nations communities across Quebec participated. No communities from Labrador were included in the study since neither of the two First Nations communities in this region was selected during the random selection process. Although all result tables and figures in this report are labelled as "Quebec", all results from this study apply to the Quebec-Labrador AFN region.

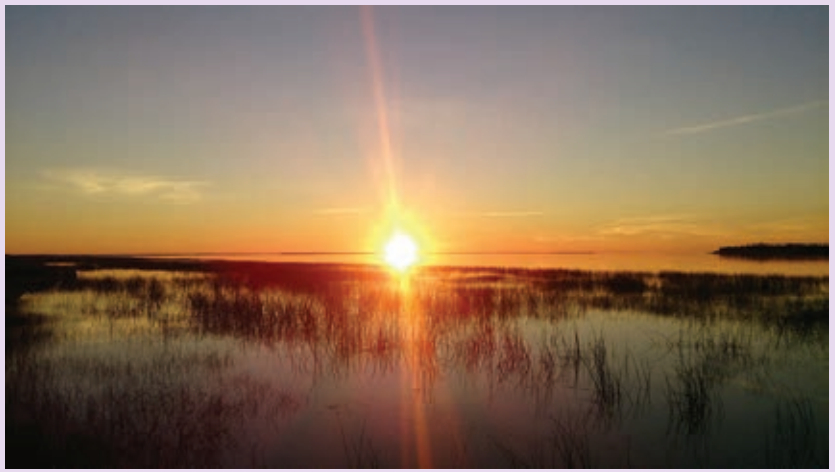
Due to the fact that only one community from the Hudson Plains was surveyed and could be easily identified, this report only presents the aggregated results from the 10 participating First Nations communities combined and from the other four ecozones: Taiga Shield, Boreal Shield, Mixedwood Plains and Atlantic Maritime. Results for the community in the Hudson Plains will be included in a future report combining results by ecozone at the national level.



## The FNFNES includes five components:

1) Household interviews to collect information on dietary patterns, lifestyle and general health status, environmental concerns and food security;
2) Drinking water sampling for trace metals;
3) Hair sampling for exposure to mercury;
4) Surface water sampling for pharmaceuticals; and
5) Traditional food sampling for chemical contaminant content.

This study was guided by The *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans* and in particular Chapter 9 research involving the First Nations, Inuit and Métis Peoples of Canada (2010) and the First Nations principles of Ownership, Control, Access and Possession (OCAP®) of data (The First Nations Information Governance Centre (FNIGC) 2014). Ethical approval has been granted by the Research Ethics Boards of Health Canada, the University of Northern British Columbia, the University of Ottawa and the Université de Montréal.



Rupert River, Waskaganish First Nation. Photo by Rebecca Hare.

## Results

In each community, households were randomly selected; one participant per household, nineteen years and older, living on-reserve and who self-identified as a First Nation person, was invited to participate. There was a total of 573 participants (420 women and 153 men). The overall participation rate was 71% for questionnaires and 66% (n=381) for hair testing for mercury. The average age of the participants was 42 years for women and 48 years for men. The median number of people living in a household was four: 67% were between the ages of 15 and 65, 27% were children under 15 years of age and 6% were over 65 years of age.

Based on measured and/or self-reported height and weight data, 9% of adults were at a normal weight, while 25% of adults were overweight (25% of women and 26% of men) and 66% were obese (66% of women and 65% of men). One out of four adults (25%) reported that they had been told by a health professional that they had diabetes. Almost half of all adults (46%) were smokers. Thirty percent of adults said that their health was very good or excellent.

Traditional food appeared in the diet of almost all (95%) adults. Over 100 different traditional foods were reported to be harvested during the year, with the types varying across communities. Most participants reported eating land mammals (84%) and berries (79%), while many had fish (76%), wild birds (59%) and wild plants (31%) in their diet. At the regional level, First Nations adults in Quebec consumed an average of 37 grams of traditional food a day. Individuals at the upper end of the traditional food intake distribution or at the 95$^{th}$ percentile ate 113 grams/day. The most frequently eaten traditional foods were blueberries, moose and Canada goose. Seventy-eight percent of households reported harvesting traditional food in the last year and more than three-quarters (84%) of participants reported that they would like to have more traditional food. However, the key barriers to increased use included a lack of: time, a hunter in the household and equipment and/or transportation. External factors that inhibited access to traditional food included industry (forestry, pulp mill, hydro), recreation boaters/fishers, snowmobiles/ATVs, as well as roadways. Climate change was also perceived by participants to have impacted the availability and the accessibility of traditional food as well as the seasonal round (lifecycle pattern of plants and animals and harvesting times).

In terms of overall diet quality, First Nations adults in the Quebec-Labrador region do not meet the amounts and types of food recommended in Eating Well with Canada's Food Guide-First Nations, Inuit and Métis. Of the four food guide groups (Meat and Alternatives, Milk and Alternatives, Vegetables and Fruit, and Grain Products), men met the recommended number of food guide servings for Grain Products only, while women did not meet the recommended number of servings for any group. Fibre and many nutrients that are needed for good health and prevention of disease, including vitamin A, vitamin B6, vitamin C, vitamin D, calcium and magnesium, are at risk of insufficient intake. Overall, saturated fat and salt consumption were too high. Dietary quality was much improved on days when traditional foods were consumed, as traditional foods are important contributors of protein, vitamin D, vitamin B12, niacin, riboflavin, iron and zinc.

Almost two in five (36%) households experienced food insecurity; 28% of the households were moderately food insecure and 8% were severely food insecure. The cost of food relative to income is a contributing factor to food insecurity. The average cost of groceries per week for a family of four in the participating First Nations in Quebec was $262. Costs at the community level ranged from $179 to $336, compared to $196 in Montreal. When asked about traditional food security, 45% of households said that they worried that their traditional food supplies would run out before they could get more.

In terms of water treatment systems, there were 10 public water systems serving communities. In the 12 months preceding this study, water disruptions and short-term drinking water advisories occurred in 5 of the systems due to power outages, broken watermains, routine system cleaning, and elevated bacteria count in one community.

While all households have tap water, only 71% of participants said they use it for drinking (52% reported regular use while 19% sometimes drank it) though 96% use tap water for cooking. A high percentage of participants reported using water from both hot and cold water taps for drinking (36%) and cooking (51%). In the 156 homes which had the drinking water tested for metals of public health concern, no exceedances occurred.

Testing for the presence of pharmaceuticals in surface water was undertaken in 9 communities: 25 pharmaceuticals were found in 8 of the 9 communities where samples were collected. The FNFNES results are considerably lower than those found in other surface waters reported in Canada, the United States, Europe, Asia, Central America and Africa. However, the health effects of the mixtures of multiple pharmaceuticals in the surface water are unknown at this time.

Of the 381 hair samples tested for mercury, 23 (6%) exceeded Health Canada's mercury biomonitoring guidelines. Exceedances among women of childbearing age (WCBA) represent 8.3% of the sample. There was a south-north gradient of increasing mercury in hair. In general, a high percentage of WCBA and elders living in the northern ecozones exceeded Health Canada's mercury guidelines.

A total of 682 food samples representing 80 different types of traditional foods were collected for contaminant analysis. Most of the contaminant concentrations found in the traditional foods were within the normal ranges that are typically found in Canada with no health concern associated with the current consumption rate. Some samples such as wild birds (duck and grouse) and game (black bear meat and caribou heart) had higher concentrations of lead, likely as a result of contamination from lead-containing ammunition. It is recommended to use non-lead ammunition when hunting. If hunting with lead-containing ammunition, it is suggested to cut away the portion of meat surrounding the entry area to decrease the risk of lead exposure.

In the fall of 2018, FNFNES shared and verified community-specific results with each First Nation in Quebec that participated in the study. For the most part, representatives of each participating First Nation felt that the results presented were accurate. All communities were concerned about the level of food insecurity reported and felt that the situation is likely worse than what was reported. Health Directors were interested in using study results to develop programs that positively impact food security, obesity and unhealthy eating habits.

Thus far, this study has been a valuable tool in addressing the gaps in knowledge about the diet, including both store-bought and traditional food consumption and levels of environmental contaminants to which First Nations in Quebec are exposed. It should be noted that this is the first study of this type to be conducted on a regional level across the country. The data collected will serve as a critical source of information to inform human health risk assessments and to serve as a benchmark for future studies to determine if changes in the environment are resulting in an increase or decrease in concentrations of chemicals of concern and how diet quality will change over time.

Whapmagoostui First Nation. Photo by Rebecca Hare.

# INTRODUCTION

In Canada, there remain large gaps in health between First Nations and the non-Indigenous population. First Nations continue to experience a lower life expectancy (Health Canada 2014), higher rates of chronic and infectious diseases, and mental health issues (Public Health Agency of Canada 2012; 2011; 2010). Rates of obesity, diabetes and heart disease among First Nation Peoples have reached epidemic levels (Ayach and Korda 2010; Belanger-Ducharme and Tremblay 2005; Young 1994). The well-being of individuals and communities is determined by a broad range of factors including diet and lifestyle, genetics, the state of the environment and the social determinants of health. The social determinants of health (social and economic factors including income, education, employment, early childhood development, social networks, food security, gender, ethnicity, and disability that can result in inequities and exclusion) play a key role in health inequities: those who have more advantages tend to have better health (Frohlich, Ross and Richmond 2006; Mikkonen and Raphael 2010). For First Nation Peoples, the history of colonization and the loss of jurisdiction over traditional territories is an additional dimension of the determinants of health (Egeland and Harrison, 2013; Reading and Wein 2009).

For thousands of years, First Nation communities relied on ecozone-adapted traditional food systems, as well as diverse resource management and food production technologies from hunting and foraging to intensive food production (clam gardens, berry patches, species domestication) (Deur and Turner 2005; Waldram, Herring and Young 1995). Traditional food is nutritionally, culturally, and economically important for First Nation peoples. Traditional foods are often more nutrient dense compared to store-bought food replacements. First Nations communities are experiencing a dietary transition away from traditional foods that could be attributed to a multitude of factors including acculturation, harvesting restrictions, financial constraints and loss of time for harvesting activities, and declining traditional food access and availability due to development, pollution and climate change (Kuhnlein, Erasmus, et al. 2013; Kuhnlein and Receveur 1996). As the proportion of traditional food decreases in the diet of First Nations, there is a risk of a decrease in the nutritional quality of the diet and rise in nutrition related health problems such as anemia, heart disease, obesity, osteoporosis, cancer, infections, diabetes and tooth decay (Kuhnlein and Receveur 1996). The health and nutrition of First Nations Peoples are strongly affected by social disparities, the erosion of a traditional lifestyle and the resulting high food insecurity and a poor quality diet (Adelson 2005; Kuhnlein and Receveur 1996; Power 2008; Willows, Veugelers, et al. 2011; Willows 2005).

Increasing industrialization in the last century has led to varying degrees of pollution in all ecosystems. First Nations are particularly at risk to environmental contaminant exposure because of a traditional lifestyle with a close connection to the land and water, as well as a diet that includes traditional foods from the local environment. First Nations communities from different geographical areas in Canada face their own unique environmental problems due to the nature of the point sources of environmental pollution and the degree to which their diet is obtained from the local environment. It has been suggested that major health problems (e.g. cancer, diabetes, low infant weight) may be related to the amount of chemical contaminants in the environment (Hectors, et al. 2011; Lee, et al. 2011; Li, et al. 2006; Institute of Medicine 2007). There are also concerns of new or unknown health issues associated with the consumption of food contaminated with chemicals that have not been fully characterized. However, the risks and benefits of traditional food must be better understood before recommendations can be made. Unfortunately, there has been very limited information on both the nutritional composition of the average diet of most First Nations and the levels of contaminants in their traditional foods.

Exposure to food toxicants and environmental contaminants as well as nutritional imbalances have been associated with a range of human health conditions including; cancer, kidney and liver dysfunction, hormonal imbalance, immune system suppression, musculoskeletal disease, birth defects, premature births, impeded nervous and sensory system development, reproductive disorders, mental health problems, cardiovascular diseases, genito-urinary disease, old-age dementia, and learning disabilities. Toxicants in food can occur naturally or can enter during processing or through environmental contamination. Toxicants can be 'natural' or 'manufactured'. For example, some mushrooms produce toxins that can be harmful to human health. Toxic elements such as arsenic, cadmium, lead and mercury are found naturally in soil and rocks. However, they can also be emitted as a waste product (pollutant) of human activities such as mining and forestry and accumulate in animals and plants in high enough amounts that are harmful to the human consumers. The burning of wood and fossil fuels can release toxic chemicals such as polycyclic aromatic hydrocarbons (PAHs) and dioxins and furans into the environment. Man-made (anthropogenic) chemicals such as PCBs (derived from industrial activities), PBDEs and PFCs (used in consumer products) and organochlorine pesticides (used in agriculture and forestry) can also enter into the food system.

About 8,400,000 chemical substances are commercially available and 240,000 are reported to be inventoried/regulated chemicals. Combined with pesticides, food additives, drugs and cosmetics, over 100,000 chemicals have been registered for use in commerce in the United States in the past 30 years, with similar numbers in the EU and Japan (Muir and Howard 2006). Canada has compiled a list of approximately 23,000 chemicals manufactured, imported or used in Canada on a commercial scale and identified 4,300 chemicals as priorities for assessment by 2020: as of 2015, 60% have been assessed (Health Canada and the Public Health Agency of Canada 2015). Some organic chemicals, such as pesticides, PCBs and dioxins, as well as organic lead and mercury, have physical and chemical characteristics that allow them to resist degradation and persist in the environment, to be transported globally via air and water currents and to bioaccumulate and biomagnify along biological food chains. These persistent organic pollutants (POPs) are of particular concern in aquatic environments since the aquatic food chains are usually longer than the terrestrial food chains, resulting in higher bioaccumulation in the top predators. Where these chemicals are present in fish, they will also accumulate in the animals that consume them, such as birds, marine mammals and bears, eventually reaching humans.

In the last few years, concern has also been raised about pharmaceuticals and personal care products (PPCPs) in the environment (Treadgold, Liu and Plant 2012). Some of these compounds, including human pharmaceuticals and veterinary drugs, are excreted intact or in conjugated form in urine and feces. These PPCPs have also been found in sewage treatment effluent and surface waters.

Health authorities usually employ four complementary approaches to assess and characterize risk and develop programs meant to minimize the potential health impact of toxic chemicals:

1. Monitor foods for compliance with national and international food safety regulatory standards. In Canada, this function is the responsibility of the Canadian Food Inspection Agency.
2. Conduct targeted surveys to identify and eliminate sources of high-priority contaminants of public health concern, such as lead, dioxins and pesticides, from foods.
3. Estimate the actual consumption of chemicals in the diet by population at risk, and compare these intakes with toxicological reference points, such as the acceptable daily intake (ADI) or provisional tolerable weekly intake (PTWI). On a yearly basis, Health Canada purchases store-bought food and analyses high-priority chemicals as part of the Total Diet Study (TDS).
4. Conduct biomonitoring projects by measuring the chemical concentrations in blood, urine, breast milk, hair, nail clippings and/or fetal cords blood collected from the target population as indicators of exposure. The Canadian Health Measures Survey (CHMS) is an ongoing bio-monitoring surveillance study that began in 2007 (Statistics Canada n.d.(a)).

Canada is one of the global leaders in conducting Total Diet Studies (TDS). Health Canada (Health Canada 2009a) has been collecting and analyzing store-bought foods since 1969 to assess nutrient intake and exposure to chemical contaminants from these foods. In each TDS, a variety of store-bought foods are purchased from several supermarkets in major cities and analysed for nutrients and chemical contaminants. This information is combined with available dietary data for Canadians to estimate exposure. Results of the studies have been published in the scientific literature. As the TDS only focuses on the chemical contaminants found in store-bought foods, the findings have limited value for First Nations communities that also rely on traditionally harvested foods. A similar situation exists for the evaluation of food intake and diet quality. National health surveys that include a focus on nutrition, such as the 2004 and 2015 Canadian Community Health Surveys (Health Canada and Statistics Canada 2009; Statistics Canada 2017), do not include First Nation peoples living on-reserve.

There have been a number of dietary studies conducted in First Nations communities since the 1970s. They provide a general understanding of the types of foods eaten by some First Nations peoples living on-reserve. The data are not easily comparable as the studies were conducted at different times by different research teams that used different investigative tools to address a variety of research objectives. Relatively more complete information is available for First Nations, Inuit and Métis communities in the three northern territories. With the funding support from the Northern Contaminants Program, three comprehensive dietary surveys were conducted in the Yukon, the Northwest Territories and Nunavut in the 1990's providing information on the diets, the nutritional value of foods eaten and the food pathways of exposure to environmental chemicals (Kuhnlein, Receveur and Chan 2001). A comprehensive dietary study was conducted among Canadian Inuit as part of the Inuit Health Survey conducted in 2007-2009 (Saudny, Leggee and Egeland 2012). Diets have been consistently shown to be of greater nutritional quality when traditional food is consumed compared to when only store-bought food is consumed. Furthermore, the nutritional, as well as cultural benefits of traditional food repeatedly outweigh the risks from chemical contamination (Donaldson, et al. 2010; Kuhnlein, Receveur and Chan 2001; Laird, et al. 2013; Canada, Crown-Indigenous Relations and Northern Affairs (CIRNAC) 2018).

In summary, although there is a valuable but disparate patchwork of research that helps in assessing the contribution of nutrients from traditional foods to the diet and some major issues in regard to chemical exposures through food pathways, research to date has not succeeded in providing reliable regional information on First Nations' diets and the risk of chemical exposure through the consumption of locally-harvested foods in the 10 Canadian provinces. This gap is targeted by this study entitled the First Nations Food, Nutrition and Environment Study (FNFNES).

The FNFNES goal is to provide information needed for the promotion of healthy environments and healthy foods for healthy First Nations. The measurement of baseline levels of key environmental chemicals of concern and an assessment of diet quality of First Nations on a regional level across the country are this study's main objectives. The FNFNES is measuring chemicals of potential concern reported by Health Canada (1998) including arsenic, cadmium, lead, mercury, PCB and organochlorines, PAH, PFCs, PBDE, dioxin and furans, and PFOS. Fact sheets of the contaminants measured in this study can be found in Appendix A. This study also aims to quantify the intake of metals through drinking water and the presence of various pharmaceutically-active compounds that may find their way into surface waters that are used for fishing or as a source for drinking water. Pharmaceuticals are emerging contaminants and the FNFNES is the first study to quantify them in waters on First Nation reserves.

Results of this study will be useful for the development of community-level dietary advice and food guidance for First Nations at the regional level. The information on background exposures to POPs, toxic metals and pharmaceutical products is also essential for First Nations as an enabling foundation for any future food monitoring at the community level. Results of this study will also empower communities to make informed decisions to address and mitigate environment health risks.

The FNFNES has been implemented in eight Assembly of First Nation regions over a 10-year period and will be representative of all First Nations regions south of the 60th parallel. The study was first undertaken in 21 First Nations communities in British Columbia in 2008 and 2009 (Chan, Receveur and Sharp, et al. 2011). In 2010, nine First Nations communities in Manitoba participated (Chan, Receveur and Sharp, et al. 2012) followed by a two-year period (2011-2012) in Ontario, during which 18 First Nations participated (Chan, Receveur, et al. 2014). From 2013 to 2015, the study occurred with the participation of 10 First Nations in Alberta (2013) (Chan, Receveur, et al. 2016), 11 First Nations in the Atlantic (2014) (Chan, Receveur, et al. 2017), and 13 First Nations in Saskatchewan (2015) (Chan, Receveur, et al. 2018). The FNFNES was initiated through a resolution passed by the Chiefs-in-Assembly at the Assembly of First Nations' (AFN) Annual General Assembly in Halifax, Nova Scotia on July 12, 2007.

In the Quebec-Labrador AFN region, communities were contacted by the AFN in January 2016 and invited to attend a two-day Methodology Workshop in March 2016. The formal start of research activities took place after interested communities formally agreed to participate and Community Research Agreements were signed.

This phase of the study was led by four principal investigators: Dr. Laurie Chan from the University of Ottawa, Dr. Malek Batal and Dr. Olivier Receveur from the Université de Montréal, and Dr. Tonio Sadik from the Assembly of First Nations. This regional report, descriptive in its intent, was developed on the basis of aggregated information and has been provided to the 10 communities that participated in the study, as well as to regional and national First Nations organizations. The FNFNES regional reports are publicly available in print and online (www.fnfnes.ca). Preliminary results were disseminated through meetings with each participating community in August to December 2018 and feedback on the content of these community level reports is included in this report.

Kahnawá:ke Mohawk Territory. Photo by Lynn Jacobs.

# METHODOLOGY

The FNFNES is representative of all on-reserve First Nations in Canada for regions south of the 60th parallel. Within the eight AFN regions south of 60, there are 597 First Nations communities. The FNFNES invited approximately 100 communities to participate in this study.

## Sampling

For the purposes of this study, communities were sampled using an ecozone framework to ensure that the diversity is represented in the sampling strategy. Only First Nations communities with a population on-reserve were included (583 communities).

**Ecozones** are large scale divisions of the earth's surface based on the distribution of plants and animals. Ecozones are separated by such features as oceans, deserts or high mountain ranges that form barriers to plant and animal migration. Within Canada, there are 15 terrestrial ecozones and 5 aquatic ecozones. First Nations communities south of the 60th parallel are located within 11 ecozones. Further information on ecozones can be found within the first National Ecological Framework Report, published by Agriculture and Agri-Food Canada (Smith and Marshall 1995), and at the Ecological Framework of Canada website (www.ecozones.ca).

### Map of five ecozones within the Quebec-Labrador AFN Region


In 2016, FNFNES was undertaken in the Assembly of First Nations region of Quebec and Labrador. In this region, there are 43 First Nations from ten cultural groups (the Abenaki, the Algonquin, the Atikamekw, the Cree, the Huron-Wendat, the Montagnais/Innu, the Malecite, the Mi'kmaq, the Mohawk and the Naskapi). At the time of the study, 9.5% of individuals in Canada who identify as First Nation reside in Quebec, comprising 1% of this province's total population (Statistics Canada 2018). At the time of the study, there were approximately 58,000 First Nations people living on-reserve in 38 First Nations communities in five ecozones (See Figure A) of the Quebec-Labrador AFN region; 6 First Nations in the Taiga Shield, 2 First Nations in the Hudson Plains, 23 First Nations in the Boreal Shield, 5 in the Mixedwood Plains and 2 in the Atlantic Maritime ecozone. Table A provides a brief description of the five ecozones within the Quebec-Labrador AFN region.

### Table A. Description of the ecozones within the Quebec-Labrador AFN Region

| Ecozone name | General description |
|---|---|
| Taiga Shield | The Taiga Shield stretches across most of the Northwest Territories and the southern edge of this large ecozone dips down into Saskatchewan, northwestern Manitoba and across to northern Quebec and southern Nunavut. The land consists of rolling hills and flat lands covered in lakes, wetlands and small conifers that mark the northern edge of the boreal forest. |
| Hudson Plains | The Hudson Plains extends from northeastern Manitoba across Ontario and into western Quebec. Situated along the edge of Hudson Bay, this large low flatland contains much of Canada's and the world's wetlands. |
| Boreal Shield | The Boreal Shield is the largest ecozone in Canada, stretching from northeastern Alberta to Newfoundland. It is an immense flat plain of bedrock covered in boreal forest, millions of lakes, ponds and wetlands. |
| Mixedwood Plains | The Mixedwood Plains ecozone is comprised of gentle rolling hills and lowlands. Located primarily in southern Ontario, it is bounded by 3 of the Great Lakes (Huron, Erie and Ontario) and extends eastward along the St. Lawrence river to Quebec City. |
| Atlantic Maritime | The Atlantic Maritime extends from the St. Lawrence River into the Maritime provinces of New Brunswick, Nova Scotia and Prince Edward Island. The area comprises the hilly Appalachians and coastal plains. |

**Table B. Summary of collection effort for each ecozone in Quebec**

| Ecozone area | Population on-reserve * | Number of communities | Sample allocation (number of communities selected) | Sample collected (number of communities that participated) | Population on-reserve for participating communities | Number of adults responding |
|---|---|---|---|---|---|---|
| Taiga Shield | 8,752 | 6 | 2 | 2 | 2,080 | 63 |
| Hudson Plains | 2,926 | 2 | 2 | 1 | 2,182 | 56 |
| Boreal Shield | 31,486 | 23 | 3 | 3 | 6,943 | 118 |
| Mixedwood Plains | 11,104 | 5 | 2 | 2 | 8,146 | 221 |
| Atlantic Maritime | 2,738 | 2 | 2 | 2 | 2,738 | 115 |
| **Total** | **57,006** | **38** | **11** | **10** | **22,089** | **573** |

*Total population at time of calculation was based on 2013 statistics.

The communities were selected using a systematic random sampling method with probability proportional to the size of communities. This selection method ensures that the most populated communities are more likely to be chosen in the sample rather than the smallest ones. Four communities were pre-selected from the two ecozones that only had two communities (Atlantic Maritime and Hudson Plains). Six communities were randomly selected from the other ecozones. Of the 10 communities selected, three declined to participate so alternative communities were invited. One community that chose not to participate did not have an alternate replacement community. In addition, one community was added to broaden the cultural and linguistic representation of Quebec First Nations within the sampling frame. By summer 2016, 10 communities agreed to participate. Table B presents a summary of the collection effort in each ecozone. The sample is considered representative of 99% of First Nations in the Quebec-Labrador region due to the non-participation of the one community that did not have an alternate replacement community. To note, neither of the two First Nations communities in Labrador were selected, however all results apply to the entire AFN region.

The FNFNES relies on data collected from probability samples of adult First Nations living on-reserve. Communities (Primary Sampling Units or PSUs), households (Secondary Sampling Units or SSUs) and individuals (Tertiary Sampling Unit or TSU in each household), were selected using random mechanisms by statisticians at Statistics Canada under the witness of representatives from the Assembly of First Nations.

### Sampling in Quebec proceeded in three stages:

1. Primary Sampling Units (PSUs): Systematic random sampling of **communities** took place within each AFN Region. The number of communities allocated to each region was proportional to the square root of the number of communities within it. Over-sampling was carried out to account for potential community non-response.
2. Secondary Sampling Units (SSUs): Systematic random sampling of 125 **households** occurred within each selected community, with a target of 100 households to be surveyed. In communities with fewer than 125 households, all households were selected. A larger number of households than required (100) was allowed to adjust for expected non-response.
3. Tertiary Sampling Units (TSUs): In each household, one **adult** who met the following inclusion criteria was asked to participate:

- 19 years of age or older;
- able to provide written informed consent;
- self-identified as being a First Nations person living on-reserve in Quebec; and
- whose birthday was next.

The statistics produced for this study are derived from data obtained through random samples of communities, households and persons. For these statistics to be meaningful for an AFN Region, they need to reflect the whole population from which they were drawn and not merely the sample used to collect them. The process of going from the sample data to information about the parent population is called *estimation*.

The first step in estimation is the assignment of a design weight to each of the responding sampled units. The design weight can be thought of as the average number of units in the survey population that each sampled unit represents and is determined by the sample design. The design weight for a unit in the sample is the inverse of its inclusion probability. Note that for a multi-stage design, a unit's probability of selection is the combined probability of selection at each stage.

The final weight is the combination of many factors reflecting the probabilities of selection at the various stages of sampling and the response obtained at each stage. Final weights are the product of a design weight (the inverse of the selection probability) and of one or many adjustment factors (non-response and other random occurrences that could induce biases in the estimates). These design weights and adjustment factors are specific to each stage of the sample design and to each stratum used by the design.

Some communities may have been unable or unwilling to participate in the study. The design weight was adjusted based on the assumption that the responding communities represent both responding and non-responding communities. Assuming that non-response is not related to the topic of the study (missing at random), a non-response adjustment factor was calculated, within each stratum (see Appendix B for calculations).

Surveys with complex designs require special attention when it comes to estimation of the sampling error. Both the survey design and the unequal weights are needed to obtain (approximately) unbiased estimates of sampling error. Failing to do so can lead to severe underestimation of the sampling error. While exact formulae exist in theory for stratified PPS sample designs, the required computations become practically impossible as soon as the number of primary units (here, communities) selected per stratum exceeds two. The Bootstrap method was adopted for the estimation of the sampling error of the estimates produced for this study (see Appendix B for calculations).

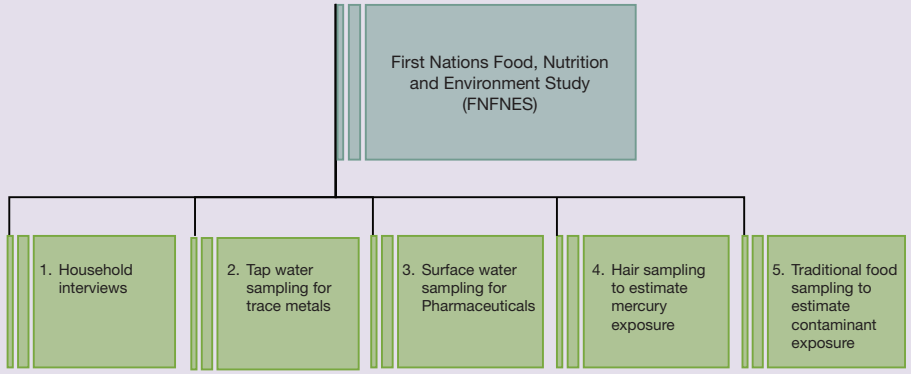
Sometimes the sampling error might be difficult to interpret because the measure of precision is influenced by what is being estimated. For example, a sampling error of 100 would be considered large for measuring the average weight of people but would be considered small for estimating average annual income.

To resolve the apparent scale effect in the appreciation of sampling errors, coefficients of variation (CV) could be used. The CV of an estimate is a measure of the relative error rather than of the absolute error. It is very useful in comparing the precision of sample estimates, where their sizes or scale differ from one another. The CV is expressed as a percentage (see Appendix B for calculation). In this report, all results are weighted unless stated otherwise. Their corresponding standard errors are reported unless it is greater than 33.3% of the estimated parameter, in which case the estimates parameter is identified as (-) for being unreliable.



# Principal Study Components

The following chart illustrates the five components of the FNFNES:




1. Household interviews: Each participant is asked a series of questions that focus on foods consumed (both traditional and store-bought food), health, lifestyle and socio-economic issues, and food security.
2. Tap water sampling for trace metals[1]: Two water samples are collected at the household level; one that has stagnated in the plumbing overnight and a second after a five-minute flush. These are analyzed for trace metals.
3. Surface water sampling for pharmaceuticals: Water samples are collected from three separate sites chosen by the participating community to analyze for the presence and amount of agricultural and human pharmaceuticals and their metabolites.
4. Hair sampling to estimate mercury exposure: Hair samples are collected voluntarily from participants. Hair analysis for mercury allows estimation of the participants' exposure to mercury.
5. Traditional food sampling for contaminant[2] content: traditional foods that are commonly consumed by members of the participating First Nation community are collected to analyze for the presence of environmental contaminants.

[1] This study determines the chemical safety of the community water supplies. In Quebec, bacteriological and/or chemical monitoring of drinking water are conducted by trained Community Based Water Monitors in collaboration with Environmental Health Officers (EHOs).

[2] FNFNES is studying the chemical safety of traditional food. The bacteriological safety is monitored by the community's EHO.

# Household Interviews

The household interview component of the FNFNES took each participant approximately 45 minutes to complete. Participants were asked a series of questions in multiple sections described in further detail below.

### Traditional Food Frequency Questionnaire

This questionnaire was developed based on previous work conducted with First Nations, Inuit and Métis in Canada (Kuhnlein, Receveur and Chan 2001). Questions sought information on frequencies of consumption of all identified traditional foods (retrospectively for the four past seasons). The traditional food list was constructed based on a review of existing literature for Quebec and input of representatives of each participating community. Table C shows the categories of frequency of consumption that were used as an aid when the respondent had difficulty recalling a more precise estimate. For the purposes of this study, each of the four seasons consisted of 90 days.

### Table C. Categories of frequency of consumption

| Frequency | Average days/season |
|---|---|
| Very rarely (< 1 day/month) | 2 days/season |
| Rarely (1-2 days/month) | 6 days/season |
| Quite often (1 day/week) | 12 days/season |
| Often (2-3 days/week) | 30 days/season |
| Very frequently (4-5 days/week) | 54 days/season |
| Almost every day (5-7 days/week) | 72 days/season |

### 24-Hour Diet Recall

The 24-hour diet recall was an 'in-person' interview aimed at recording all foods and beverages (including their approximate quantities) consumed the previous day using food and beverage models.[3]

This interview used the multi-pass technique with three stages as follows:

1. Make a quick list of all foods consumed during a 24-hour period (the first pass);
2. Get a detailed description of the foods and beverages (brands, amounts, and amount eaten); and
3. Review the recall with the participant to see if anything was missed.

A subsample of 20% of the respondents were invited to complete a second 24-hour recall for later analyses using SIDE (see Data Analyses section) to partially adjust for intra-individual variation. This method allows for a better approximation of the usual diet.

Joshua Loon and Samantha Coonishish-Coon. Cree Nation of Mistissini.
Photo by Maude Bradette-Laplante.

[3] Plastic models that resemble food quantities to assist in determining amounts consumed.

## Socio/Health/Lifestyle (SHL) Questionnaire

The SHL questionnaire incorporates several questions from the Canadian Community Health Survey, Cycle 2.2, Nutrition questionnaire (2006) and others derived from previous work with Indigenous Peoples in Canada (Kuhnlein, Receveur and Chan 2001) as appropriate, including:

- General health
- Height and weight (either measured or self-reported)
- Vitamin and dietary supplement use
- Physical activity
- Smoking
- Food security
- Socio-demographic characteristics
- Economic activity

## Food Security Questionnaire

Food security is considered achieved by the Food and Agricultural Organization of the United Nations (2002) "... when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".

The questionnaire used in this project is the income-related Household Food Security Survey Module (HFSSM) (Health Canada 2007a). Households are classified as food secure or food insecure (moderate or severe) based on their responses to the 18-question food-security module (10 questions for adults' status and an additional 8 questions for households with children).

Income-related food insecurity can present itself in many ways: it can range from worry about running out of food before there is more money to buy more, to the inability to afford a balanced diet, to cutting down or skipping meals or not eating for a whole day because of a lack of food or money for food. Households experiencing 'moderate food insecurity' may rely more on lower quality foods whereas 'severely food insecure' households would experience regular food shortages. To be classified as food secure, a household responded affirmatively to a maximum of one answer on either the 10 questions related to adult food security or the 8 questions related to child food security. Moderately insecure households were identified by 2-5 affirmed answers on the adult-related questions or 2-4 affirmed answers on the child-related questions and, severely food insecure households, by 6 or more affirmed answers on the adult survey section or 5 or more on the child survey section. Table D displays the categorization of food security status based on this three-category classification method. More information on the household questionnaire is available on the FNFNES website: www.fnfnes.ca.

### Table D. Categorization of food security status

| Category labels | Category description | Score on 10-item adult food security scale | Score on 8-item child food security scale |
|---|---|---|---|
| Food secure | no, or one, indication of difficulty with income-related food access | 0 or 1 affirmed responses | 0 or 1 affirmed responses |
| Food insecure, moderate | indication of compromise in quality and/or quantity of food consumed | 2 to 5 affirmed responses | 2 to 4 affirmed responses |
| Food insecure, severe | indication of reduced food intake and disrupted eating patterns | ≥ 6 affirmed responses | ≥5 affirmed responses |

Naskapi Nation of Kawawachikamach. Photo by Lara Steinhouse.

# Water Sampling for Trace Metals

## Tap Water Sampling

The drinking water component aimed to collect tap water samples from 20 participating households in every community. Selection of sampling sites was based on what would be considered representative of the water distribution system, i.e. at the ends of pipelines and at miscellaneous points within the system. Maps were used to help in the selection. In addition, if a household in the community was accessing a source of drinking water that was not part of the community water supply system, such as a well, nearby spring, or a trucked water source, these were also sampled.[4]

The tap water analysis consisted of both sample collections for laboratory analysis of trace metals and on-site testing for several parameters that would assist in later interpretation of the laboratory data. At each home selected to participate in this component, two tap water samples were collected: the first draw sample was collected after the water had been sitting stagnant in the pipes for a minimum of four hours and a second draw sample was taken after running the water for five minutes, or until cold to flush out the water that had been sitting in the pipes.

## Water Sample Preparation

Dissolved Metals: Prior to analysis, samples were filtered through a 0.45-micron pore size filter and acidified with nitric acid (using methodology based upon EPA Method # 200.1).

Total Metals: Prior to analysis samples were digested using nitric acid (using methodology based upon EPA Method # 200.2).

## Analysis

Water samples were sent for analysis to ALS Global, in Waterloo, Ontario. The choice of the contract lab was based on a rigorous performance evaluation and a formal bidding process. A comprehensive quality assurance/quality control (QA/QC) program was implemented by the analytical laboratory and the QA/QC results were verified and approved by the Principle Investigators (PIs) of the FNFNES.

Inductively Coupled Argon Plasma Mass Spectroscopy (ICP/MS) was used to perform all analysis for the elements requested (using methodology based upon EPA Method # 200.8). Mercury was determined using Cold Vapour Atomic Fluorescence Spectroscopy (using methodology based upon EPA Method # 245.7). All sample results are reported as micrograms per-litre 'parts per billion' on either dissolved or total basis. Please refer to Appendix C for detection limits.

Farrah Cheezo, La Nation Anishnabe du Lac Simon. Photo by Marie Pier Bolduc.

[4] The Environmental Public Health Services, FNIHB, Department of Indigenous Services Canada monitors drinking water in First Nations Communities which includes weekly microbiologic monitoring, annual basic chemical monitoring and a comprehensive chemical and radiological monitoring on a five-year cycle. The region maintains a database with complete and historic records on community drinking water quality and water system profiles for all the communities in Quebec.

# Pharmaceuticals in Surface Water

In the last ten years, there has been considerable interest concerning the occurrence of pharmaceuticals in surface water and drinking water (Aga 2008). These emerging chemicals that find their way into the environment have yet to be characterized in surface waters on-reserve.

NRC Rebecca Hare taking surface water samples in Whapmagoostui First Nation. Photo by Frances Kawapit.

This study component was undertaken to:

- establish a baseline of agricultural, veterinary and human pharmaceuticals occurrence in surface water on reserves in Canada;
- determine the exposure of fish and shellfish (an important component of many First Nations' diets) to pharmaceuticals in surface water on reserves in Canada; and
- establish a pharmaceuticals priority list for future health and environmental effects studies.

In each community, three sampling sites were chosen by the community. These sites were selected based on where fish may be harvested, at the drinking water supply intake, or other location of importance to the participating First Nation. Samples were collected by an Environmental Health Officer (EHO), from First Nations and Inuit Health Branch (FNIHB), Quebec region in five communities and by community members in five communities.

The criteria used for the selection of pharmaceuticals were: 1) levels of detection of the pharmaceuticals in the aquatic environment in previous studies; 2) frequency of detection of the pharmaceuticals in the environment in previous studies; and, 3) evidence of usage of the pharmaceuticals in First Nations communities. The First Nation usage information was provided by Non-Insured Health Benefits (NIHB), FNIHB (Booker and Menzies 2017). The FNFNES has chosen a list of 42 pharmaceuticals that meet the above criteria and can be analyzed by the laboratory that has been contracted by the FNFNES (Appendix C, Table C.10).

The pharmaceuticals in surface water samples were sent for analysis to ALS Global, in Waterloo, Ontario. The choice of the contract lab was based on a rigorous performance evaluation and a formal bidding process. A comprehensive quality assurance/quality control (QA/QC) program was implemented by the analytical laboratory and the QA/QC results were verified and approved by the PIs of the FNFNES.

Two separate 250 mL sample aliquots are required to analyze all of the target analytes. One aliquot is adjusted to pH 1.95-2.0 and mixed with 500 mg of $Na_4EDTA{\cdot}2H_2O$. The sample is loaded onto a HLB solid phase extracting column. The column is washed with 10 mL water and eluted with 12 mL of methanol. The eluent is evaporated and reconstituted with 450 µL water and 50 µL internal standard. The extract is analyzed by LCMSMS in positive and negative ion mode. The second 250 mL aliquot is adjusted to pH 10 ± 0.5. The sample is loaded onto a HLB solid phase extracting column. The column is eluted with 6 mL of methanol followed by 9 mL of 2% formic acid in methanol. The eluent is evaporated and reconstituted with 450 µL acetonitrile and 50 µL internal standard. The extract is analyzed by LCMSMS in positive ion mode.

### 17α-Ethinylestradiol in Water

A 20mL aliquot of the sample is loaded onto a HLB SPE column. The column is washed with 3mL of water and eluted with 3mL of methanol. The eluent is evaporated to dryness. 100 µL of 100mM sodium bicarbonate (pH 10.5) is added followed by 100 µL of 1 mg/mL Dansyl Chloride to derivatize the Ethinylestradiol. Samples are then incubated at 60°C for 6 minutes. After cooling to room temperature, the samples are diluted with 50µL of 1:1 acetonitrile: water. The extracts are analyzed by LCMSMS in positive ion mode.

Please refer to Appendix C for detection limits.

# Hair Sampling for Mercury

The FNFNES includes a non-invasive bio-monitoring component, relying on sampling of human hair for analysis for mercury (Hg). This sampling is done in order to use this information for additional validation of dietary assessments and to develop a new estimate of First Nations populations' exposure to mercury across Canada. The hair is collected in the early fall of each study year according to the established procedure of the Health Canada Regions and Programs Bureau Québec Region Laboratory in Longueuil, Québec. In essence, a 5-mm bundle of hair is isolated and cut from the occipital region (the back of the head), ensuring a minimal and most often unnoticeable effect on participants' aesthetics. The hair bundle (full length, as cut from the scalp) is placed in a polyethylene bag and fastened to the bag with staples near the scalp end of the hair bundle. For participants with short hair, a short hair sampling procedure is followed. For this procedure, approximately 10 milligrams of hair are trimmed from the base of the neck onto a piece of paper. The paper is then folded, stapled, and placed in a polyethylene bag.

The national project coordinator sent all hair samples (accompanied by a duly filled in Chain of Custody form) to the Department of Indigenous Services Canada Co-Investigator, who entered all data associated with the hair samples (participant identification number and age) into a spreadsheet. The hair samples were then sent to the Health Canada Québec Region Laboratory in Longueuil, Québec for analysis. No information that could be used to identify the participant is included in the package sent to Health Canada.

In the laboratory, each hair bundle is cut into 1 cm segments, starting from the scalp end. Three segments are analyzed to provide the level of mercury in participants' hair for approximately the last three months. For short hair samples (less than 1 cm), the level of mercury is only available for less than one month (as hair grows approximately 1 cm per month). Total mercury (all samples) and inorganic mercury (all segments with levels greater than 1.0 ppm (or ug/g) which was 6.5% of the sample) in the hair are analyzed. Segmented hair samples are chemically treated to release ionic mercury species which are further selectively reduced to elemental mercury. The latter is concentrated as its amalgam using gold traps. The mercury is then thermally desorbed from the gold traps into argon gas stream, and concentration of mercury vapours is measured with a UV-detector at 254 nm wavelength using Cold Vapor Atomic Fluorescence Spectrophotometer (CVAFS). Selective reduction of the ionic mercury species allows measurement of total or inorganic mercury. The limit of quantitation is 0.06 ppm (or µg/g) for total and 0.02 ppm (or µg/g) for inorganic mercury in hair. Any unused hair left from the original bundle is reattached to the polyethylene bag and together with unused segments are returned to participants at the end of each study year.

Thomasina Phillips and Katsitsiio Brooke Splicer, Kahnawáke. Photo by Sue Hamilton.

# Food Sampling for a TDS Suite of Contaminants

Traditional food samples were collected on the basis of traditional food lists compiled in each community so that collected foods represented at least 80% of the traditional foods consumed that season/year in the region.

The food-sampling strategy was as follows:

- Up to 30 food samples were to be collected from each participating community;
- The community was to identify the most commonly consumed food; the foods that are of the most concern from a nutrition or environmental perspective; and, based on existing knowledge, foods that are known to accumulate higher concentrations of contaminants; and
- Each food sample was a composite of tissues from up to 5 different animals or plants.

The traditional food samples collected were analyzed for the following categories of toxic chemicals, based on the general structure of the Canadian Total Diet Study 1992-1999:

### Metals

- Trace elements and metals of human health concern

### Persistent Organic Pollutants

- Polycyclic aromatic hydrocarbons (PAHs)
- Perfluorinated compounds (PFCs)
- Organochlorine compounds
  - o Organochlorine Pesticide (OCPs) including hexachlorobenzene (HCBs), dichlorodiphenyltrichloroethane or DDT measured as pp-DDE, chlordane (measured as trans-nonachlor), toxaphene,
  - o Polychlorinated biphenyls (PCBs),
  - o Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs), also known as dioxins and furans
- Polybrominated fire retardants (PBDEs)

All food samples were sent for analysis to ALS Global in Burlington, Ontario. The choice of the contract lab was based on a rigorous performance evaluation and a formal bidding process. A comprehensive quality assurance/quality control (QA/QC) program was implemented by the analytical laboratory and the QA/QC results were verified and approved by the PIs of the FNFNES.

### Tissue Samples

Prior to digestion, samples were homogenized to provide a homogeneous sample for subsequent digestion. If required, a moisture value was determined gravimetrically after drying a portion of the blended sample at 105°C overnight.

### Metals in Tissue Samples

Samples were digested using an open vessel in a combination of nitric acid and hydrogen peroxide using methodology based upon EPA Method # 200.3. Inductively Coupled Argon Plasma Mass Spectroscopy (ICP/MS) was used to perform all analyses for the elements requested. Mercury was determined using Cold Vapour Atomic Fluorescence Spectroscopy. Blanks, duplicates and certified reference materials were digested and analyzed concurrently. All sample results are reported as either micrograms per gram 'as received' or on a 'wet weight' basis.

### Perfluorinated Compounds in Tissue Samples

One gram of homogenized tissue sample undergoes an alkaline digestion using 10 mL of 10mM potassium hydroxide in methanol and shaking for 16 hours. A 5-mL aliquot of the extract is diluted with water and the pH is adjusted to 4-5 with 2% formic acid. The diluted pH adjusted extract is then loaded onto a weak anion exchange (WAX) column and the column washed with 1 mL of 25mM sodium acetate at pH 4.0. The first fraction is eluted with 3 mL of methanol to recover PFOSA. This is directly transferred to a vial for analysis by LC-MS/MS in negative ion mode. The second fraction is eluted with 3 mL of 0.1% ammonium hydroxide in methanol to recover the remaining PFCs. This fraction is evaporated and reconstituted with 1 mL of 85:15 water: acetonitrile and analyzed by LC-MS/MS in negative ion mode.

Roger-Shayne Papatie, La Nation Anishnabe du Lac Simon. Photo by Marie Pier Bolduc.

### PAH in Tissue Samples

Six grams of homogenized tissue is homogenized in dicloromethane (DCM) and filtered through anhydrous sodium sulphate. The extract is evaporated to 6 mL, and 5 mL is injected onto the Gel Permeation Chromatography (GPC) column where a fraction of the eluent is collected, concentrated, and solvent exchanged to hexane. Further clean-up is performed by eluting this extract through 7.3% deactivated silica gel and anhydrous sodium sulphate. The final extract is concentrated and solvent exchanged to isooctane. Analysis is performed using GC-MS in Selective Ion Monitoring (SIM) mode with an EI source.

### Pesticides and PCBs (organochlorines) in Tissue Samples

Six grams of tissue is homogenized in dicloromethane (DCM) and filtered through anhydrous sodium sulphate. The extract is evaporated to 6 mL and 5 mL is injected onto the Gel Permeation Chromatography (GPC) column where a fraction of the eluent is collected, concentrated, and solvent exchanged to acetone:hexane (1:1). Further clean-up is performed by eluting this extract through PSA columns. The final extract is concentrated and solvent exchanged to isooctane. Analysis is performed for the organochlorine pesticides (except for toxaphene) and PCBs using GC-MS in Selective Ion Monitoring (SIM) mode with an EI source. Analysis for toxaphene is performed using GC-MS in SIM mode with a CI source.

### PCDD/F (Dioxins and Furans) in Tissue Samples

Approximately 10-12 grams of tissue is spiked with 0.5-1 ng each of 15 carbon-13 labeled PCDD/F internal standards and then digested with 80 mL of pre-cleaned concentrated hydrochloric acid. Following overnight digestion of the tissue, the samples are extracted with three 20 mL portions of 9:1 dichloromethane:acetone. The sample is placed in a pre-tared test tube and the remainder of solvent is removed by passing a gentle stream of nitrogen over the surface. The sample is reweighed for lipid concentration. The sample is placed in a vial to which 10 mL of concentrated $H_2SO_4$ is added. It is vigorously shaken and left to sit overnight to allow the layers to separate. The extract is then cleaned up on a mixed bed silica gel column (basic, neutral and acidic silica gel). The final cleanup is with basic alumina. The eluate from the alumina column is concentrated by rotary evaporator to 2 mL and final reduction to dryness is by a gentle stream of nitrogen. Recovery standard (1 ng) is added and the final volume made up to 10 µL.

All samples are analyzed on a Thermo Instruments DFS high resolution mass spectrometer coupled with a Thermo Trace gas chromatograph. The column used is a 60 m RTX-DIOXIN2, 0.25 µm, 0.25 mm internal diameter (i.d). An initial six-point calibration (CS-Lo, CS-1 to CS-5) containing all PCDD/F congeners is run covering the range of 0.1 ng/mL to 2000 ng/mL.

### PBDE in Tissue Samples

Approximately 10-12 grams of tissue is spiked with 1-10 ng each of carbon-13 labeled PBDE standards and then digested with 80 mL of pre-cleaned concentrated HCl. Following overnight digestion of the tissue, the samples are extracted with three 20 mL portions of 9:1 dichloromethane:acetone. The sample extract is concentrated and placed in a vial to which 10 mL of concentrated $H_2SO_4$ is added. It is vigorously shaken and left to sit overnight to allow the layers to separate. The extract is then cleaned up on a mixed bed silica gel column (basic, neutral and acidic silica gel). The final cleanup is with basic alumina. The eluate from the alumina column is concentrated by rotary evaporator to 2 mL and final reduction to 50 µL is by a gentle stream of nitrogen. Recovery standard (1-5 ng) is added and the final volume made up to 100 µL.

All samples are analyzed on a Thermo Instruments DFS high resolution mass spectrometer coupled with a Thermo Trace gas chromatograph. The column used is a 15 m DB-5HT, 0.1 µm, 0.25 mm i.d. An initial five-point calibration (CS-1 to CS-5) consisting all PBDEs is run covering the range of 0.25 ng/mL to 1000 ng/mL.

Please refer to Appendix C for detection limits.

Beaver meat. Photo by Maude Bradette-Laplante

## Timeline for Data Collection

After communities were selected to participate in FNFNES, they were contacted by the AFN and invited to send a representative to a two-day Methodology Workshop where the study design was presented in detail. After this workshop, if requested, arrangements were made for the principal investigators (PIs) to visit each selected community to discuss the project with the Chief and Council, and, in some cases, with the community at large. The main purpose of these visits was to introduce the project in person to leadership and the larger community and to answer questions and concerns about the nature of the partnership. After a community agreed to participate in the study, a Community Research Agreement, which outlined the details of the research partnership (see sample at www.fnfnes.ca), was signed by the Chief and FNFNES PIs marking the formal beginning of research activities.

Shortly after signing the Community Research Agreement, financial arrangements were agreed upon and community members were hired and trained to be Community Research Assistants (CRAs). After training, which was conducted by Nutrition Research Coordinators (NRCs) [who are Registered Dietitians and/or have a degree in dietetics], the CRAs carried out data collection activities that continued between the months of September and December. These activities were conducted under the supervision of the NRCs.

## Ethical Considerations

This research was conducted following the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans and in particular Chapter 9 research involving the First Nations, Inuit and Métis Peoples of Canada (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada 2010), and the document entitled: Indigenous Peoples & Participatory Health Research: Planning & Management, Preparing Research Agreements published by the World Health Organization (2010). Its protocol was accepted by the Ethical Review Boards at Health Canada, the University of Ottawa and the Université de Montréal. The FNFNES also follows the First Nations principles of Ownership, Control, Access and Possession (OCAP®) of data (FNIGC 2014). Individual participation in the project was voluntary and based on informed written consent following an oral and written explanation of each project component.

Project direction followed agreed-upon guiding principles (see www.fnfnes.ca), which were jointly established by the Steering Committee and consultation with Statistics Canada for the sampling methodology and random sample selection. The AFN has played an active role in all aspects of providing initial and ongoing direction to the FNFNES as an equal partner in the research and regularly reports on progress to First Nations.

Each First Nation that participates in the FNFNES is considered to be an equal partner. Each First Nation is offered opportunities to contribute to the methodology and refinement of the data collection tools as well as results communications and any follow-up required. Each First Nation takes the lead role in data collection and coordination, including; prioritization and collection of traditional food for chemical contaminant testing; identification and prioritization of surface water sampling sites for pharmaceutical testing; recruitment of community research assistants to conduct the household survey and collection of household tap water samples and hair for mercury analyses.

La Nation Anishnabe du Lac Simon. Photo by Marie Pier Bolduc.

# Data Analyses

All household survey data were entered by the NRCs into a database using Epi-Info version 3.5.4[5], with the exception of the information derived from the 24-hour recalls, which were entered by research nutritionists at the Université de Montréal, using CANDAT[6]. To ensure the accuracy of data entry of the 24-hour recalls, a sub-sample of 10% of the records were cross-checked and discrepancies reconciled. Any systematic discrepancies were also corrected throughout. For food groupings, in addition to assigning each food code to only one food group when feasible, a set of 11 multi-food group classifiers was created for complex recipes (see Appendix D).

Data analysis used SAS/STAT software (version 9.2) with regional estimates generated according to the complex survey design using the bootstrapping SAS subroutines. The SIDE SAS sub-routine[7] was used to assess nutrient adequacy, accounting for intra-individual variation, and therefore approximating usual nutrient intakes. When single bootstrap estimates were greater than the observed mean plus 4 times the standard deviation of the 1st day intake, they were deleted and resampled until they fell within the margin for inclusion in calculations of the standard error of percentiles. The 95th percent confident intervals (CI) for the percent of participants with intakes either below the Estimated Average Requirements (EAR), above the Tolerable Upper Intake Level (UL) or below, above and within the Accepted Macronutrient Distribution Range (AMDR), were obtained in a non-parametric fashion by ordering the 500 bootstraps and using the 2.5th percentile as the lower end and the 97.5th percentile as the upper end.

The intent of this regional report is to be descriptive with an aim to generate representative estimates (i.e. min., max., mean, median, 75th percentile, 95th percentile) at the regional level (weighted estimates). Subsequent analyses examining the relationships between the variables studied will be the objective of separate publications.

To make the information in this report easier to read, many of the numbers have been rounded up to the nearest whole number. For nutrients and contaminants information, numbers are rounded to the first decimal place. As a result, some totals do not add up to 100%.

For individuals interested in community level estimates, the respective Chief and Council need to be contacted to access the data. A backup copy of all data has been archived at the AFN and to which requests for accessing the community data must be presented. The data will not be released without the respective First Nation's approval in writing.

Results of this study were first presented to each community and their suggestions and concerns are summarized at the end of this report.

Listuguj Mi'gmaq First Nation. Photo by Stephanie Levesque.

[5] More information about the software is available online: <http://www.cdc.gov/epiinfo>

[6] More information about the aware is available online: <http://www.candat.ca>

[7] More information about the software is available online: http://www.cssm.iastate.edu/software/side/

# RESULTS

This report contains information on socio-demographics, health and lifestyle practices, nutrient and food intake with comparisons to *Eating Well with Canada's Food Guide – First Nations, Inuit and Métis* (Health Canada 2007b), traditional food use, income-related household food security, environmental concerns, contaminant exposure, and drinking water and hair analyses.

## Sample Characteristics

From September to December 2016, FNFNES was undertaken with 10 First Nations in the AFN Quebec-Labrador region located in five ecozones (Table 1). As only one community in the Hudson Plains participated and could be easily identified, this report presents the aggregated results from the 10 participating First Nations communities combined, and the four other ecozones. Results for the community in the Hudson Plains will be integrated into a future report combining results by ecozone at the national level. No communities from Labrador were included in the study since neither of the two First Nations communities in this region was selected during the random selection process. Although tables and figures in this report are labelled as "Quebec", all results from this study apply to the Quebec-Labrador AFN region.

Data collection was conducted in the following First Nations communities: Naskapi Nation of Kawawachikamach, Whapmagoostui First Nation, The Crees of Waskaganish First Nation, Montagnais de Unamen Shipu, La Nation Anishnabe du Lac Simon, Cree Nation of Mistissini, Kahnawá:ke, Odanak First Nation, Micmacs of Gesgapegiag, and Listuguj Mi'gmaq First Nation (Figure 1). All First Nations had more than 150 homes on reserve lands: the largest community was Kahnawá:ke with 2185 homes. In eight of the participating First Nations, most members lived on reserve lands. Five of the 10 participating communities were located between 6 to 37 km from a city or service centre and four were located between 387 to 800 km away. Six of the 10 participating communities had year-round road access, while three were fly-in and one only had seasonal access to a service centre via ferry/road.

The majority of results presented in this report are based on in-person interviews conducted with 573 First Nations respondents living on-reserve in Quebec. As some questions were not always answered, there are different sample sizes (n) for some of the results. All estimates presented in this report have been adjusted (weighted) whenever possible to be considered representative of all on-reserve First Nations adults in Quebec. However, some estimates are presented unweighted (Tables 8, 12 and 13) and illustrate only geographical variation when applicable.

Table 2 provides details on the sample selected to ensure that the results were representative for First Nations adults living on-reserve in Quebec. Just over 1400 households were selected to participate with the aim of reaching a targeted survey sample size of 1375 adults. Community research assistants contacted 953 homes (68% of homes selected). In the households visited, 810 adults were eligible to participate. The overall participation rate was 71% (573/810 eligible households). No formal probing was conducted to determine how participants differed from non-participants but there was a higher ratio of female participants (73% of the sample) than male participants (27%).

Photo by Lara Steinhouse.

# Socio-demographic Characteristics

A total of 573 individuals (420 women and 153 men) participated in this study. The average age was 42 years for women and 48 years for men (Table 3). Figures 2a and 2b demonstrate the age group distribution of participants by gender. The percentage of participants aged 31-50 was highest in the Boreal Shield, while adults aged 71 and over only comprised 4% of all female participants and 11% of all male participants.

In participating First Nations households in Quebec, 67% of individuals were between the ages of 15-65, with children under 15 years of age representing 27%, and elders (over the age of 65), representing 6% (Figure 3). These results are similar to those reported in the 2016 Indian Registration System (IRS) population count for Quebec (25% under 15 years, 67% between 15-65, and 8% over the age of 65) (First Nations and Inuit Health (FNIH), Personal communication. 2017).

In terms of household size, the median number of people living in a First Nations household in Quebec was 4, with a range of 1 to 14 people (Table 4). One quarter (25%) of households contained 6 or more people (results not shown). Half of the adults reported that they had completed up to 10 years of education, with 25% having completed 12 or more years. Figure 4 displays further results on education: 36% of all First Nations adults in Quebec had obtained a high school diploma, 5% had obtained a general education development (GED) certificate, 22% had obtained a vocational degree and 22% had obtained a post-secondary degree (15% college/CEGEP degree, 7% bachelor's degree).

Figure 5 shows that the main source of income was wages (57%), followed by social assistance (19%), and pension/senior's benefits (10%). Overall, 77% of households reported that at least one adult had employment (part or full-time) (Figure 6). The percentage of households reporting full-time employment ranged from 32%-91% among communities (results not shown).

# Health and Lifestyle Practices

## Body Mass Index and Obesity

Participants were asked a series of health-related questions in order to understand the relationships between diet, lifestyle and health risks. Height and weight measurements were both self-reported and measured for individuals who agreed to have these values recorded. In total, 453 individuals provided both measured height and weight while 62 individuals provided only self-reported height and/or weight. Statistical differences were found between measured and self-reported body weights and heights for both men and women. Due to this reporting bias, Body Mass Index (BMI) was calculated using both measured heights and weights when the data were available. In cases where only reported or a combination of reported and measured heights and weights were available, the BMI values were adjusted by the addition of the estimated bias value. The estimated bias value is the mean difference found between the BMIs using measured and reported values using a paired t-test.

The BMI is a proxy measure of body fat based on a person's weight and height and is an index used to categorize body weights and risk of disease (See Appendix E for further information). Individuals with a BMI less than 18.5 are categorized as underweight, while a BMI in the range of 18.5 to 24.9 is considered a normal weight. A BMI between 25 and 29.9 categorizes a person as overweight while a person with a BMI of 30 and over is considered obese. People who are overweight or obese are more likely to develop health problems.

Based on the BMI categories, 9% of adults had a normal or 'healthy weight', 25% were classified as overweight and 66% of adults were classified as obese (Figure 8a). Eighty-eight percent of women aged 19-30, 91% aged 30-50 and 91% of women aged 51 and older were overweight or obese (Figure 8b). The overweight/obesity rate was 68% for men aged 19-30, 95% for men aged 30-50 and 94% for men aged 71 and older (Figure 8c). In the Canadian general population, based on measured weight and height data from the 2015 CCHS, 61.3% of Canadians and 73.3% of Quebec adults aged 18 years and older are either overweight or obese (Statistics Canada n.d. (b)).

## Diabetes

The self-reported rate of diabetes among First Nations adults in Quebec was 25%: older adults (40+) were twice as likely to report having diabetes compared to younger adults (Figure 9). Type 2 diabetes was the most common form of diabetes reported (Figure 10). In order to compare with previous studies, age-standardized rates were calculated using the 1991 Canadian census data (Statistics Canada's standard for vital statistics due to its relatively current population structure). Age standardization allows for comparison of populations with different age profiles. The age-standardized rate was 17.4% (Table 5). This rate is triple the age standardized rate of 5.2% reported nationally and 5.0% in Quebec in 2014 for Canadians aged 12 and older (Statistics Canada n.d. (c)) but is slightly lower than reported in other studies involving First Nations, Inuit and Métis communities including the Phase 3 of the 2015/2016 Regional Health Survey (RHS) (age standardized rate of 19.2% among adults 18 years and older) (FNIGC 2018a). In an effort to lose weight, 11% of adults indicated that they were dieting on the day of the 24-hour recall (Figure 11a). Dieting among female participants was similar among the age group categories but appeared to be less common among younger men (Figure 11b).

## Smoking

Almost half (46%) of First Nations adults in Quebec reported that they smoked cigarettes (Figure 12a). While this is lower than the rate of 53.5% reported for First Nations adults living on-reserve across Canada in the 2015/2016 RHS (FNIGC 2018a), it is several times higher than among the general population, aged 15 years and older (13% nationally and 14% in Quebec) (Reid, et al. 2017). The average daily number of cigarettes (7) smoked by adults in this study was half the number of cigarettes smoked among the general population (14 cigarettes) (Reid, et al. 2017). A comparison of smoking rates across the AFN regions participating in FNFNES is shown in Figure 12b.

The high rates of smoking and diabetes are troubling from a health perspective. Smoking promotes abdominal obesity and increases the risk of diabetes by more than 30% (U.S. Department of Health and Human Services 2014). Both smoking and diabetes cause hardening of the arteries and damage to the blood vessels, thus increasing the risk of heart disease for those who smoke and have diabetes. The risk of having a heart attack is 2-3 times greater for a smoker with diabetes compared to a non-smoker with diabetes, especially in women (Willett, et al. 1987).

## Physical Activity

Over two-thirds of all adults (70%) were classified as being 'sedentary' or 'somewhat active' based on an affirmative response to one of the following statements 'I am usually sitting and do not walk around very much, or, 'I stand or walk around quite a lot, but I do not have to carry or lift things often' (Figures 13a-c). Men more frequently reported that their daily activities including lifting or carrying light or heavy loads. As such, men were more likely to have their activity level categorized as 'highly active'. According to results from the 2015/2016 CCHS, 42.3% of Canadians aged 18+ and 45.1% in Quebec are inactive (Statistics Canada n.d. (d)).

## Self-perceived health

In terms of self-perceived health, only 30% of adults said their health was 'very good' or 'excellent' while 39% said their health was 'good' (Figure 14a). Women aged 31-50 and older men (51+) were more likely to report their health as 'fair' to 'poor' (Figure 14b-c). In the 2015/2016 RHS, only 37.8% of First Nations adults nationally reported that their health was 'excellent' or 'very good' (FNIGC, 2018b). In contrast, 61.5% of all Canadians and 62.6% in Quebec aged 12+ say that their health is 'very good' or 'excellent' (Statistics Canada n.d. (d)).

Listuguj Mi'gmaq First Nation. Photo by Stephanie Levesque.

# Traditional Food Use and Gardening

In Quebec, traditional food harvesting (hunting, fishing, and gathering of wild plants), and production is an important part of the traditional food systems and food security of First Nations communities. For this survey, community members were asked to describe their pattern of use, over the past year, for 200 traditional foods specific to Quebec. Participants shared information about their personal and family traditional food harvesting and gardening practices, as well as their perceptions about the adequacy of their current traditional food supply. Together, this information demonstrates the value of community food activities to the health of First Nations.

Kahnawake white corn plant. Photo by Sue Hamilton

Almost all adults (95%) reported eating traditional food in the year preceding the interview. Over 100 different traditional foods were harvested during the year, with the types varying across communities. Table 6 shows the percentage of the population surveyed that reported eating each particular traditional food. Most First Nations adults in Quebec ate land mammals (84%) and berries (79%), while many consumed fish (76%), wild birds (59%), wild plants (31%) and tree foods (30%). Some ate seafood (9%) and cultivated traditional foods (17%). The most frequently consumed traditional foods were blueberries (71%), moose (69%), Canada goose (54%) and walleye (47%).

Geographically, there was diversity in the overall use and kinds of traditional food eaten. Adults in most of the ecozones (except Mixedwood Plains) regularly ate freshwater fish such as walleye and trout while saltwater species of fish and other kinds of seafood (i.e. lobster, crab and shrimp), occurred primarily in the Atlantic Maritime. Most adults across the Quebec region had land mammals in their diet, but there was more frequent use of both large and small land mammals, such as moose, beaver and hare/rabbit among adults in the Boreal Shield, while adults in the Taiga Shield heavily depended on caribou along with various species of fish and birds. The consumption of wild birds (Canada goose, ptarmigan and grouse) was mainly by adults in the Boreal Shield and Taiga Shield ecozones. Most adults across all ecozones had wild berries/fruits in their diet, while the use of other wild plant foods was largely reported by adults in the Taiga Shield (Labrador tea) and in the Atlantic Maritime (fiddleheads). Tree food use (maple syrup) appeared highest in the Atlantic Maritime. The consumption of cultivated traditional foods was more common in the southern ecozones of the Mixedwood Plains and Atlantic Maritime.

Grilling smoked whitefish. Photo by Rebecca Hare.

Tables 7a-7d summarizes the average and 95$^{th}$ percentile frequency of use for 10 traditional food species that appeared most often in the diet. Results are presented for all Quebec and at the ecozone level for all adults (consumers and non-consumers) and for consumers only (those individuals who reported having eaten a particular traditional food in the last year). At the regional level (Table 7a), consumers reported eating moose about three times a month throughout the year, while blueberries and Canada goose were consumed about once a month. High consumers (those individuals reporting use at the upper end or 95$^{th}$ percentile) ate moose as often as 8 times per month (or twice per week), and blueberries and Canada goose about three times per month (or about once per week). Tables 7b-7e illustrates differences between the top 10 traditional foods by ecozone. Blueberry appeared on the table in all ecozones; it was commonly eaten in the summer and fall but most often in the Atlantic Maritime (two times per month). Caribou was only eaten in the Taiga Shield (about twice per month). Deer was reported to be eaten most often by in the Mixedwood Plains about three times per month. Fish appeared in the diet on a monthly basis in the Taiga Shield, Boreal Shield and Atlantic Maritime but was rarely eaten in the Mixedwood Plains.

To estimate the amount of traditional food consumed per day by First Nations adults in Quebec, the traditional food frequency data (Table 6) were multiplied by the average portion size reported by consumers of traditional food from the 24-hour recalls (Table 8). When portion size values could not be estimated by gender and age group for some food categories due to low sample size, mean portion sizes by each category by total consumers were calculated instead. Since bird eggs and mushrooms were not reported to be consumed on the 24-hour recalls from Quebec, portion size values from the literature for these foods were used instead.

The average and high (95th percentile) daily intake of traditional foods, by age group and gender, for all participants and consumers only, is presented in Table 9a. At the regional level, the average daily intake of traditional food by all participants was 36.9 grams (or about 2.5 tablespoons), whereas high consumers (those individuals eating at the upper end or the 95th percentile of intake) had 112.8 grams per day (about 1/2 a cup). Men aged 19-50 appeared to consume the greatest amount of traditional food. To note, removal of non-consumers from the analyses had little effect on the average or 95th percentile intake of total grams of traditional food.

Within traditional food categories, especially for seafood and birds, traditional food intakes among consumers appeared quite different from all participants. For seafood, the average and 95th percentile intake for all adults in Quebec was 0.5 and 2.0 grams per day compared to 5.3 and 20.6 grams per day for consumers (Table 9a). Similarly, the average and 95th percentile intake for birds by all participants was 7.3 and 35.9 grams/day compared to 12.4 and 53.4 grams per day for consumers only.

Table 9b provides a regional breakdown, for consumers only and by gender, of the top three consumed traditional foods within each traditional food category. Walleye, trout and sturgeon were the most frequently eaten kinds of fish, with some adults consuming an average of 20.0 grams of trout daily. Lobster, scallops and shrimp were the most consumed seafood. Moose, beaver and hare/rabbit were the most heavily consumed land animals, while Canada goose, grouse and ptarmigan were the most consumed wild birds. The top three consumed traditional berries were blueberry, raspberry and strawberry.

Tables 10a-10e present traditional food intake at the regional and ecozone level for consumers only. At the regional level, average consumption is 121 grams/day or ½ a cup, compared to 136 grams/day in the Taiga Shield, 112 grams/day in the Boreal Shield, 139 grams/day in the Mixedwood Plains and 167 grams/day (2/3 of a cup) in the Atlantic Maritime. Appendix G provides detailed Information on the daily intake (mean and 95th percentile intake) of traditional foods by species among different age groups.

Information on current traditional food harvesting and cultivation practices, at both the household level and for participants, are displayed in Figures 15a to 15c. Over three-quarters (78%) of households reported engagement in at least one traditional harvesting/ gathering activity in the year preceding the interview (Figure 15a). This figure rose to 86% for households in the northern Boreal Shield ecozone. Almost one in three participants hunted (31%), while 36% reported fishing, 43% collected wild plants, 3% collected seafood and 11% had a garden (Figure 15b). At the household level, 59% hunted, 60% fished, 50% collected wild plants, 4% collected seafood and 13% had a garden (Figure 15c). The different kinds of garden vegetables and fruits reported to be eaten by First Nations in Quebec are listed in Appendix H. Tomatoes, cucumbers, and beans were the top three commonly consumed garden vegetables in Quebec.

Garden in Listuguj Mi'gmaq First Nation.
Photo by Stephanie Levesque

Whether it be hunting, fishing, plant harvesting or gardening, a clear pattern emerged: traditional food production depends on the contribution from various family members. Fishing, hunting and wild plant gathering were more frequently practiced by households in the Taiga and Boreal Shields, while seafood harvesting was more common in the Taiga Shield and the Atlantic Maritime.

Gardening was reported mainly in the Mixedwood Plains and Atlantic Maritime. While across the region only 13% of households reported gardening, 24% of all adults said that they ate vegetables from a family or community garden (Figure 16). Similarly, more adults reported eating game, fish and wild plant food (Table 6) than the proportion of households who were engaged in harvesting. For example, while only 31% of households reported hunting, 84% of adults reported eating traditional meat in the last year. These findings reinforce that for many communities, both the sharing and distribution of harvested and locally produced foods remain cornerstone activities and are significant contributors to the intake of the variety of food on the table among First Nations in Quebec.

When asked if their household would like to have more traditional food, over three-quarters of all adults (84%) said that they would (Figure 17). Common barriers to greater use of traditional food included a lack of: time, hunters, and equipment and/or transportation (Figure 18). At the ecozone level, a lack of a hunter was predominantly reported by participants in the Taiga Shield, while the lack of time was reported as the key barrier in the Mixedwood Plains. Other reported barriers that limit harvesting for traditional food included: industrial activities (forestry, hydro, mining, oil and gas) and government restrictions (Figure 19).

When asked to list the most important benefits of traditional food, the top responses were that they were healthy, natural, had cultural values, tasted good and were inexpensive (Figure 20). Store-bought foods were appreciated most for their availability, convenience and variety (Figure 21).

# Nutrient Intake

In order to understand how well First Nations adults in Quebec are eating, each participant was asked to describe the types and amounts of food and beverages that were consumed within a one-day period (24 hours). Data from the 24-hour recalls were used to estimate usual food and nutrient intakes and evaluate the diet quality of First Nations adults in Quebec. The results are compared to *Dietary Reference Intakes* (Institute of Medicine 2000) and *Eating Well with Canada's Food Guide – First Nations, Inuit and Métis* (Health Canada 2007b). Alcohol and supplement intake data were excluded from all dietary intake analyses.

Dietary Reference Intakes (DRIs) are recommendations for nutrient intakes (Institute of Medicine 2000). There are four types of reference values: Estimated Average Requirements (EARs); Recommended Dietary Allowance (RDA); Adequate Intake (AI); and Tolerable Upper Intake Levels (UL). The EAR is the median daily intake that is estimated to meet the needs of 50% of the individuals in a group. The EAR is used to assess whether a group of men or women is likely to be getting enough of a certain nutrient for good health. The RDA is the amount of a nutrient that would meet the daily needs of up to 97.5% of healthy individuals in the population. An AI for some nutrients (such as potassium and sodium), is used when there is currently insufficient evidence to establish an EAR and an RDA. The UL is the highest daily nutrient intake that is not likely to pose a risk to health.

Tables 11.1-11.37 compare nutrient intakes from First Nations adults in Quebec-Labrador to the DRIs. The SIDE SAS sub-routine (see methodology section) nutrient analyses were performed on data from a total of 495 participants (359 women and 136 men) to obtain the distribution (percentiles) of usual intake and to estimate adequacy of intake of the population. Although 573 interviews were completed, nutrient data from 78 individuals were excluded from the analyses (28 pregnant and/or lactating women due to higher nutrient requirements, and 50 participants aged 71+ due to low sample size).

For nutrients with an EAR, values in the '%<EAR' column indicate the percentage of the population with usual intakes less than estimated requirements, that is the proportion at risk of inadequate intake for a specific nutrient. A value of less than 10% below the EAR was used as the cut-off value to define a low prevalence of inadequate intake. This is the same cut-off value used by Health Canada when developing Canada's Food Guide (HC 2009b). The values reported in the '%>UL' column indicate the proportion of the population at risk of excessive intake for a specific nutrient. For some gender and age groups, the estimate of the percentile value, as well as the level of adequacy, could not be estimated precisely enough due to the high level of variability in nutrient intake between and within individuals. Data that have been suppressed due to extreme sampling variability are indicated in Tables 11.1-11.37 by the symbol (-).

When the coefficients of variance (CV) for the %<EAR or %>UL were >33% and these values needed to be suppressed, the interpretation of adequacy of intake or proportion of risk could not be made using the standard approach. In these cases, an alternate approach was used in which the EAR or AI reference value was compared to ± 2 SD of the 50th percentile intake value. If the reference value was less than –2 SD of the 50th percentile value, then the intake was considered to be adequate for the population, while a reference value greater than +2 SD of the 50th percentile value meant that the intake was considered to be inadequate. If the reference value for a specific nutrient was between ± 2 SD of the 50th percentile intake value, then the adequacy of intake was inconclusive. Due to large CVs, adequacy of intake for certain gender and age groups was determined using the aforementioned method for the following nutrients: carbohydrate, fibre, vitamin C, folate, vitamin B6, vitamin B12, thiamin, riboflavin, calcium, phosphorus and zinc. Due to the limited sample size, especially for male participants, the interpretation of adequacy was inconclusive and the percentile plus SE values were not estimable for some nutrients.

Energy or caloric intakes estimates for First Nations adults in Quebec (Table 11.1) are similar to those reported in previous FNFNES regional reports. Energy intakes for adults appear somewhat different than those reported for the general Quebec adult population in CCHS 2015 (Statistics Canada n.d. (e)). In this study, males aged 19-50 had an average energy intake of 2350 kcal/day while CCHS reported an energy intake of 2570 kcal/day for males aged 19-30 and 2446 kcal/day among males aged 31-50 years. Males aged 51-70 in this study had a caloric intake of 1801 kcal/day compared to 2192 kcal/day in the general population. This was a similar picture for females. Females in this study had an energy intake of 1986 kcal/day (aged 19-50) and 1765 kcal/day (51-70), while CCHS energy intakes for females were lower at 1868 kcal/day (19-30), 1828 (31-50), and 1384 (51-70).

The percentage of energy in the diet from protein, carbohydrates and fat are provided in Tables 11.30 to 11.37 and compared to the AMDR (Acceptable Macronutrient Distribution Range) which is expressed as a percentage of total energy intake. Intakes within the range described for each nutrient are associated with a reduced risk of chronic disease. The percentage of energy from protein (Table 11.30) was within the recommended AMDR for all adults. Carbohydrate

intake was within the AMDR for most adults: 33% of older females (51-70) had carbohydrate intakes below the AMDR (Table 11.31). Most of the female population and males (19-50) had fat intakes above the AMDR: it was not possible to assess the proportion of older males with fat intakes below, within or above the AMDR (Table 11.32). The percentage of energy from saturated fat was greater than the recommended 10% for all adults (Table 11.33). In the general Quebec population (aged 19 to 70), the mean percentage of energy from protein (16.8 to 17.9%) (Statistics Canada n.d.) (f)), and carbohydrate (46.2% to 49.0%) (Statistics Canada n.d.) (g)) appeared similar, while the mean percentage of energy from fat (31.1 to 32.6%) appeared lower than among First Nation adults in this study (Statistics Canada n.d. (h)).

Overall, in comparison to the Dietary Reference Intakes, First Nations in Quebec-Labrador have:

- Adequate intakes for folate, thiamin, riboflavin, niacin, iron and phosphorous;
- Adequate intakes for vitamin B12 for women and younger men aged 19-50 (adequacy of intake was inconclusive for older men aged 51+);
- Adequate intakes for zinc for women (adequacy of intake was inconclusive for men);
- Intakes of protein and carbohydrates within recommended ranges;
- High intakes of saturated fat;
- Very high prevalence of excessive intakes of sodium;
- Low intakes of fibre;
- High prevalence of inadequate intakes of vitamin A;
- Very high prevalence of inadequate intakes of vitamin D;
- High prevalence of inadequate intakes of calcium for women and older men aged 51+ (adequacy of intake was inconclusive for younger men aged 19-50);
- High prevalence of inadequate intakes of vitamin C among men and older women (aged 51-70), and smokers;
- High prevalence of inadequate intakes of magnesium for men and women aged 31-70 (intakes were not estimable for younger men and women); and
- High prevalence of inadequate intakes of vitamin B6 among women.

High (excess), as well as low (inadequate), intakes can have serious consequences on health. A high intake of saturated fat from meat is associated with heart disease (Wang, et al. 2016) while excess sodium (salt) intake, which is linked to high blood pressure, is a risk factor for stroke, heart disease and kidney disease. Inadequate levels of micronutrients (vitamins and minerals) can have severe effects on growth and development outcomes and impact vulnerability to infection and disease. Meeting the daily recommended intakes for vitamins and minerals and reducing the intake of saturated fat and sodium are key steps to promoting better health. Additionally, further work is needed by the Government of Canada and the food industry to reduce the amount of salt and fat in store-bought food (Health Canada 2018).

Wild cranberries. Photo by Rebecca Hare.

*Eating Well with Canada's Food Guide - First Nations, Inuit and Métis* (Health Canada, 2007b) describes the amount and types of food recommended daily to supply adequate amounts of nutrients for good health, and to reduce the risk for both infectious and chronic disease. There are four food groups in Canada's Food Guide (CFG-FNIM): Vegetables and Fruit, Grain Products, Milk and Alternatives, and Meat and Alternatives. A copy of CFG-FNIM is in Appendix I and is available online at Health Canada's website (http://www.hc-sc.gc.ca/fn-an/pubs/fnim-pnim/index-eng.php#).

When compared to CFG-FNIM, First Nations in Quebec-Labrador are not meeting the recommendations for healthy eating (Table 12). First Nations females do not meet the recommended number of servings for any of the four food groups (Vegetables and Fruit, Grain Products, Milk and Alternatives and Meat and Alternatives) while First Nations males met the recommended number of servings for Grain Products only. Twenty-nine percent of adults reported that they avoided specific food or beverages because of intolerance. More commonly avoided foods included milk and dairy products (avoided by 8% of adults), vegetables (2% of all adults), spicy (2%) and greasy food (2%) (see Appendix J for the complete list). The following describes the eating patterns of First Nations adults compared to the guidelines in more detail:

**Vegetables and Fruit group:** CFG-FNIM recommends that adult males have 7-10 Food Guide servings daily while females have 7-8 Food Guide servings per day. A Food Guide serving is equivalent to ½ cup (4 ounces) of vegetables, berries, fruit, 100% fruit juice or 1 cup (8 ounces) of raw leafy greens. First Nations adults in Quebec-Labrador did not meet the recommended amount, consuming only 4 Food Guide servings per day, although there are diverse choices: fresh/frozen and canned vegetables were a larger contributor than potatoes (Table 13). As described earlier, there are inadequate intakes of nutrients that are mainly supplied by servings from this food group (vitamin A, C, magnesium, folate and fibre). These nutrients are important for several functions within the body, including: maintaining healthy skin (vitamins A and C); regulating blood pressure and bone mass (magnesium); producing healthy blood (folate and vitamin C); and reducing the risk of infection (vitamins A and C) and some cancers (fibre). However, it is important to recognize that the current intake pattern likely reflects financial constraints. Other research has found that the intake of fruits and vegetables is usually below recommended levels in low income households (Kirkpatrick and Tarasuk 2008).

**Grain Products:** CFG-FNIM recommends that adult males have 7-8 Food Guide servings a day, while females are recommended to have 6-7 Food Guide servings of grain products per day; half of these servings should be whole grain foods. Examples of a Food Guide serving from the Grain Products include 1 slice of bread, a 2" x 2" x 1" piece of bannock, ½ a bagel or pita, or tortilla, and ½ cup of cooked rice. Whole grain foods, such as whole wheat bread, brown rice, wild rice, barley and oats, are a good source of fibre and have many health benefits. Foods high in fibre can help us feel full longer, and maintain a healthy body weight, as well as reduce the risk of heart disease, diabetes and cancer. Grain products are also an important source of several nutrients necessary for good health including riboflavin, thiamin, zinc, folate, iron, magnesium and niacin. First Nations men in Quebec-Labrador met the recommended number of servings from this group, while women did not, having only 5 Food Guide servings per day. For all adults, very few Grain Product servings were whole grain, which explains in part the low intake of fibre (Table 11.12).

**Milk and Alternatives group:** CFG-FNIM recommends that adult males and females aged 19-50 consume 2 servings from this food group per day. Adults aged 51+ are advised to have at least 3 servings a day. Examples of a Food Guide serving from this group include: 1 cup of milk or fortified soy beverage, ¾ cup of yogurt and 1 ½ ounces of cheese. This food group contains the primary sources of calcium and vitamin D which are essential for building and maintaining healthy bones and teeth. Adults had only 1 serving per day, which may be explained, in part, by some dairy product intolerance (see Appendix J), as reported by 8% of all respondents, as well as cost. This low intake poses a concern for adequacy for calcium and vitamin D.

**Meat and Alternatives group:** CFG-FNIM recommends that adult men consume 3 Food Guide servings of food from the meat and alternates food group every day, while the recommendation for women is 2 servings per day. A Food Guide serving from the Meat and Alternatives Group is equivalent to 2 eggs or 2 ½ ounces (½ cup) of wild or store-bought meat, fish, poultry, shellfish, ¾ cup of cooked beans (lentils, black beans, split peas), or 2 tablespoons of peanut butter. In this study, both men and women ate 1 more serving than recommended. Consuming more than the daily recommended amount of foods from the Meat and Alternatives group can contribute to a high fat intake and replace foods from other food groups which are consumed in low amounts.

Overall, the food choices of First Nations men and women in Quebec are very similar. (Table 13). The higher use of mixed vegetables relative to potatoes is very positive as is the reliance on a variety of meats, including traditional meats. The consumption of whole grains, vegetables and fruit as well as foods rich in calcium and vitamin D (fish, milk and alternatives) is low. Increasing the intake of these foods could significantly improve the diet by increasing the intake of healthier fats, fibre, and vitamins and minerals, and decreasing sodium (salt).

Beaver stew. Photo by Maude Bradette-Laplante.

Blueberry jam. Photo by Rebecca Hare

Table 14 lists the foods that are the most important contributors to each nutrient, ranked in descending order. Processed meats such as cold cuts and sausages were top contributors to both total fat and saturated fat. Together, white bread, cereal and pasta supplied 33% of the iron and 43% of folate in the diet. Eggs, margarine and milk provided 60% of the vitamin D in the diet. Wild meats contributed 9% of protein and 10% of iron in the diet. As mentioned above, salt and saturated fat intakes for all adults were above the recommended levels. The main sources of salt were processed food: white bread, soup and processed meats. Replacing processed cuts of meat with non-processed leaner meat, pork, chicken and fish, would help in reducing both fat and salt intake. Making homemade soups more often or choosing canned soups marked as 'low sodium' would also reduce salt intake. Increasing consumption of vegetables and fruit would help to increase intakes of vitamin A, vitamin C and fibre. Increasing intake of foods such as fish, milk and milk products (cheese and vitamin D fortified yogurt), calcium and vitamin D fortified beverages (such as fortified soy beverages), bannock (made with baking powder that contains calcium), and dark green vegetables and wild plants (calcium rich sources), would increase intakes of vitamin D and calcium. Finally, eating more whole grain products such as whole grain breads, cereals and pasta would increase intakes of folate and fibre.

Table 14 also demonstrates that traditional foods such as wild meat and fish were important sources of nutrient intake as they were major contributors to protein, vitamin D, iron and zinc, which are required for strong bones (vitamin D), proper growth, healthy blood and maintenance of muscles. Overall, 18% of the 24-hour recalls included at least one traditional food item (Figure 22). The important contribution of traditional food to nutrient intake is further illustrated in Table 15. On days that traditional food was eaten, the intake of most nutrients was significantly higher while the intake of saturated fat was lower.

Table 16 shows the top 10 store-bought beverages and foods consumed in the greatest amounts by First Nations adults in Quebec. For the longer list, see Appendix K (items are organized/coded using the Total Diet Study food codes). By weight, water and soup were the beverage and food item consumed in the greatest amount. When soft drinks were combined with fruit drinks, iced tea and sports drinks, the intake of sugar-sweetened beverages averaged 1 1/4 cups per person per day. As sugar-sweetened beverages can cause cavities and have been linked to an increased risk of weight gain and adverse health effects (Hu and Malik 2010), water is generally a healthier alternative. However, only half (52%) of all adults reported regular use of tap water for drinking (see Section 2: Tap water sampling).

Twenty percent of adults reported taking a supplement with higher use among older women and men aged 31-50 (Figure 23). The most commonly reported supplements were multivitamin/mineral supplements, vitamin D and prenatal supplements (Appendix L). In the general population, 47% of adults across Canada and 33% in Quebec report using nutritional supplements (Statistics Canada n.d. (i)). Nutrient supplements can help individuals meet their nutrient needs when the diet quality is low. Also, the need for vitamin D increases over the age of 50. As such, Heath Canada recommends that men and women over 50 take a vitamin D supplement of 10 µg (400 IU) per day (Health Canada, 2007b).

Bannock. Photo by Maude Bradette-Laplante.

# Food Security

In order to gain a better picture of food security (the ability of households to access enough food) among First Nations households, a series of questions were asked about access to both traditional and store-bought food. Some of the findings about traditional food (harvesting, barriers to use) appear in the *Traditional Food Use and Gardening* section of this report.

As reported in the *Traditional Food Use and Gardening* section, while the majority of adults would like to have more traditional food in their diet, financial and household constraints (see Figure 18) prevent greater access. Almost half of the participants (45%) said that they often or sometimes worried that their traditional food supplies would run out before they could get more (Figure 24). Almost half (47%) of the population also worried that they wouldn't be able to replace their traditional foods when they ran out (Figure 25).

Almost all participants (97%) completed the income-related Household Food Security Survey Module (HFSSM): respondents were dropped from the food security analyses if they answered "Don't know" to at least one of the first three questions. The food security status of three percent of all participants was treated as missing and unknowable.

Within the households completing the questionnaire, 55% contained children under the age of 18 years. In previous FNFNES reports, the percentages of households with children were: 58% (British Columbia), 68% (Alberta), 74% (Manitoba), 48% (Ontario), and 48% (Atlantic), 69% (Saskatchewan). Household responses to the 18-item food security section of the questionnaire are presented in Table 17. Examining the responses to the 18 questions in detail, 31% of households worried that their food would run out before they could buy more, 31% said that the food that they bought didn't last and there wasn't any money to get more and 37% couldn't afford to eat balanced meals. Moreover, 30% of households with children relied on less expensive foods to feed their children and 15% said they couldn't afford to feed their children balanced meals. These responses can explain much of the dietary pattern and the inadequate intake of several nutrients described in the previous section.

Based on the three standard categories of food security (see methods section), 36% of First Nations households in Quebec were classified as food insecure: 28% of all households were classified as moderately food insecure and 8% were classified as severely food insecure (Table 18 and Figure 26). Households with children experienced significantly greater food insecurity (37%) (Table 18 and Figure 27) than those without children (33%) (Table 18 and Figure 28). Among households with children, 16% experienced food insecurity at the child level. That is, one or more children in each of these households were food insecure in the last year. In general, children tend to be protected from food insecurity, and particularly so from its most severe form (8% of adults with severe food insecurity vs 0.4% of children).

Food insecurity rates among First Nations households on-reserve are much higher than other Canadian households. In 2011/2012, the national food insecurity rate was 8.3% and 23% among Indigenous households off reserve. In Quebec, the rate of food insecurity was 8.1% (Statistics Canada 2013). More recent household food insecurity rates exist, although data for a few regions (British Columbia, Manitoba, Newfoundland and Labrador and the Yukon) are not available as they opted out of the food security module. In 2014, 8.2% of all households and 19.7% of Indigenous households off-reserve experienced food insecurity while in Quebec household food insecurity was measured at 7.3% (Tarasuk, Mitchell and Dachner 2016).

Recently, some food security experts recommended that households be classified as food secure *only if* all questions are answered 'no'. Households affirming 'yes' to no more than one question on either the adult or child survey should be classified as 'marginally food insecure' (Tarasuk, Mitchell and Dachner 2013). When this approach is taken, 48% of First Nations households in Quebec are

Community garden in Listuguj Mi'gmaq First Nation. Photo by Stephanie Levesque.

food insecure (Figure 29), compared to 11.6% among the general population in Quebec and 12% across Canada (Tarasuk, Mitchell and Dachner 2016).

When stratified by ecozone, the lowest rate of food insecurity (estimated using the 3 standard categories only) was found to be in the Mixedwood Plains at 9%, with the highest rate in the Boreal Shield at 48% (Figure 30). When stratified by income source, adults on social assistance or on worker's compensation reported the highest levels of food insecurity (67%) (Figure 31). Moreover, almost one in five households (19%) with at least one adult earning wages was food insecure.

A combination of insufficient wages, lack of employment and the high cost of food are contributing factors to high food insecurity. In each participating community, a Nutrition Research Coordinator (NRC) asked permission of the local grocery store manager to document the cost of common grocery items found in Health Canada's 2008 National Nutritious Food Basket tool (Health Canada 2009c). The food basket contains 67 basic food items that require preparation (see Appendix M for description and costs). Pre-packaged meals (such as pizza), non-food items (such as household supplies or personal care items) and the cost of transportation are not included in the food basket pricing. Comparison costing was also conducted in Montreal. The total costs of these items were used to calculate the weekly costs of a food basket for a family of four consisting of two adults (one female and one male, aged 31-50 years) and two children (one male teenager aged 14-18 and one female child aged 4-8).

Photo by Stephanie Levesque.

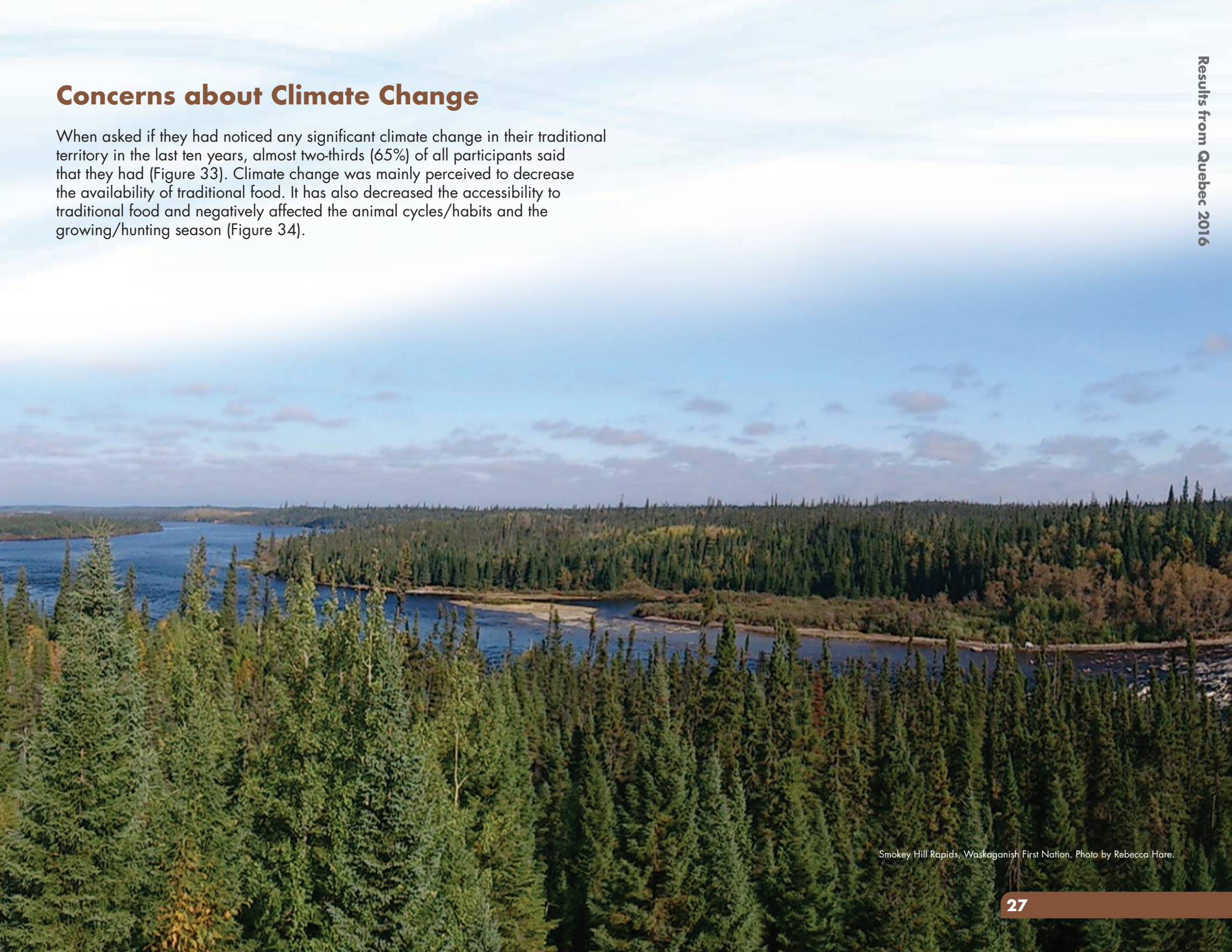
The average weekly cost of groceries was $262, compared to $196 in Montreal (Figure 32). At the community level, costs ranged from $179 to $336 (results not shown), with prices almost double in the north. To note, the actual food basket costs may be different than reported here as typically at least between 3-8 items were missing in more northern stores located in the Taiga and Boreal Shield. Missing prices were imputed from the next available store or from the average price for that item across available stores.

The current food and beverage pattern of First Nations in Quebec include many items not found in the NNFB list. As such, estimates of food costs using the NNFB tool may differ from actual household spending on food. Food costs reported for northern communities were similar to those reported by the Cree Board of Health and Social Services of James Bay (Cree Board of Health and Social Services of James Bay 2017) in September 2016 in the Cree territory, Eeyou Istchee ($321.93). To note, food costs reported for Montreal in this study are lower than the cost of $226 reported by the Montreal Diet Dispensary (2016). The MDD undertakes costing in small to medium sized stores that are less than 30,000 square feet and uses a different food basket tool (contains 71 items). FNFNES undertook costing in Montreal in two large sized stores (more than 30,000 square feet).

Cree Nation of Mistissini. Photo by Maude Bradette-Laplante.

## Concerns about Climate Change

When asked if they had noticed any significant climate change in their traditional territory in the last ten years, almost two-thirds (65%) of all participants said that they had (Figure 33). Climate change was mainly perceived to decrease the availability of traditional food. It has also decreased the accessibility to traditional food and negatively affected the animal cycles/habits and the growing/hunting season (Figure 34).



Smokey Hill Rapids, Waskaganish First Nation. Photo by Rebecca Hare.

# Tap Water

## Drinking Water Systems

Drinking water systems which provide water to households and buildings for consumption can include Public Water Systems (PWS), Semi-Public Water Systems (SPWS), and Individual Water Systems (IWS) also known as wells.

In each First Nation, a series of questions were asked about the PWS components, including the water treatment plant (WTP) and distribution system. All First Nations operated a PWS on their lands. Nine First Nations indicated that tap water provided through the PWS was treated: eight First Nations had a WTP, one community had a long-term municipal transfer agreement (MTA) that provided treated tap water to their PWS and one community indicated that the groundwater was untreated. Most homes on the First Nation PWS were on piped distribution.

The WTPs located in eight First Nations' were constructed between 1974 and 2009. At the time of data collection, First Nations with a WTP indicated that plant operators had adequate certification. Prior to disinfection with chlorine, water was filtered (ex. gravity, green sand, multimedia) at five WTP and ozonated at one WTP. Chemicals reported to be used in the disinfection process. No First Nations reported that their WTP needed upgrades and none reported challenges in the past year related to maintenance/repair services or procuring required supplies and/or replacement parts. In terms of the piped water distribution system, most communities indicated that the pipes were made of metal (steel, cast iron) and/or plastic. In terms of water storage reservoirs, six communities reported large tanks at the treatment plant that were functional.

With respect to water availability and bacteriological safety, water disruptions and short-term drinking water advisories (DWA) occurred in five of the systems serving communities in the 12 months preceding the study. The short term DWAs lasted for a period from one to five days due to: a power outage in one community; a broken water main in one community; routine system cleaning in two communities, and elevated bacteria counts in one community.

Table 19 reports the characteristics of all First Nations households and plumbing systems in Quebec. At the time of the study, the oldest house was reported to have been built in 1717 and the newest in 2016. Two-thirds (61%) of homes were constructed in the last 25 years, 28% were built between 26 to 35 years ago and the remainder (11%) were older. Only 3% of homes were older than 56 years. A total of 21% of households had upgraded plumbing, 29% of households treated their water (mainly by boiling it or using filters) and 14% had water storage tanks located inside the home. Almost half (47%) of the households had flex lines (26% steel and 21% braided) under their kitchen sink, while 25% had metal pipes (17% metal only and 18% metal attached to PEX or flex lines) and16% had plastic pipes (12% plastic alone and 6% with metal fittings).

Eighty-seven percent of households reported that the source of their drinking water was the FN PWS, while 7% received water through a MTA and 6% were on an IWS (Figure 35). Although all households have tap water, only 71% using it for drinking (52% reported regular use while 19% sometimes drank it) while 96% reported using tap water for cooking (Figure 36). In four of the 10 communities, less than 50% of respondents reported regularly using the tap water for drinking. Bottled water was the common replacement used if tap water was not used (Figure 37). The main deterrents to use of tap water included: a preference for other beverages, taste, the lack of confidence in the water quality, smell and colour (Figure 38). Among those drinking tap water, 29% also reported using filters or boiling it before use (Figure 39).

Over one-third (36%) of the participants who usually used their tap water for drinking reported obtaining their drinking water from both the hot water and cold-water taps (Figure 40). As for cooking water, this figure rose to 51% (Figure 41). This is a concern since higher levels of metals are found in hot water: metals in hot water tanks and pipes dissolve more easily in hot water. It is safer to only use water from cold taps for drinking and cooking (Health Canada 2010).

## Tap Water Analysis

Tap water samples were collected from a range of 3 to 34 households in nine of the participating communities (17 was the average). It is the standard protocol to invite up to 20 households in each community to provide tap water samples for analysis. A total of 156 of a planned 200 household sampling plan participated in the tap water sampling component. There were four samples that were collected from alternate drinking water sources.

## Metals of Public Health Concern

The FNFNES quantified ten metals that are of concern to human health when the maximum acceptable concentration (MAC) of the Canadian Guidelines of Drinking Water Quality (Health Canada, 2017) is exceeded *in the flushed samples:*

- Antimony
- Arsenic
- Barium
- Boron
- Cadmium
- Chromium
- Lead
- Mercury
- Selenium
- Uranium

The results of water sample testing for metals in drinking water of public health concern are listed in Table 20. Of the 156 households, no exceedances were found for any metals of public health concern. An elevated level of lead was recorded in the first draw sample taken from two households (one in each of the two communities in the Mixedwood Plains ecozone), however there were no exceedances in the flushed samples that followed.

**Lead:** No communities had an exceedance for lead in the flushed sample, however in the first round of sampling (first draw), one household in two First Nations communities, located in the Mixedwood Plains ecozone, had a lead level of 17.9 and 25.3 µg/L respectively, which exceeds the guideline value of 10 µg/L. Following a five-minute flush of the household piping, lead levels for both households were below the maximum acceptable guideline. In the homes where lead levels were acceptable only after flushing, tap water should be flushed for several minutes before use.

## Aesthetic Objective (AO) and Operational Guidance (OG) Metals Sampled

The FNFNES quantified six metals that have operational guidance values (OG) and aesthetic objectives (AO):

- Aluminum
- Copper
- Iron
- Manganese
- Sodium
- Zinc

Concentrations were above the aesthetic guidelines of the Canadian Guidelines of Drinking Water Quality (Health Canada, 2017) for four metals: aluminum, iron, manganese, and sodium. The results of water sample testing for metals with OG and AO values in drinking water are listed in Table 21.

**Aluminum:** One community had aluminum levels above the guidance value (100 µg/L):

- Two households in one First Nation located in the Boreal Shield ecozone had first round sampling levels ranging from 105 to 125 µg/L. Following a 5-minute flush, two households were still in exceedance with levels of 150 to 157 µg/L of aluminum.

While there are no health concerns, the Chief and Council, the Health Canada EHO for the communities and the householders have been made aware of these exceedances.

**Iron:** One community had elevated levels of iron above the guideline of 300 µg/L:

- Three households in one First Nation located in the Mixedwood Plains ecozone had elevated first draw levels of 400 to 3,240 µg/L. Following a 5-minute flush, three households were still in exceedance with levels of 344 to 5,070 µg/L of iron.

While there are no health concerns, the Chief and Council, the Health Canada EHO for the communities and the householders have been made aware of these exceedances of iron.

**Manganese:** Two communities had elevated levels of manganese above the aesthetic objective of 50 µg/L:

- Two households in one First Nation located in the Mixedwood Plains ecozone had first round sampling levels ranging from 155 to 370 µg/L. Following a 5-minute flush, both households still had exceedance of manganese with levels of 159 to 361 µg/L.
- One household in a First Nation located in the Atlantic Maritime ecozone had first round sampling level of 975 µg/L. Following a 5-minute flush, this household still had an exceedance of manganese with a value of 929 µg/L.

While there are no health concerns, the Chief and Council, the Health Canada EHO for the communities and the householders have been made aware of these exceedances.

**Sodium:** One community was found to have elevated levels of sodium above the aesthetic objective of 200,000 µg/L:

- Nine households from one community in the Mixedwood Plains had first round sampling levels ranging from 213,000 – 798,000 µg/L. Following a 5-minute flush, all nine households still had exceedances in sodium with levels of 219,000 to 866,000 µg/L.

While there are no health concerns, the Chief and Council, the Health Canada EHO for the communities and the householders have been made aware of these exceedances.

## Water Parameters; chlorine, pH, temperature

### Chlorine:

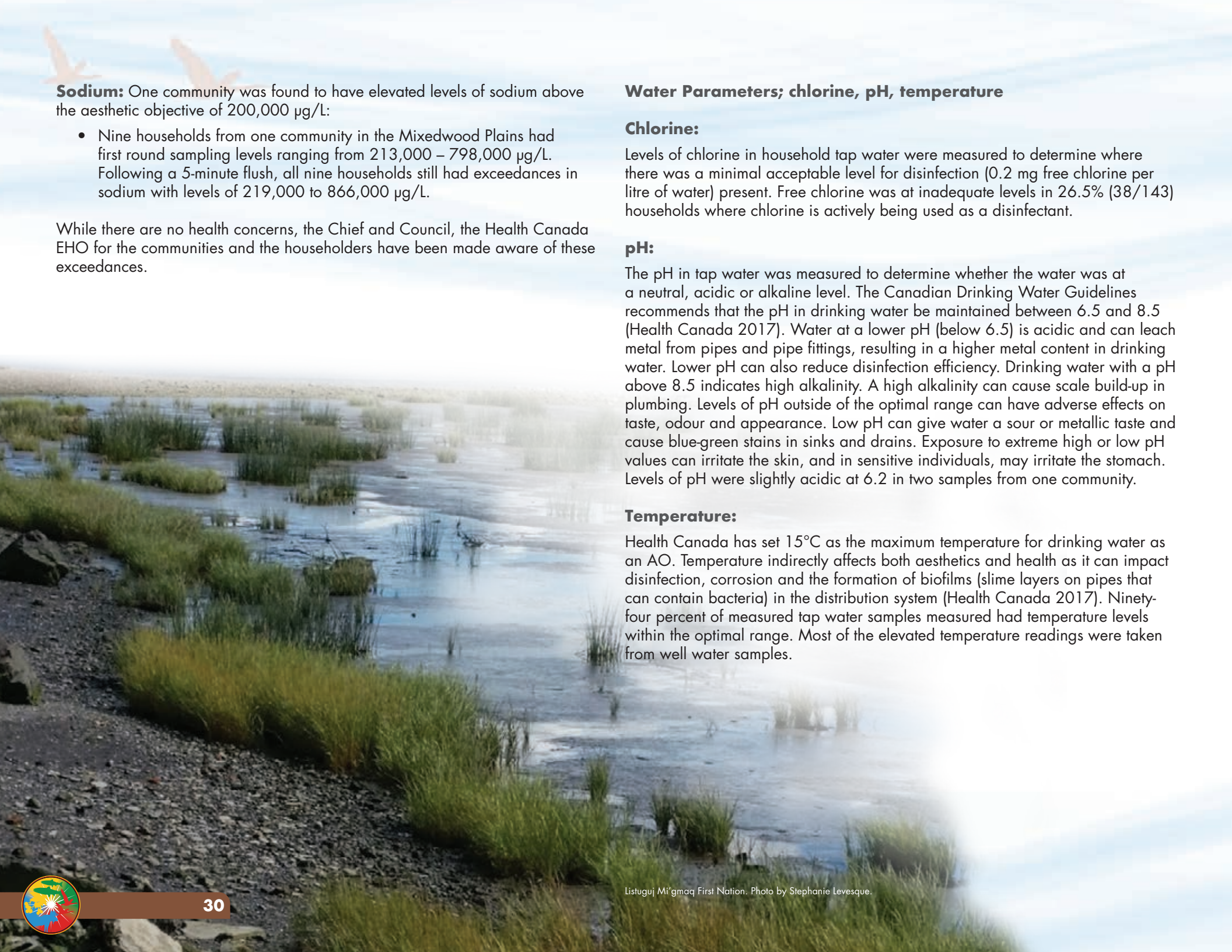
Levels of chlorine in household tap water were measured to determine where there was a minimal acceptable level for disinfection (0.2 mg free chlorine per litre of water) present. Free chlorine was at inadequate levels in 26.5% (38/143) households where chlorine is actively being used as a disinfectant.

### pH:

The pH in tap water was measured to determine whether the water was at a neutral, acidic or alkaline level. The Canadian Drinking Water Guidelines recommends that the pH in drinking water be maintained between 6.5 and 8.5 (Health Canada 2017). Water at a lower pH (below 6.5) is acidic and can leach metal from pipes and pipe fittings, resulting in a higher metal content in drinking water. Lower pH can also reduce disinfection efficiency. Drinking water with a pH above 8.5 indicates high alkalinity. A high alkalinity can cause scale build-up in plumbing. Levels of pH outside of the optimal range can have adverse effects on taste, odour and appearance. Low pH can give water a sour or metallic taste and cause blue-green stains in sinks and drains. Exposure to extreme high or low pH values can irritate the skin, and in sensitive individuals, may irritate the stomach. Levels of pH were slightly acidic at 6.2 in two samples from one community.

### Temperature:

Health Canada has set 15°C as the maximum temperature for drinking water as an AO. Temperature indirectly affects both aesthetics and health as it can impact disinfection, corrosion and the formation of biofilms (slime layers on pipes that can contain bacteria) in the distribution system (Health Canada 2017). Ninety-four percent of measured tap water samples measured had temperature levels within the optimal range. Most of the elevated temperature readings were taken from well water samples.



Listuguj Mi'gmaq First Nation. Photo by Stephanie Levesque.

# Surface Water Sampling for Pharmaceuticals

FNFNES quantified the 43 pharmaceuticals listed in Table 22. These pharmaceuticals are widely used in human medicines, veterinary drugs and aquaculture as analgesics, anticonvulsants, antibiotics, antihypertensives, antacids and contraceptives. These pharmaceuticals are of concern to human and/or environmental health and have been frequently reported in other Canadian and American studies (Blair, Crago and Hedman 2013; Deo 2014; Geurra, et al. 2014; Glassmeyer, et al. 2005; Kleywegt, et al. 2011; Koné, et al. 2013; Kolpin, et al. 2002; Kostich, Batt and Lazorchak 2014; Waiser, et al. 2011; Wu, et al. 2009; Yargeau, Lopata and Metcalfe 2007).

Attikamagan Lake, Naskapi Nation of Kawawachikamuch. Photo of Billy Shecanapish by Lara Steinhouse.

As in the other sections, results for the Hudson Plains ecozone are not presented. In all, 42 samples were collected at 30 sites. Thirty-nine samples were taken at 28 surface water sites in nine communities in the Quebec region. Pharmaceuticals were found in 18 of the 28 surface water sites. Three drinking water samples were collected at two sampling sites in one First Nation community in the Quebec region. One pharmaceutical was found in both drinking water sites. Overall, 25 unique pharmaceuticals were detected in eight of the nine communities where samples were collected (Table 23).

The maximum concentrations found in the Quebec FNFNES sampling and a comparison to the highest levels reported in other Canadian, U.S. and global studies are summarized in Table 24. The FNFNES results are lower than those found in other surface waters studies in Canada, the United States, Europe, Asia and Central America.

The results of the pharmaceuticals component of the FNFNES study in Quebec are summarized in Table 23 at both the regional level and separately for the Taiga Shield, Boreal Shield, Mixedwood Plains and Atlantic Maritime ecozones. As in the other sections, results for the Hudson Plains are not presented. Overall, there were 25 distinct pharmaceuticals detected in surface water sampled from eight communities.

### Pharmaceuticals Detected by Type and Prevalence in Surface water

The 25 pharmaceuticals detected in surface water are presented below in order of the number of sites where they were detected. Reasons as to why they may have been found are provided where possible.

**Caffeine** was detected in 7 of the 9 communities and at 16 of the 28 surface water sites sampled throughout the province. Caffeine is a component of the drug Acetaminophen/caffeine/codeine (Tylenol No. 1) and is also present in many coffees, teas, soft drinks, energy drinks, and foods containing chocolate.

**Metformin** is an antidiabetic medication that was detected in 4 of the 9 communities and at 11 of the 28 surface water sites sampled throughout the province. From 2013 to 2016, metformin was among the top five most prescribed medications in all the communities where it was detected and was among the top 10 in most (8 out of 9) of the communities (Booker and Menzies 2017).

**Sulfamethoxazole** is an antibiotic used to treat urinary tract and respiratory tract infections that was detected in 3 of the 9 communities and at 10 of the 28 surface water sites sampled throughout the province. Sulfamethoxazole was not prescribed in any of the participating communities between 2013 and 2016 (Booker and Menzies, 2017).

**Carbamazepine** is a medication prescribed as an anticonvulsant and mood stabilizer that was detected in 3 of the 9 communities and at 10 of the 28 surface water sites sampled throughout the province. It is a potential endocrine disrupting chemical. Carbamazepine is not highly prescribed in Quebec. From 2013 to 2016 it was only prescribed in two of the three communities where it was detected (Booker and Menzies, 2017).

**Cotinine** is a metabolite of nicotine that was detected in 4 of the 9 communities and at 7 of the 28 surface water sites sampled throughout the province. In humans, an average of 80% of nicotine that is consumed is excreted as cotinine. Although nicotine was prescribed (e.g. smoking cessation products, such as patches and gum) in all of the communities where it was detected (Booker and Menzies, 2017), its presence is probably also a result of tobacco use.

**Atenolol** is a beta-blocker used to treat angina and hypertension that was detected in 2 of the 9 communities and at 7 of the 28 surface water sites sampled throughout the province. Atenolol is minimally prescribed in Quebec. It was the 61$^{st}$ and 77$^{th}$ most prescribed pharmaceutical in the two communities where it was detected (Booker and Menzies, 2017).

**Naproxen** is a pain reliever and a fever reducer that was detected in 3 of the 9 communities and at 6 of the 28 surface water sites sampled throughout the province. Naproxen was among the top 50 most prescribed pharmaceuticals in the three communities where it was detected (Booker and Menzies, 2017).

**Clarithromycin** is an antibiotic used to treat bacterial infections such as strep throat and pneumonia that was detected in 3 of the 9 communities and at 6 of the 28 surface water sites sampled throughout the province. Clarithromycin is not highly prescribed in Quebec. Between 2013 and 2016, it was prescribed only in 2013 and only in one of the three communities where it was detected (Booker and Menzies, 2017).

**Acetaminophen** is a pain reliever and a fever reducer that was detected in 2 of the 9 communities and at 5 of the 28 surface water sites sampled throughout the province. From 2013 to 2016 it was ranked among the top 15 most prescribed medications in the 2 communities where it was detected. Like caffeine and codeine, acetaminophen is also a component of Tylenol No. 1 (Booker and Menzies, 2017).

**Metoprolol** is a beta-blocker used to treat angina and hypertension that was detected in 2 of the 9 communities and at 4 of the 28 surface water sites sampled throughout the province. Metoprolol is a highly prescribed medication in the Quebec region FNFNES communities and was among the top 15 most prescribed pharmaceuticals in the two communities where it was detected (Booker and Menzies, 2017).

**Gemfibrozil** is a cholesterol medication that was detected in 2 of the 9 communities and at 4 of the 28 surface water sites sampled throughout the province. Between 2013 and 2016, gemfibrozil was not prescribed in any of the participating communities (Booker and Menzies, 2017).

**Bezafibrate** is a cholesterol medication that was detected in 2 of the 9 communities and at 3 of the 28 surface water sites sampled throughout the province. Between 2013 and 2016, bezafibrate was not prescribed in any of the participating communities (Booker and Menzies, 2017).

**Cimetidine** is an ulcer medication that was detected in 1 of the 9 communities and at 3 of the 28 surface water sites sampled throughout the province. Between 2013 and 2016, cimetidine was not prescribed in any of the participating communities (Booker and Menzies, 2017).

**Ketoprofen** is an arthritis and pain medication that was detected in 2 of the 9communities and at 2 of the 28 surface water sites sampled throughout the province. Between 2013 and 2016, ketoprofen was not prescribed in the communities where it was detected (Booker and Menzies, 2017).

**Hydrochlorothiazide** is a diuretic commonly used to treat hypertension and edema that was detected in 2 of the 9 communities and at 2 of the 28 surface water sites sampled throughout the province. In 2016, hydrochlorothiazide was among the top 15 most prescribed pharmaceuticals in the two communities where it was detected (Booker and Menzies, 2017).

**Codeine** is a pain and cough relief medication that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Codeine, which is also a component of Tylenol No. 1, is a moderately prescribed medication in the Quebec region FNFNES communities, but was not prescribed in the community where it was detected (Booker and Menzies, 2017).

**Diclofenac** is an arthritis and pain medication that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Between 2013 and 2016, diclofenac was not prescribed in the community where it was detected (Booker and Menzies, 2017).

**Ibuprofen** is a pain reliever, fever reducer, and inflammation reducer that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Ibuprofen is a moderately prescribed medication among the Quebec region FNFNES communities, but was not prescribed in the community where it was detected (Booker and Menzies, 2017).

**Ranitidine** is an ulcer medication that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Ranitidine is a moderately prescribed medication among the Quebec region FNFNES communities, and in 2016 it was the 60th most prescribed pharmaceutical in the community where it was detected (Booker and Menzies, 2017).

**Ciprofloxacin** is an antibiotic commonly used to treat urinary tract and respiratory tract infections that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Ciprofloxacin is not highly prescribed in the Quebec region FNFNES communities. It ranked as 98$^{th}$ and 99$^{th}$ among the most commonly prescribed medications in 2013 and 2015, respectively, in the community where it was detected (Booker and Menzies, 2017).

**Sulfamethazine** is an antibiotic used to treat bacterial infections in livestock that was detected in one of the nine communities and at one of the 28 surface water sites sampled throughout the province. Between 2013 and 2016, sulfamethazine was not prescribed in any of the participating communities (Booker and Menzies, 2017).

**Pentoxifylline** is an antidiabetic medication that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Between 2013 and 2016, pentoxifylline was not prescribed in any of the Quebec FNFNES communities (Booker and Menzies, 2017).

**Diphenhydramine** is an antihistamine commonly used to treat allergy symptoms, nausea, and vomiting that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Diphenhydramine is not highly prescribed in the Quebec FNFNES communities. Between 2013 and 2016, it was not prescribed in the community where it was detected (Booker and Menzies, 2017).

**Furosemide** is a diuretic commonly used to treat hypertension and edema that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Furosemide is a moderately prescribed medication in the Quebec FNFNES communities. In 2016 it ranked 21$^{st}$ among the most prescribed pharmaceuticals in the community where it was detected (Booker and Menzies, 2017).

**Atorvastatin** is a cholesterol medication that was detected in 1 of the 9 communities and at 1 of the 28 surface water sites sampled throughout the province. Atorvastatin is a highly prescribed medication in the Quebec FNFNES communities and in 2016 it ranked 6$^{th}$ among the most prescribed pharmaceuticals in the community where it was detected (Booker and Menzies, 2017).

### Pharmaceuticals Detected by Type and Prevalence in Drinking Water

One community chose to sample for pharmaceuticals at two drinking water sites.

**Ketoprofen** is an arthritis and pain medication that was detected in one community's drinking water. Ketoprofen was not prescribed in the community where it was detected (Booker and Menzies, 2017).

### Overview of Pharmaceuticals Detected by Ecozone

The results of the pharmaceuticals found in the Taiga Shield, the Boreal Shield, the Mixedwood Plains, and the Atlantic Maritime ecozones in Quebec are summarized in Table 23.

***Taiga Shield:*** Two communities were sampled.

In surface water, two pharmaceuticals were detected:
- Nicotine metabolite (smoking cessation): Cotinine
- Stimulant: Caffeine

***Boreal Shield:*** Three communities were sampled.

In surface water, three pharmaceuticals were detected:
- Analgesic/Anti-inflammatory: Ketoprofen
- Antidiabetic: Metformin
- Stimulant: Caffeine

In drinking water, one pharmaceutical was detected:
- Analgesic/Anti-inflammatory: Ketoprofen

***Mixedwood Plains:*** Two communities were sampled

In surface water, 16 pharmaceuticals were detected:

- Analgesics/Anti-inflammatories: Acetaminophen, Ketoprofen, and Naproxen
- Antacid: Cimetidine
- Antibiotics: Ciprofloxacin, Clarithromycin, and Sulfamethoxazole
- Anticonvulsant: Carbamazepine
- Antidiabetic: Metformin
- Antihypertensives (Beta-blockers): Atenolol and Metoprolol
- Diuretic: Hydrochlorothiazide
- Lipid Regulator: Bezafibrate and Gemfibrozil
- Nicotine metabolite (smoking cessation): Cotinine
- Stimulant: Caffeine

***Atlantic Maritime:*** Two communities were sampled.

In surface water 19 pharmaceuticals were detected:

- Analgesic: Codeine
- Analgesics/Anti-inflammatories: Diclofenac, Ibuprofen, and Naproxen
- Antacid : Ranitidine
- Antibiotics: Clarithromycin, Sulfamethazine, and Sulfamethoxazole
- Anticonvulsant: Carbamazepine
- Antidiabetics: Metformin and Pentoxifylline
- Antihistamine: Diphenhydramine
- Antihypertensives (Beta-blockers): Atenolol and Metoprolol
- Diuretics: Hydrochlorothiazide and Furosemide
- Lipid Regulator: Atorvastatin
- Nicotine metabolite (smoking cessation): Cotinine
- Stimulant: Caffeine

## FNFNES Quebec Region findings compared to Pharmaceutical Guidelines:

### *Ambient Guidelines*

Currently only one pharmaceutical in Canada has an ambient water guideline level, 17 α-Ethinylestradiol at 0.5 ng/L in the province of British Columbia (Nagpal and Meays 2009). The European Commission (EC) has proposed a freshwater Environmental Quality Standard of 0.035 ng/L for Ethinylestradiol. This pharmaceutical was not detected in the surface water of any participating First Nations communities in Quebec. The EC has also proposed a freshwater Environmental Quality Standard of 100 ng/L for Diclofenac. Diclofenac was detected in the surface water samples of only one Quebec FNFNES community and the level was 16ng/L. i.e., below the suggested standard.

### *Drinking Water Guidelines*

There are no Canadian Drinking Water Quality Guidelines for pharmaceuticals. Australia has set a drinking water guideline for water recycling that includes 19 of the 25 pharmaceuticals found in the surface water of Quebec: codeine, acetaminophen, diclofenac, ibuprofen, ketoprofen, naproxen, cimetidine, ciprofloxacin, clarithromycin, sulfamethazine, sulfamethoxazole, carbamazepine, metformin, metoprolol, atorvastatin, bezafibrate, gemfibrozil, cotinine, and caffeine (Australian guidelines for Water Recycling 2008). In addition, the state of California has developed Monitoring Trigger Levels (MTLs) for potable water reuse for 13 of the 25 pharmaceuticals found in the surface water of Quebec: acetaminophen, diclofenac, ibuprofen, ketoprofen, naproxen, ciprofloxacin, sulfamethoxazole, carbamazepine, atenolol, metoprolol, atorvastatin, gemfibrozil, caffeine (Anderson, et al. 2010). The state of New York has established standards for seven of the 25 pharmaceuticals found in the surface water of Quebec: acetaminophen, ibuprofen, sulfamethoxazole, carbamazepine, gemfibrozil, cotinine, and caffeine (New York City Environment Protection 2011). No Quebec FNFNES surface water samples exceeded these guideline levels. The only pharmaceutical found in drinking water was more than 500 times lower than the Australian and California standards. The comparison of the Quebec results to drinking water guidelines in Australia, California and New York is provided in Table 25.

The concentrations of the pharmaceuticals found in the Quebec FNFNES study should not pose a threat to human health. In several communities there were more than 12 pharmaceuticals detected in the surface water. The health effects from drinking the water from these surface water sites over a prolonged period are unknown at this time.

# Mercury in Hair Results

Of the 573 FNFNES adult participants (420 women and 153 men) in Quebec, 381 agreed to have their hair sampled and tested for mercury. This represents about 66% of the respondents to the household surveys. Therefore, mercury component weights were calculated and estimates obtained based on data from 381 participants. Respondents to the mercury component were mostly females (293 or 77%) and mostly between ages 31 and 70 (280 or 73%). The selection of weighted results is presented in Table 26.

Health Canada has a mercury guideline of 2 µg/g in hair (8 ug/L mercury in blood) for women of childbearing age (WCBA), or all females in the age category 19-50 along with children from birth to 18 years. The guideline is higher at 6 µg/g in hair for adult males and women aged 51+ (20 ug/L mercury in blood). There is also an "action level" of mercury exposure at 30 µg/g in hair or 100 µg/L in blood that applies to the general population and requires medical consultation and potential intervention (Legrand, et al. 2010).

In the entire sample there were 23 exceedances (6% of the total sample) of Health Canada's mercury biomonitoring guidelines in at least one hair segment sampled (15 WCBA, 5 women aged 51+, and 3 men aged 71+). The exceedances among WCBA represents 8.3% of the sample, which is quite notable.

The arithmetic mean of mercury concentration in hair among the First Nations adult population living on reserve in Quebec (sample data weighted) was 1.45 µg/g (while the geometric mean was at 0.42 µg/g. As the CV was between 15% and 35% these results should be used with caution. Of the entire sample, 22.6% tested below the level of detection (0.07 µg/g).

The weighted population estimates for participants aged 71+ suggest that exposures can be expected to be quite high in this age group, on average exceeding Health Canada's biomonitoring guideline (6.65 µg/g and 95%CI = 2.49-10.81 µg/g). Although the population percentile estimates for this age group demonstrates a high level of variability (CV above 35% and therefore the estimates are thought to be unreliable), the weighted mean exceeds Health Canada's guideline (6 µg/g) starting at the 50$^{th}$ percentile (results not shown). Additionally, results indicate that at the 90$^{th}$ percentile (upper 95% CI), there could be exceedances of the Health Canada action level's (30 µg/g) among men aged 71+ (47.25 µg/g). Together these findings suggest an elevated potential for exceedances to occur among this age group.

For WCBA, the means are also thought to be unreliable. With that in mind, the weighted results suggest that an exceedance of Health Canada's guideline (2 µg/g) can be expected at the 75$^{th}$ percentile (upper 95% CI) (2.27 µg/g). The results for WCBA continue to exceed the guideline in the 90$^{th}$ (2.89 µg/g) and 95$^{th}$ (3.21µg/g) percentiles.

David Shem and Virginia Sheshamush, Whapmagoostui First Nation. Photo by Rebecca Hare.

The entirety of the weighted data is characterized by very high CVs.

The analysis by ecozone demonstrated a difference in the profiles of mercury exposure among the study participants from one ecozone to the other. Results are not shown for the Hudson Plains ecozone. Figures 43a-d and 44a-d illustrate that the more northern ecozones of Quebec (Taiga Shield and Boreal Shield) are characterized by a greater frequency of higher exposures to mercury (6.7% of participants in the combined sample of two ecozones exceeded the general population guideline). In just the Taiga Shield ecozone, the percentage of the total population exceeding the general Health Canada guideline was 15.4% (mean of three samples). Out of the 67 WCBA from the northern ecozones who provided a hair sample, 11 exceeded the 2 µg/g mercury guideline (mean of three samples). This represents 16.4% of the sample and suggests that mercury risk communication should be focused on the First Nations WCBA residing in these ecozones. Although only 21 women of childbearing age were sampled in the Taiga Shield ecozone, seven of them (mean of the three samples) or 33.3% exceeded the biomonitoring guideline. This quite clearly illustrates a strong south-north gradient of increasing exposures and should be considered in risk communication and public health education.

In general, FNFNES results in Quebec suggest that certain age and gender groups within First Nations population have higher mercury exposure that exceed Health Canada's guidelines. There is a need for sustained risk communication and education on the both the importance of traditional food and suggestions on how to reduce exposure to mercury. Public health measures should be targeted to WCBA residing in northern ecozones and elders.

# Traditional Food Contaminant Results and Risk of Exposure

A total of 682 food samples representing 80 different types of traditional foods were collected for metals and persistent organic pollutants analyses. To estimate the daily contaminant intake from traditional food, the amount of traditional foods consumed per day by First Nations in Quebec (See Traditional Use and Gardening) were multiplied by the amounts of contaminants found in the food samples. As contaminant concentrations varied between samples collected from different communities, both the mean and maximum concentrations were used to estimate the average and the highest exposure.

Contaminant exposure analyses were completed using the Hazard Quotient (HQ) method. In this approach, the daily contaminant intake is divided by the provisional tolerable daily intake (PTDI) guideline level. The PTDI level represents the daily exposure to a contaminant that is unlikely to have an adverse health affect over a lifetime. The risk of harm will be negligible if the HQ is 1 or less. The HQ was calculated for both the average traditional food consumer (average intake/PTDI) and the high traditional food consumer (95$^{th}$ percentile intake/PTDI). It is important to note that risk exposure analysis was completed ***only for*** traditional food and not for store-bought food.

### Metals

Table 27 presents the mean and maximum concentrations of four toxic metals in the Quebec traditional food samples. These metals include arsenic, cadmium, lead, and mercury. Samples that are known to have higher levels of mercury are further analyzed for the more toxic form, methylmercury. Tables 28a-d show the top 10 traditional food contributors of arsenic, cadmium, lead and mercury in the diet by ecozone and for the total region. Exposure estimates for these metals were analyzed for all adults (Table 29) and separately for mercury for WCBA (Table 30). At the ecozone level, exposure estimates were conducted for consumers only i.e. excluding those who did not eat any traditional food in the year prior to the interview (Tables 31a-e, Table 32).

**Arsenic:** Overall, lobster and shrimp were the main traditional food sources of arsenic (Table 28a). For both the average (mean/PTDI) and the high traditional food consumers (95$^{th}$/PTDI), the HQ values for arsenic were lower than 1, therefore the risk of harm is negligible based on current consumption (Table 29).

**Cadmium:** Higher levels of cadmium were found in samples of kidney (moose and deer) and liver (moose). Higher concentrations of cadmium are typically found in the kidney and liver of land mammals as cadmium tends to accumulate in these organs. Based on their reported use, the main traditional sources of cadmium in the diet were moose and caribou kidney (Table 28b). For both the average and high traditional food consumers, the HQ values for cadmium were lower than 1, therefore the risk of harm is negligible based on current consumption level (Table 29).

**Lead:** Among the samples collected, higher levels of lead were found in samples of wild birds (mallard, mean value of 20.91 ug/g and grouse/partridge, 4.34 ug/g) and game meat (black bear, 2.75 ug/g and caribou heart, 2.74 ug/g). The main traditional food contributors of lead in the diet were mallard, ptarmigan and grouse (Table 28c). The finding of lead in meat samples is likely due to residuals from lead-containing ammunition. Higher lead levels were also found in samples of dandelions (0.49 ug/g) and stinging nettle leaves (1.27 ug/g) collected from communities in the Mixedwood Plains and the Atlantic Maritime ecozones respectively, suggesting that there may be some local source of lead pollution in the soil.

Any lead exposure will lead to adverse effects, particularly among children. Because of these findings, Health Canada no longer uses the HQ approach for risk assessment. For consistency with other regions, FNFNES has undertaken risk exposure using the TDI to serve as a preliminary screening. For both the average and high traditional food consumers, the HQ values for lead were lower than 1, therefore the risk of harm is low based on current consumption (Table 29). However, these results should be treated cautiously because of the recent findings that there is no threshold for lead toxicity. A more comprehensive approach that monitors background exposure including all sources of lead (including store-bought food and drinking water) is needed to determine the additional risk of lead exposure from traditional food consumption. If requested, FNFNES will work with the participating communities to identify the sources of lead in their environment and coordinate a comprehensive risk assessment with the relevant public health authorities.

It has been widely reported that lead concentrations can reach high levels in game animals as a result of contamination from lead bullets and shot (Pain, et al. 2010). Therefore, it is important to raise awareness of the potential risk of eating any waterfowl and game killed by lead containing ammunition which can shatter into fragments too small to detect and remove (Bellinger, et al. 2013). A study in Minnesota found that only 30% of lead fragments were within 2 inches of the exit wound: some lead fragments were found 18 inches away from the exit hole. Rinsing the meat is not effective as it merely spreads the lead fragments (Grund, et al. 2010). Thus, the use of non-lead ammunition is recommended.

**Mercury:** There were higher levels of the more toxic form of mercury, known as methyl mercury, in samples of walleye (pickerel), pike (jackfish) and lake trout. Higher levels of mercury are commonly seen in these types of predatory fish since they eat other fish, which further increases their levels of contaminants. Based on consumption levels, the main traditional food sources of mercury in the diet were walleye and trout (Table 28d).

At the regional level, for the adult population (total and consumers only), both the average (average/PTDI) and high end (95$^{th}$ percentile/PTDI) HQ values for mercury were ***lower*** than 1, therefore the risk of harm is negligible based on the current consumption rate (Table 29, Table 31a).

Due to the susceptibility of the fetus to mercury toxicity, the PTDI for WCBA, as well as teenagers and children, is lower than the PTDI for adult males and older women (aged 51+). Therefore, the HQ is calculated separately for WCBA. For WCBA, the HQ values were also lower than 1 (Table 30, Table 32).

### Metal exposure from traditional foods at the ecozone level for consumers only

Walleye. Photo by Maude Bradette-Laplante.

The risk of exposure to metals from traditional food is generally low for traditional food consumers at the regional level (Table 31a). A similar negligible risk was found among participants in the Taiga Shield (Table 31b), Mixedwood Plains (Table 31d) and the Atlantic Maritime (Table 31e). An elevated risk of exposure to **cadmium** from traditional food among **high** consumers in the **Boreal Shield** was found using either the mean or the maximum concentration from food samples (Table 31c). This means that high consumers of organ meats such as moose kidney and liver may be at risk of cadmium exposure. As cigarettes are also a major source of cadmium, smokers who consume large amounts of organ meat are at greater risk of cadmium toxicity. Long term exposure to cadmium can result in kidney damage (see Appendix A for further information). The risk of mercury exposure for WCBA, at the ecozone level appears to be negligible (Table 32), however, there is some uncertainty as per the discussion below.

### Relationship between hair mercury bio-monitoring and dietary estimation of mercury exposure

The relationship between the estimated dietary mercury exposure from traditional food and measured hair mercury levels was investigated using correlation analyses. Dietary intake of mercury was moderately correlated with hair mercury for all adults (Pearson correlation coefficient=0.42, n=381) (Figure 44) and weakly correlated for WCBA (Pearson correlation coefficient=0.28, n=180) (Figure 45). The correlation was weak for WCBA even though there were a higher number of hair mercury exceedances in this subgroup, including seven from the Taiga Shield. This may be due to both the low number of hair samples collected from WCBA as well as the limited number of traditional food samples from the communities where there were exceedances, especially of fish which are known to bio-accumulate mercury. Less than half (43%) of the top 30 traditional foods eaten were provided for analysis, resulting in the need to impute contaminant values from other ecozones. This likely underestimated mercury exposure. A recent study on blood and hair concentrations among WCBA in Cree First Nations in Quebec found that local fish consumption was associated with increased blood and hair mercury concentrations (Ripley, et al. 2018). They also reported less than 10% of WCBA had hair mercury concentrations exceeding the Health Canada guidelines. While less than 10% of WCBA exceeded the guidelines, nevertheless, it is important that WCBA minimize their consumption of fish (i.e. walleye, lake trout and pike) that are known to have a higher mercury content. However, it is important to balance the risk with the benefits associated with other determinants of health such as nutrition, culture and physical activities.

As there were some exceedances of Health Canada's guidelines, links to current fish consumption advisories are provided here. Information for the Quebec and Labrador region can be found online at the Government of Canada's Dept. of Environment and Climate Change webpage, *Fish Consumption Advisories*, as well as at the Government of Quebec's Ministry of Environment website (mddep.gouv.qc.ca) under the webpage *Guide de consommation du poisson de pêche sportive en eau douce* and the Ministry of Health's website (sante.gouv.qc.ca/en) under the webpage, Fish Consumption and Health.

**Polycyclic Aromatic Hydrocarbons (PAHs):** Table 33 presents the concentrations of polycyclic aromatic hydrocarbon (PAH) in selected traditional food samples from Quebec. The highest levels were found in the smoked lake trout sample. These results are not surprising as the process of smoking/drying fish and meat tends to increase the level of PAHs. However, given the low measured levels, there is no concern with exposure to PAHs from eating any of the food sampled.

**Organochlorine pesticides and PCBs:** Foods were tested for various pesticides such as hexachlorobenzene (HCBs), a by-product of DDT known as dichlorodiphenyldichloroethylene (p,p-DDE), a by-product of chlordane known as trans-Nonachlor, and toxaphene (Table 34). All concentrations were very low at the parts per billion level and the variations in concentrations were largely due to the different fat content in different foods. Foods were also tested for total PCBs; the highest levels were found in mallard duck meat. PCBs can bio-accumulate and bio-magnify along the food chain. Ducks are migratory and may have been exposed to these compounds from contaminated sources elsewhere. The levels of PCBs found in the mallard duck samples are still low and should not be of any concern.

**Polybrominated diphenyl ethers (PBDEs):** Concentrations of the chemicals that are commonly used as fire retardants, polybrominated diphenyl ethers (PBDEs), are presented in Table 35. The concentrations were low at the parts per billion level; the highest concentration was found in Canada goose meat. The reason for these higher concentrations is unclear, however, PBDEs are often found in higher concentrations in fatty foods of animal origin and have been reported at higher levels in bird species (Guigueno and Fernie 2017). Research suggests that urban environments and particular commercial activities, such as electronics recycling can increase exposure to wildlife (Chen and Hale 2010). Based on the levels in the samples analyzed and current consumption, there is no concern with exposure to PBDEs.

**Perfluorinated compounds (PFCs):** Table 36 presents the concentration of perfluorinated compounds (PFCs) in selected traditional foods. The highest concentration was found in the sucker egg sample. However, there is no concern of exposure to PFCs from eating any of the food sampled.

**Dioxins and Furans [Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs)]:** Table 37 presents the concentrations of dioxins and furans expressed as toxic equivalent quotient (TEQ) in selected traditional foods. Only trace amounts were found in most food and there is no concern of dioxin and furan exposure in any of the food sampled.

Table 38 shows the result of estimated daily intake of organic contaminants including HCBs, DDE, PCB, Chlordane, Toxaphene, PAH, PFCs, PBDE, Dioxin and Furan using the average concentrations respectively. All the HQs were below 1, indicating that there is negligible risk of exposure to these contaminants through consumption of traditional food. When stratified by ecozones and for consumers only, the risk for PCB exposure from traditional food in all ecozones was also negligible (Table 39).

Smoking whitefish. Photo by Rebecca Hare.

# COMMUNITY INPUT

*This report would not have been possible without the commitment and participation of the First Nations across the Quebec - Labrador AFN region who were involved in this study. This acknowledgement includes the community research assistants, community members and those who contributed to the data collection process. Research agreements between First Nations Food, Nutrition, and Environment Study (FNFNES) and First Nations include the understanding that communities own their own data. As such, FNFNES researchers and team members report community-specific results back to the community first, before unveiling regional results. Feedback from the First Nations on their own results is collected and incorporated into this final regional report in an effort to improve the report overall and enhance its relevance. The summarized results included in this section are a reflection of that input.*

The FNFNES lead nutrition research coordinator worked with participating First Nations in Quebec to organize a results verification presentation. Each First Nation hosted either a Principal Investigator and/or another FNFNES team member, who presented the community's results in the fall of 2018. Draft copies of the community report, a 4-page summary of results written in plain language and a copy of the PowerPoint presentation illustrating community results were supplied. This sharing of community results provides an opportunity to compare results to both personal perspectives and the region as a whole. The level of engagement was high with meetings held in all participating First Nations. These meetings were attended by Chief and Councils, representatives of health centres, and from various sectors such as environment, culture and diabetes prevention.

Following each presentation, there was a discussion period which served to answer questions not already addressed, verify that the reports and accompanying documents met expectations and gain insight as to how the information would be communicated and used to support community needs. Comments were recorded and compiled in the "community input" section of each of the individual community's final community report.

Samples of questions asked are included here:

1. Do you feel the results are accurate?
2. Are you concerned about any of the results? If yes, which ones and why?
3. Please share with us any programs in place that promote traditional harvesting in your community as well as any examples of programs or activities that are intended to improve quality of diet and food.
4. Based on the results in the report, what other kinds of programs do you think your community could benefit from?
5. Do you see the FNFNES results as useful to your community? How do you plan on using these results?
6. Do you think more research is needed? If yes, what types of research?


39

Participating First Nations perceived that, overall, most results reported in their community reports were generally accurate for their First Nation. However, it was consistently reported that the level of food insecurity appeared to be underreported. Some suggested that the underreporting may be due to study participants not wanting to share with community research assistants their inability to address their own food insecurity situations. Many attendees expressed concern over the health indicators and the reported levels of obesity and diabetes. Levels of lead, mercury and cadmium in traditional food and water quality results also generated discussion. Many participants expressed a need for more research into the safety of traditional food and the environment (eg. climate change, water quality, impact on traditional food).

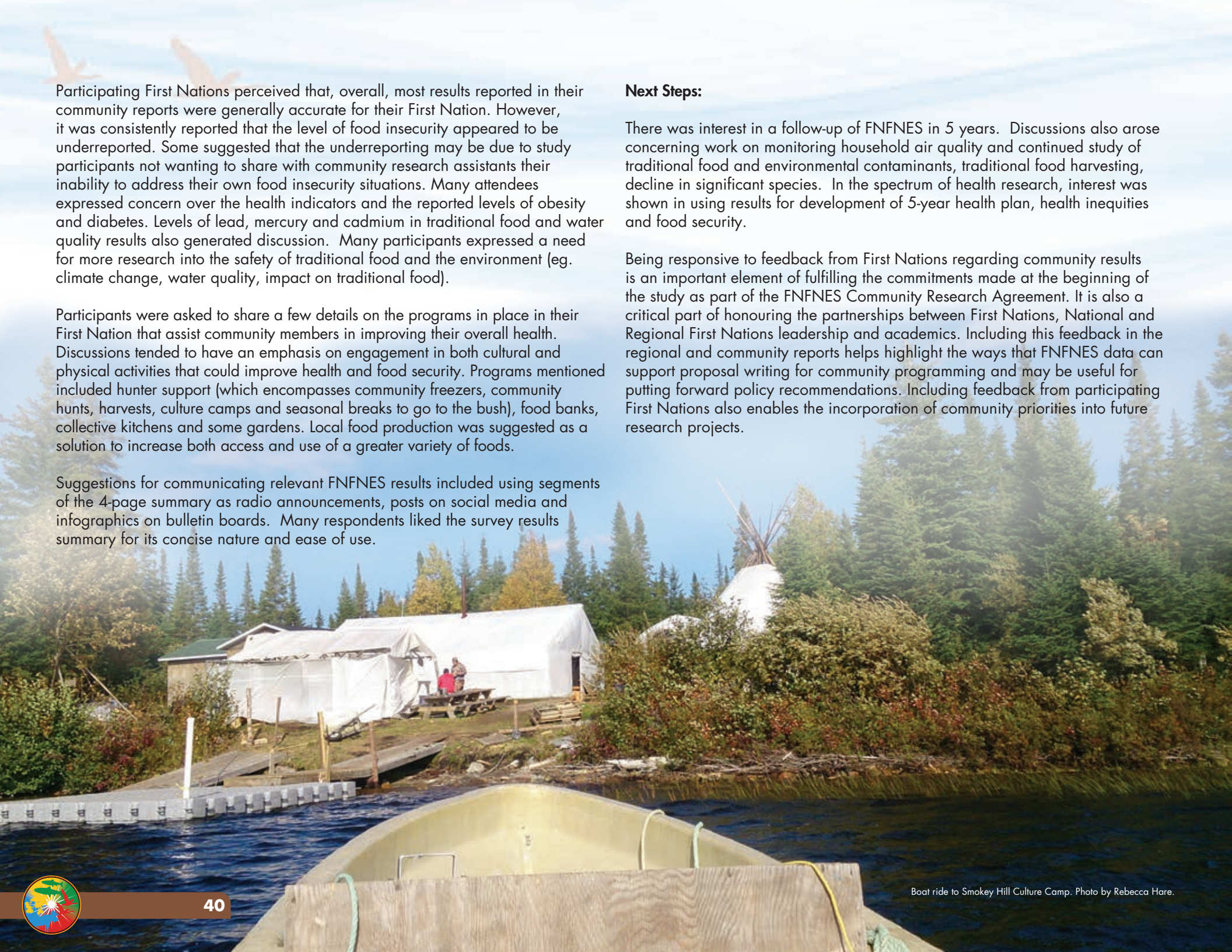
Participants were asked to share a few details on the programs in place in their First Nation that assist community members in improving their overall health. Discussions tended to have an emphasis on engagement in both cultural and physical activities that could improve health and food security. Programs mentioned included hunter support (which encompasses community freezers, community hunts, harvests, culture camps and seasonal breaks to go to the bush), food banks, collective kitchens and some gardens. Local food production was suggested as a solution to increase both access and use of a greater variety of foods.

Suggestions for communicating relevant FNFNES results included using segments of the 4-page summary as radio announcements, posts on social media and infographics on bulletin boards. Many respondents liked the survey results summary for its concise nature and ease of use.

**Next Steps:**

There was interest in a follow-up of FNFNES in 5 years. Discussions also arose concerning work on monitoring household air quality and continued study of traditional food and environmental contaminants, traditional food harvesting, decline in significant species. In the spectrum of health research, interest was shown in using results for development of 5-year health plan, health inequities and food security.

Being responsive to feedback from First Nations regarding community results is an important element of fulfilling the commitments made at the beginning of the study as part of the FNFNES Community Research Agreement. It is also a critical part of honouring the partnerships between First Nations, National and Regional First Nations leadership and academics. Including this feedback in the regional and community reports helps highlight the ways that FNFNES data can support proposal writing for community programming and may be useful for putting forward policy recommendations. Including feedback from participating First Nations also enables the incorporation of community priorities into future research projects.



Boat ride to Smokey Hill Culture Camp. Photo by Rebecca Hare.

# CONCLUSIONS

This is the first comprehensive study addressing the gaps in knowledge about the diet, traditional food and environmental contaminants to which First Nations in Quebec are exposed. The overall results indicate that traditional food is safe to eat and contributes important nutrients to the diets of First Nations adults in Quebec. Participants' own comments about the relevance of traditional food for well-being are found in Appendix N.

Nutrition and food insecurity, obesity, smoking and diabetes are major health issues across Quebec. The diet does not meet nutrition recommendations; there are excess intakes of fat and sodium (salt), and inadequate intakes of fibre, vitamin A, vitamin B6, vitamin C, vitamin D, calcium and magnesium. The inadequate intake of several nutrients is a result of a diet that does not meet the recommended servings for all food groups (Meat and Alternatives, Vegetables and Fruit, Grain Products, and Milk and Alternatives) and is made up of a limited variety of foods eaten within the food groups. The diet pattern reflects insufficient income, as evidenced by the high food insecurity.

These findings highlight the need to continue to build upon current efforts at the community, regional, provincial and national levels to improve food security and nutrition in First Nations communities through a social determinants of health approach. It is recognized that across Quebec-Labrador, there are many community-led initiatives currently addressing these issues, such as hunter support programs, community freezers, community sponsored harvests, traditional sharing, inter-generational training (culture camps), and community kitchens, gardens and food banks. Funding for health and nutrition programs comes from Indigenous Services Canada and each First Nation determines which programs and services are best to achieve their own health goals for their community members.

Policies that promote healthy meals at preschool, school and community events would also reinforce the importance of healthy food choices for better health of all community members. *Eating Well with Canada's Food Guide - First Nations, Inuit and Métis* and *Healthy Food Guidelines for First Nations Communities*, by the First Nations Health Council in B.C. (both available online), are two resources designed to assist communities to promote and serve healthier food in schools and at community events. Both can assist communities in developing healthy food policies. The Healthy Food Guidelines provide an expanded list of appropriate foods for all kinds of community settings. Appendix O of this report, adapted from the B.C. First Nations Health Council's (now known as First Nations Health Authority) Healthy Food Guidelines, contains a listing of the types of foods to serve (and not serve) at community events. While these programs, activities, and policies can have a valuable impact on the nutrition of community members, it is imperative that progress be made to reduce the gaps in income, education and the burden of illness seen in First Nation communities. When results were returned to the communities, repeatedly mentioned was the perception that at the household level, food insecurity was underreported and the cost of healthy food choices was beyond the budget of families, while at the community level, a considerable need for more community food and nutrition activities was identified.

In addition to food security, issues of food sovereignty have been identified. Many First Nations have reported that they have limited ability to affect what foods are available for purchase in the communities. Others have reported various restrictions on traditional food harvest. Self-determination for First Nations and respect for Indigenous and Treaty rights may lead to greater control of food systems in a way that positively affects food security and the environmental health of First Nations communities.

There is generally no health concern regarding the trace metal levels in the drinking water of the participating households but close monitoring is needed as water sources and the level of water treatment vary by community. With respect to bacteriological safety of water, although no tap water samples were tested for the presence of pathogens, water parameters (chlorine, pH and temperature), which can indirectly impact health, were measured. Overall, 26.5% of samples had inadequate levels of free chlorine levels while 6% of temperature readings were outside the optimal range. Many adults reported that they limit their use of tap water for drinking for a number of reasons, including confidence in the water quality. Many adults reported using water from both the hot water and cold water taps for drinking (36% of total participants) and cooking (51% of total participants). This is a concern since higher levels of metals are found in hot water: metals in hot water tanks and pipes dissolve more easily in hot water. It is safer to only use water from cold taps for drinking, cooking and making baby formula.

The levels of pharmaceuticals found in the surface water in Quebec should not pose a threat to human health. Our results also suggest that there is no wide-spread problem of sewage contamination of the sources of drinking water supply, important fishing ground and/or recreational waters. However, in several communities there were three or more pharmaceuticals detected in the surface water. The health effects from drinking the water from these surface water sites

over a prolonged period are unknown at this time; it is also unknown whether there are any effects on the fish and wildlife in the river/lakes. To reduce the presence of pharmaceuticals in the environment, it is recommended to return unused or expired prescription drugs, over-the-counter medications and natural health products to a local pharmacy for proper disposal instead of flushing them down the toilet or throwing them into the garbage.

Contaminant levels in most traditional food samples collected were generally at low or at background levels seen elsewhere in Canada. They should pose no health risk to the average consumer when consumed at the current rate. There is an elevated risk of exposure to cadmium among high consumers of organ meat. Additionally, elevated lead concentrations were found in meat samples from wild birds (such as mallard and grouse) and larger animals (such as black bear and caribou), most likely due to the use of lead containing ammunition. To successfully reduce exposure, likely a combination of subsidy programs for ammunition alternatives, and community education to minimize human health impacts (i.e. removing the meat surrounding the bullet entry point rather than rinsing only as it can spread the lead fragments) and environmental impacts (appropriate disposal to reduce harm to other predators) is needed.

The hair sampling and diet estimate results suggest that there is some concern related to mercury exposure from traditional food. Overall, 23 individuals or 6% of the total sample exceeded the guidelines at least one time during a three-month period. There was a strong south-north gradient of increasing exposure. Among those WCBA living in the northern ecozones who provided a hair sample, an exceedance was detected in 16.4% of the samples. Although there was a limited number of hair samples among adults aged 71+, the results point to an elevated likelihood of exceedances among this age group. Higher levels of mercury were found in predatory fish such as walleye, lake trout and pike. These results suggest that further community-based studies of adults living in northern ecozones may be beneficial to investigate the prevalence of higher mercury exposures and to provide coherent risk communication and nutritional advice.

The data collected in this report will serve as a benchmark for future studies of this type to determine if changes in the environment are resulting in an increase or decrease in concentrations of environmental pollutants, and how diet quality will change over time. Results of the study have also identified the important food species/parts that are commonly consumed and/or showed elevated levels of contamination in each participating community. They can serve as useful biomarker species for future monitoring programs. Some of the participating communities have already expressed an interest in conducting such a follow-up study in five- or ten-years' time.

**Highlights of results:**

1. The diet of First Nations adults in Quebec-Labrador does not meet nutrition recommendations and needs, but the diet is healthier when traditional foods are eaten.
2. Overweight/obesity, smoking, and diabetes are major public health issues.
3. Household food insecurity is a major issue.
4. Water quality, as indicated by the trace metals and pharmaceutical levels, is satisfactory overall, but close monitoring is needed as water sources and water treatment vary by community.
5. Levels of chemical contamination of traditional food are generally low. At the current rate of consumption, the total dietary contaminant exposure from traditional food is generally low and is not a health concern.
6. Mercury exposure, as measured in hair samples, suggests some concern and a strong south-north gradient of increasing exposures. There appears to be a greater frequency of exceedances among women of childbearing age and adults age 71+. Of the 381 adults in the Quebec region who provided hair samples, 23 (6%) had a mercury level above Health Canada's guideline.
7. Elevated levels of lead were found in some food items: it is important to identify the sources.
8. Future monitoring of trends and changes in the concentrations of environmental pollutants and the consumption of key traditional foods is needed.

**A summary of the study results from Quebec can be found in Appendix P.**

# TABLES AND FIGURES

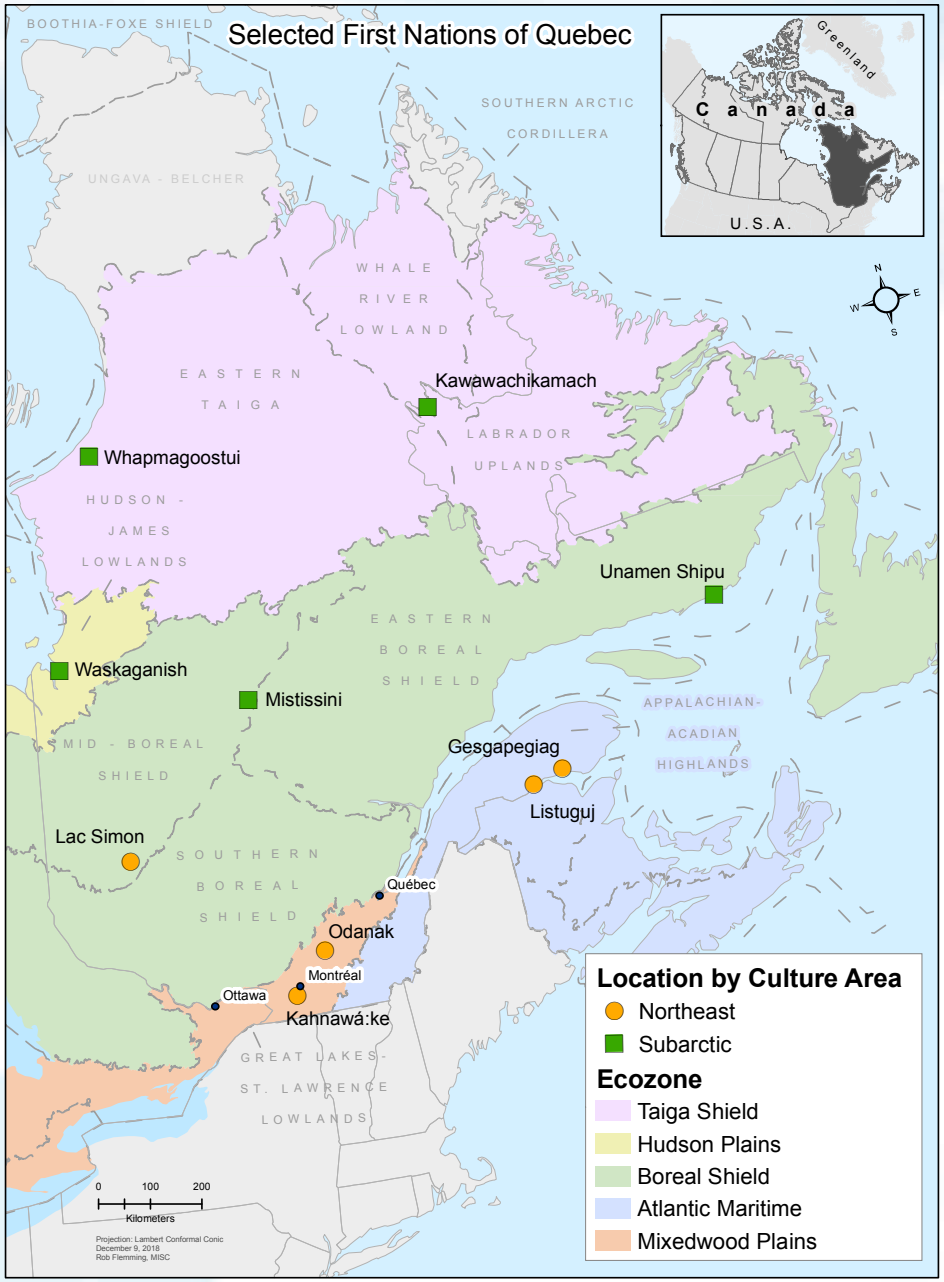
## Sample Characteristics

**Table 1. Participating First Nations communities in Quebec**

| Ecozone | Name of participating community | Number of participants | Driving distance to City/service centre (INAC) | Access | Registered 2016 population total / on-reserve* | Number of homes in communities |
|---|---|---|---|---|---|---|
| Taiga Shield | Naskapi Nation of Kawawachikamach | 31 | 520 | Fly-in | 773/707 | 177 |
| | Whapmagoostui First Nation | 32 | 800 | Fly-in | 980/952 | 195 |
| Hudson Plains | The Crees of Waskaganish First Nation | 56 | 387 | Fly-in | 2,840/2,368 | 475 |
| Boreal Shield | Montagnais de Unamen Shipu | 41 | 466 | Ferry plus road in summer/winter is fly-in | 1,180/1,135 | 255 |
| | La Nation Anishnabe du Lac Simon | 56 | 37 | Road | 2,153/1,762 | 322 |
| | Cree Nation of Mistissini | 21 | 497 | Road | 3,992/3,752 | 789 |
| Mixedwood Plains | Kahnawá:ke | 135 | 10 | Road | 10,982/7,997 | 2,185 |
| | Odanak First Nation | 86 | 31 | Road | 2,462/296 | 186 |
| Atlantic Maritime | Micmacs of Gesgapegiag | 41 | 6 | Road | 1,501/707 | 242 |
| | Listuguj Mi'gmaq First Nation | 74 | 15 | Road | 4,021/2,093 | 712 |

* (First Nations and Inuit Health (FNIH), Personal communication. 2017)

## Figure 1. Map of participating First Nations communities in the Quebec-Labrador Region




## Table 2. Number of First Nations households surveyed and participation rate

| Sampling characteristics | | All participating First Nations in Quebec |
|---|---|---|
| On-reserve and crown land Registered population 2016[a] | | 21,769 |
| On-reserve Registered population 2016, 19 years+[a] | | 15,342 |
| No of occupied households (HHs) | | 5538 |
| No. of HHs selected to participate[b] | | 1407 |
| Targeted survey completion | | 1100 |
| No. of HHs contacted | | 953 |
| Not eligible | | 4 |
| | Reason for non-eligibility | Aged less than 19 years old |
| No. of vacant homes | | 48 |
| No. of eligible HHs | | 810 |
| HH Non-response | Refused | 132 |
| | Accepted but no survey | 91 |
| | No. of incomplete records | 14 |
| No. of HHs (participants) that participated (complete records[c]) | | 573 |
| No. of participating females | | 420 |
| No. of participating males | | 153 |
| HH Participation rate (# of participating HHs/ # eligible HHs) | | **70.7%** |

[a] (First Nations and Inuit Health (FNIH), Personal communication. 2017). Non-published information as of December 31, 2016 from Indian Registration System (IRS) obtained through information request from FNIH. Total represents population count for participating communities.

[b] A random sample of up to 125 HH's per community was done to account for non-response when possible. In the community of Kahnawá:ke, a random sample of 280 was drawn due to the community size.

[c] complete records= completed all parts of questionnaire (traditional food frequency, sociodemographic, food security and 24-hour recall)

# Socio-demographic Characteristics

**Table 3. Average age (SE) of participants**

| Gender | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | First Nations adults in Quebec (n=573) |
|---|---|---|---|---|---|
| **Women** | 41 (1.9) | 40 (0.2) | 48 (3.3) | 46 (1.6) | 42 (0.4) |
| **Men** | 38 (6.9) | 48 (0.7) | 53 (1.6) | 46 (1.6) | 48 (0.5) |

**Figure 2a: Percentage of female respondents in each age group across Quebec and by ecozone**

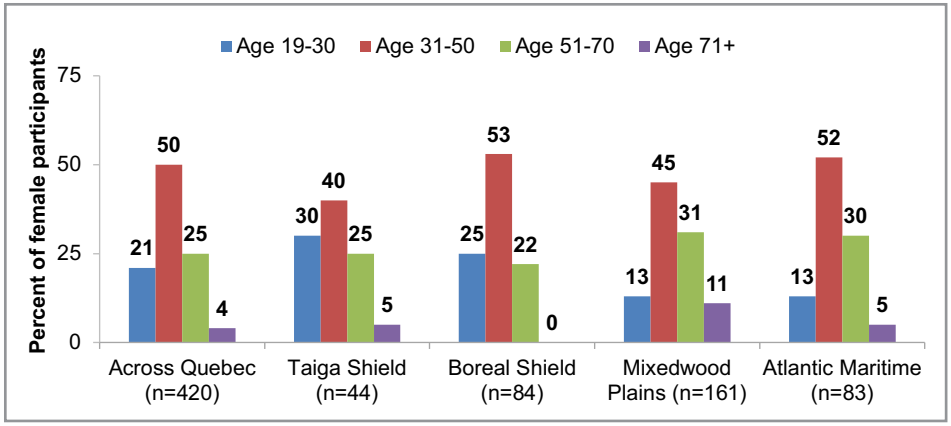



**Figure 2b: Percentage of male respondents in each age group across Quebec and by ecozone**

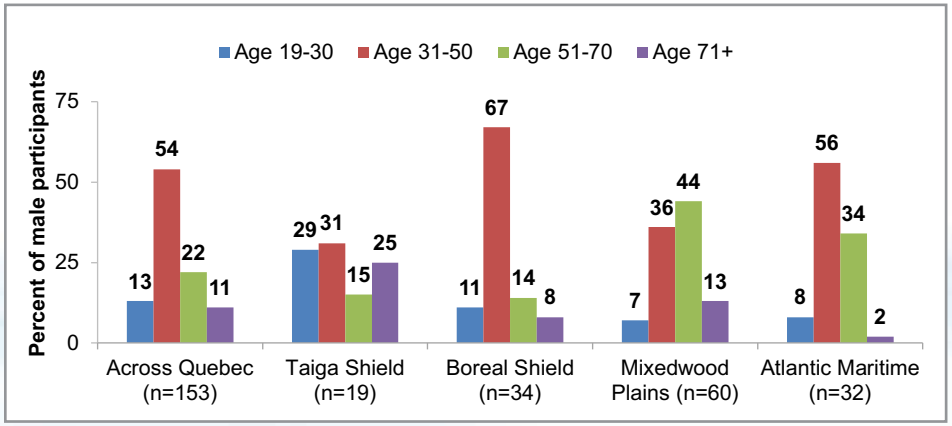



**Figure 3. Percentage of household members by age group, across Quebec (n=573)**

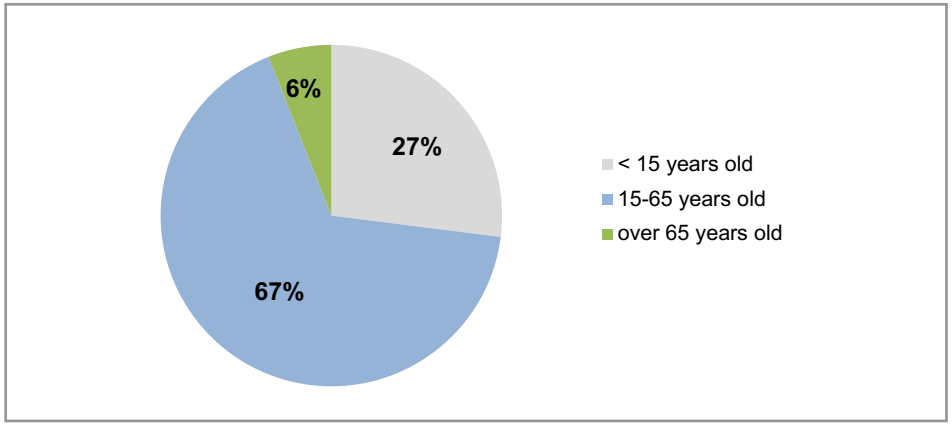
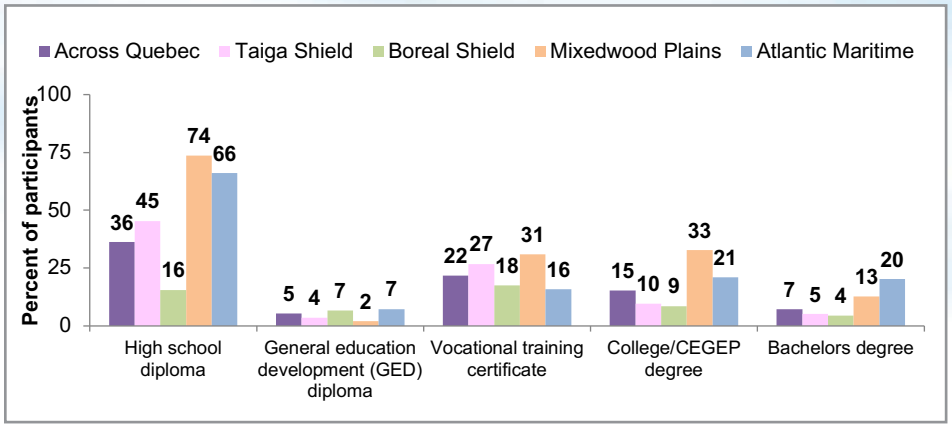


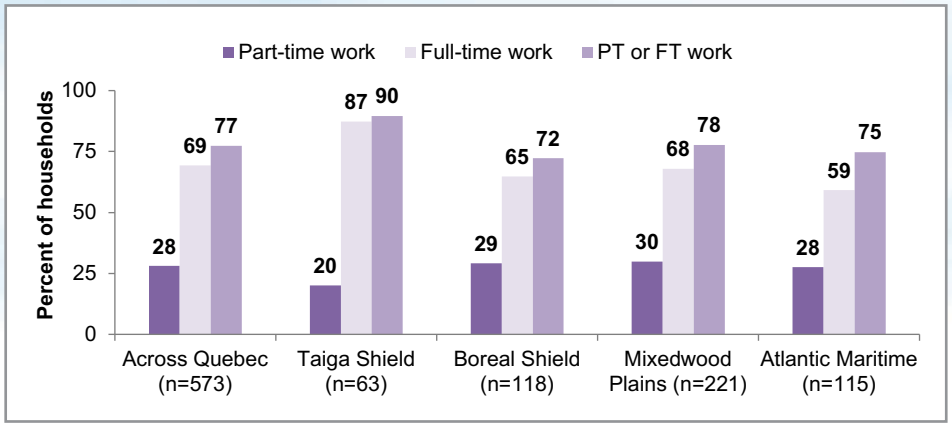

**Table 4. Median household size and years of education across Quebec and by ecozone**

| Household size and education | Median (range) | | | | |
|---|---|---|---|---|---|
| | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | Across Quebec (n=573) |
| **Number of people living in the household** | 5 (1, 10) | 5 (1, 14) | 3 (1, 9) | 3 (1, 8) | 4 (1, 14) |
| **Number of years of school completed** | 11 (0, 19) | 9 (0, 20) | 12 (3, 28) | 12 (3, 23) | 10 (0, 28) |

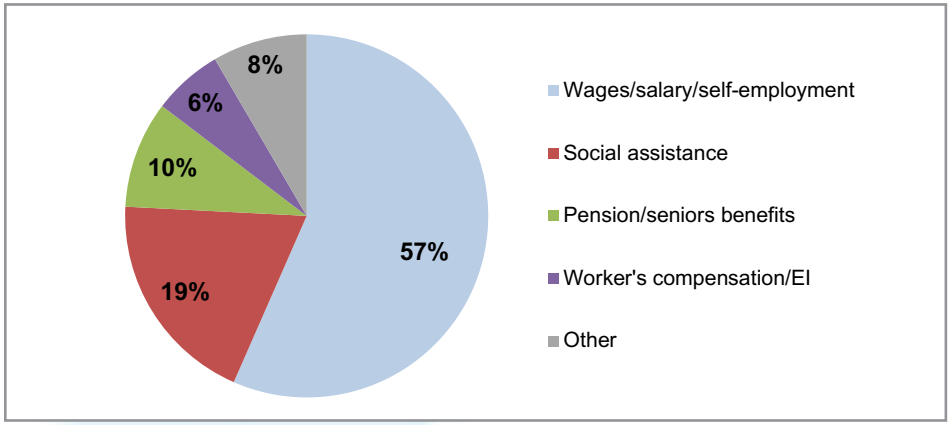
## Figure 4: Diplomas, certificates and degrees obtained by First Nations adults across Quebec and by ecozone (n=573)




## Figure 6. Percent of full-time and part-time employment reported by First Nations households across Quebec and by ecozone



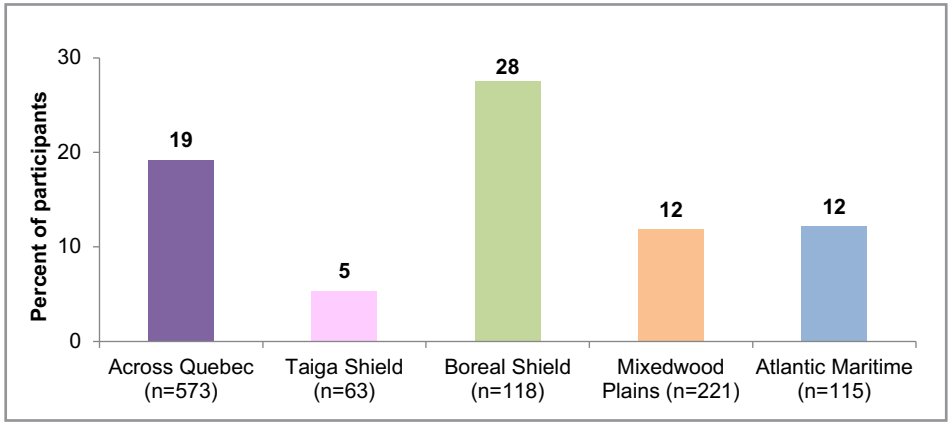

## Figure 5. Main source of income for First Nations adults in Quebec (n=573)




Notes:

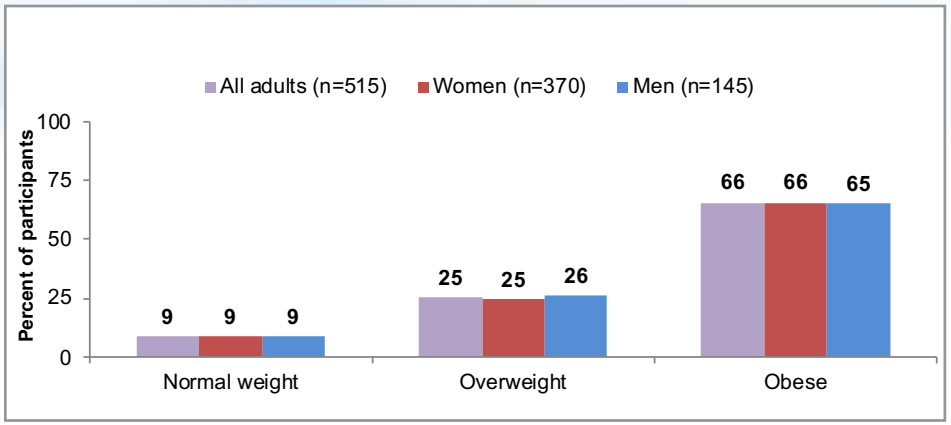
EI= Employment insurance
Other includes foster parent compensation, student/training allowance, spousal support, none, refused to say

## Figure 7. Percent of First Nations adults on social assistance, across Quebec and by ecozone

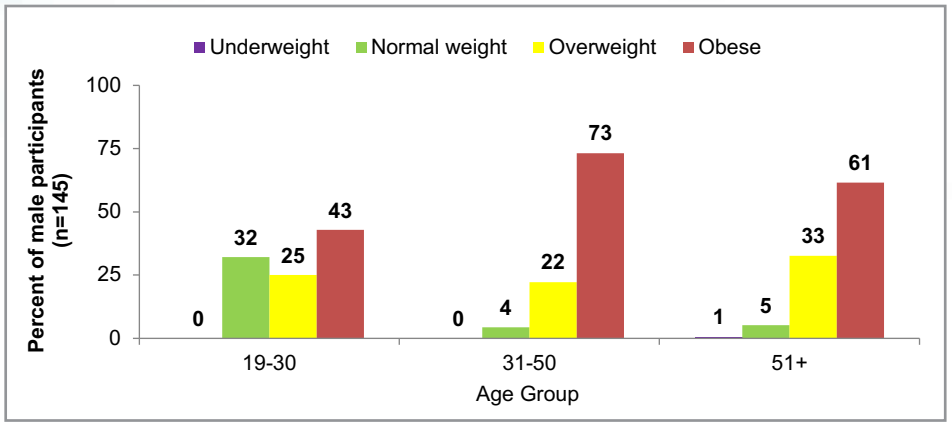


# Health and Lifestyle Practices

## Figure 8a. Overweight and obesity among First Nations adults in Quebec*

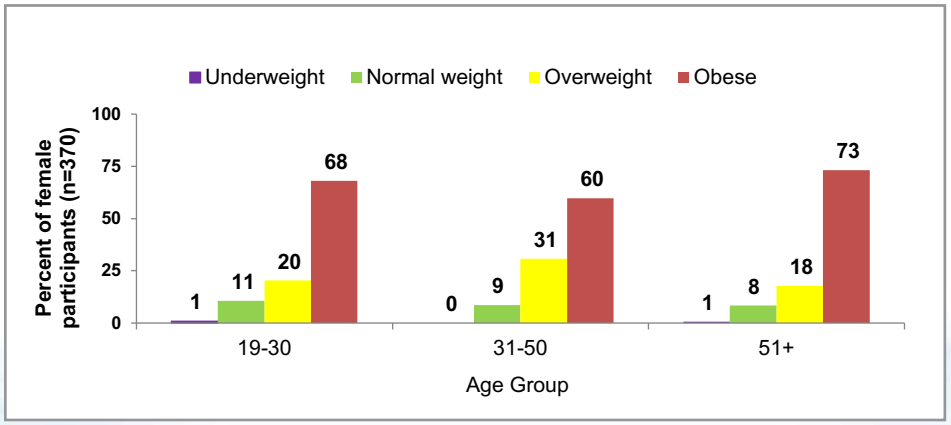



## Figure 8c. Overweight and obesity among First Nations men in Quebec by age group*

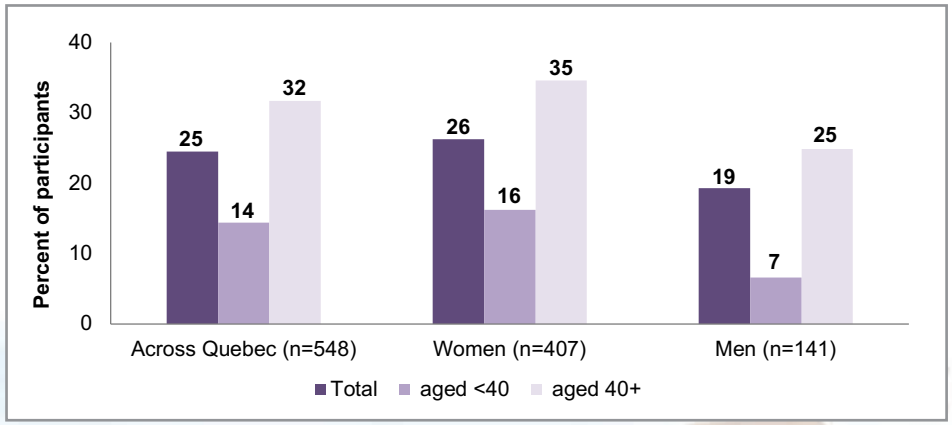



Figures 8a-c* Classified using Health Canada's BMI categories (Health Canada 2003). Results exclude pregnant and breastfeeding women (n=28). Results include both measured and reported weight and height values. Paired t-tests showed significant differences between reported and measured values, therefore all BMIs based on reported values (n=62) were adjusted to account for the estimated bias.

## Figure 8b. Overweight and obesity among First Nations women in Quebec by age group*




## Figure 9. Prevalence of self-reported diabetes among First Nations adults in Quebec, by total, gender and age group+




+Crude weighted; excludes gestational diabetes

**Figure 10. Type of diabetes reported by First Nations adults in Quebec (n=102)**

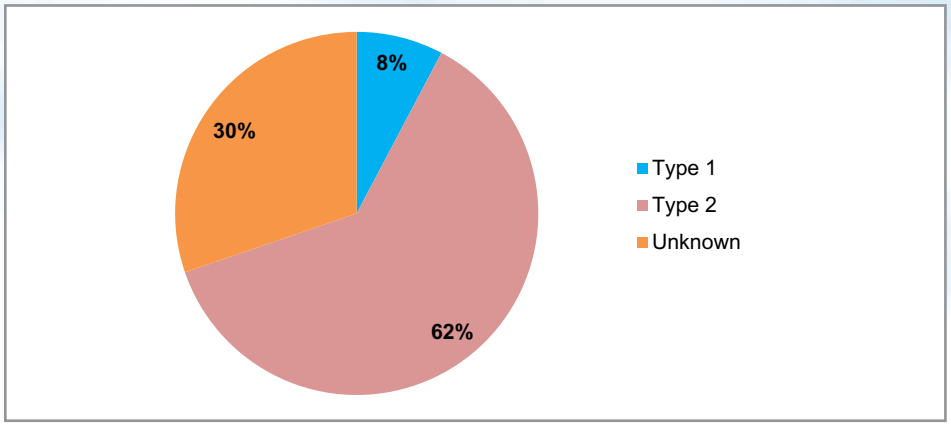



**Table 5. Prevalence of self-reported diabetes among First Nations adults in Quebec compared to other Canadian studies**

| Population | Age | Prevalence Rate % | | Reference |
|---|---|---|---|---|
| | | Crude | Age-Standardized‡ | |
| Non-Aboriginal* | 12+ | 6.0 | 5.0 | 2009-2010 CCHS |
| First Nations (on-reserve) | 18+ | 15.9 | 19.2 | 2015-2016 RHS |
| First Nations (off-reserve)* | 12+ | 8.7 | 10.3 | 2009-2010 CCHS |
| Inuit* | 15+ | 5.0 | NA | 2012 APS |
| Métis* | 12+ | 5.8 | 7.3 | 2009-2010 CCHS |
| First Nations in Manitoba+ (on-reserve) | 19+ | 24.4 | 20.8 | 2010 FNFNES |
| First Nations in Ontario+ (on-reserve) | 19+ | 26.5 | 24.3 | 2011-2012 FNFNES |
| First Nations in Alberta+ (on-reserve) | 19+ | 16.9 | 18.4 | 2013 FNFNES |
| First Nations in the Atlantic+ (on-reserve) | 19+ | 20.2 | 23.2 | 2014 FNFNES |
| First Nations in Saskatchewan+ (on-reserve) | 19+ | 19.0 | 18.1 | 2015 FNFNES |
| First Nations in Quebec+ (on-reserve) | 19+ | 24.5 | 17.4 | Current study |

*(Public Health Agency of Canada 2011) Diabetes in Canada: Facts and figures from a public health perspective. Table 6-1. Prevalence of self-reported diabetes† among First Nations, Inuit, and Métis individuals aged 12 years and older, Canada, 2006, 2008-2010, 2009-2010

+ Crude rates for FNFNES are weighted to reflect the regional population size according to sampling plan

‡ Age-standardized to the 1991 Canadian population.

CCHS= Canadian Community Health Survey

RHS= First Nations Regional Health Survey (2015/2016) (The First Nations Information Governance Centre (FNIGC) 2018a)

APS= Aboriginal Peoples Survey

FNFNES=First Nations Food, Nutrition and Environment Study, (Chan et al, 2012; 2014; 2016; 2017; 2018).

**Figure 11a. Percentage of First Nations adults in Quebec dieting (to lose weight) on the day before the interview, by gender**

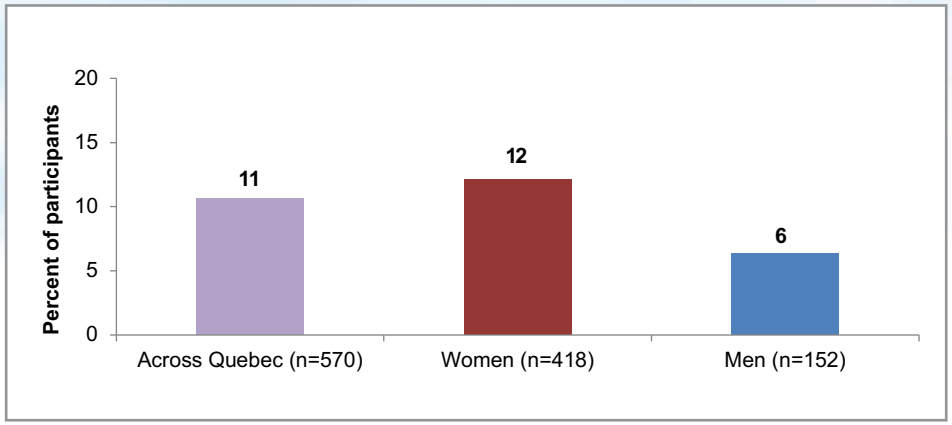



**Figure 12a. Percent of First Nations adults in Quebec who smoke, by region and ecozone**

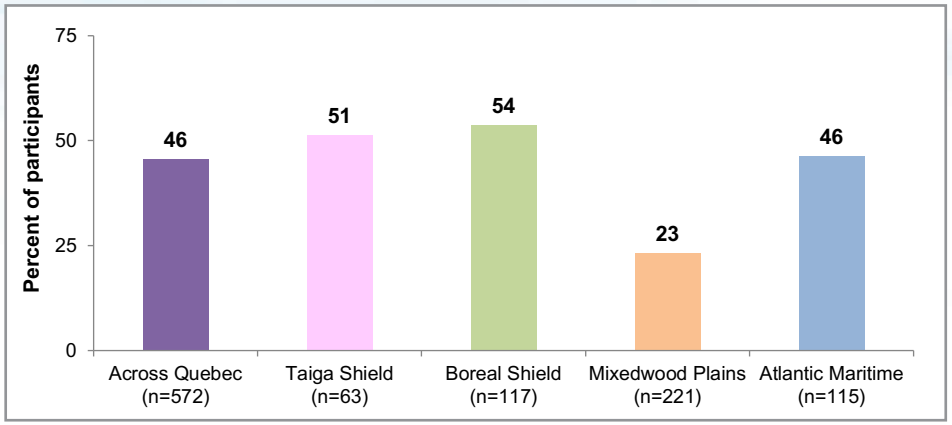



**Figure 11b. Percentage of First Nations adults in Quebec dieting (to lose weight) on the day before the interview, by gender and age group**

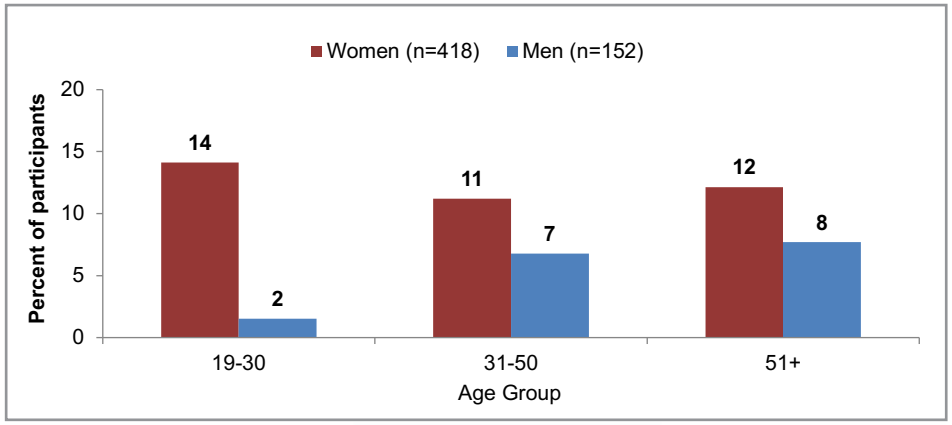
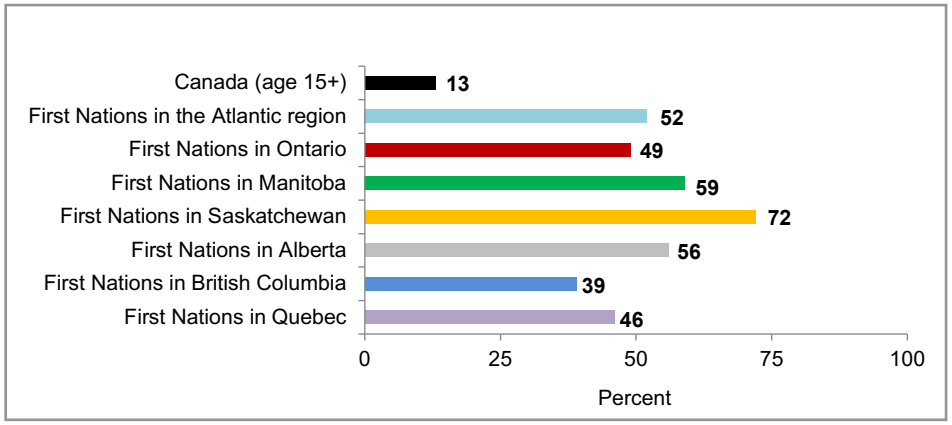
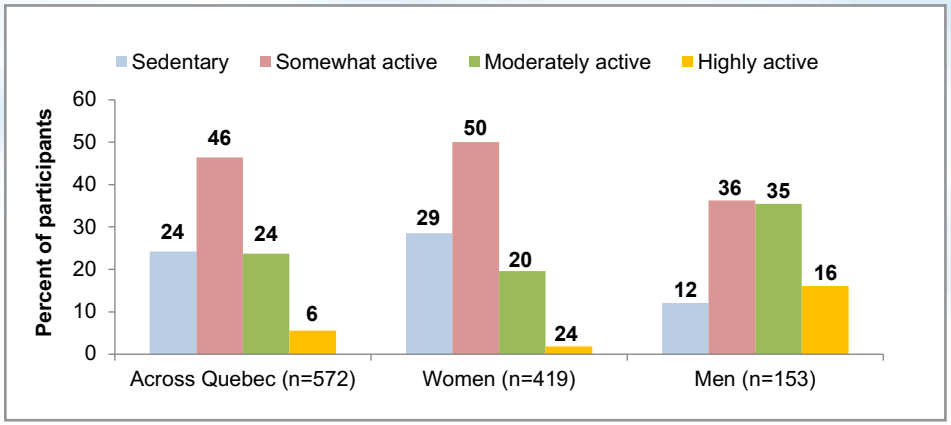



**Figure 12b. Smoking among First Nation adults in Quebec compared to other FNFNES regional findings and to the general Canadian population***



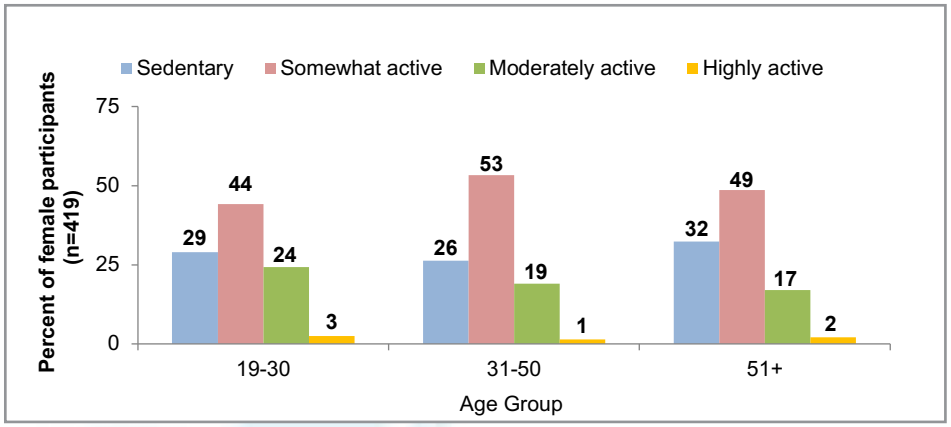

*Smoking rate for Canadians aged 15+ Reid et al. (2017. *Tobacco Use in Canada: Patterns and Trends.* Waterloo: Propel Centre for Population Health Impact, University of Waterloo.

## Figure 13a. Self-reported activity level in First Nations adults in Quebec+



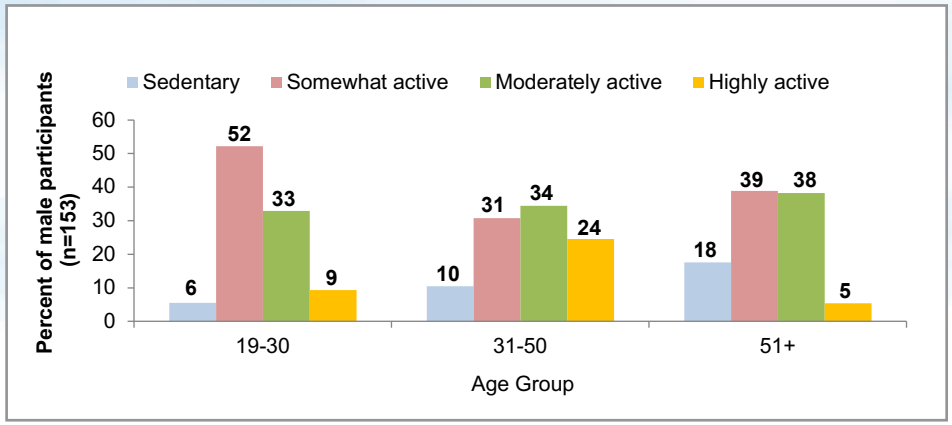

+Due to rounding, the percentage equals 101% for women and 99% for men.

## Figure 13b. Self-reported activity level in First Nations women in Quebec, by age group+




+Due to rounding, the percentage equals 99% for women aged 31-50.

## Figure 13c. Self-reported activity level in First Nations men in Quebec, by age group+




+Due to rounding, the percentage equals 99% for men aged 31-50.

**Figure 14a. Self-perceived health in First Nations adults in Quebec**

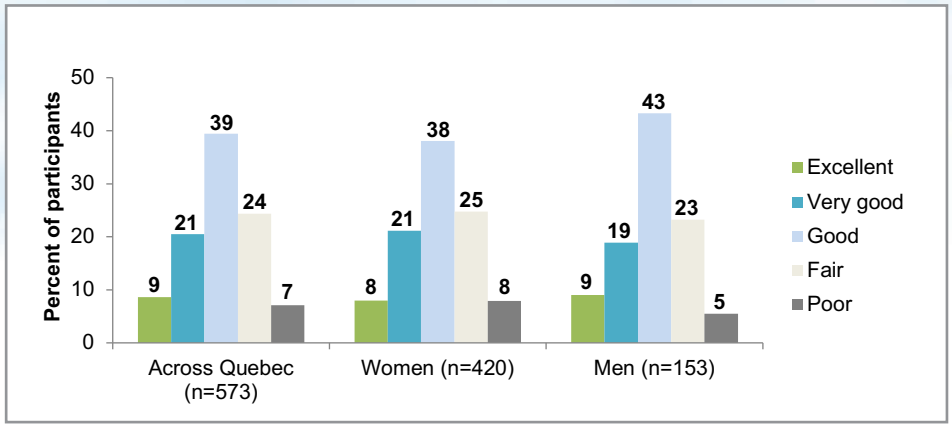



**Figure 14b. Self-perceived health in First Nations women in Quebec, by age group**

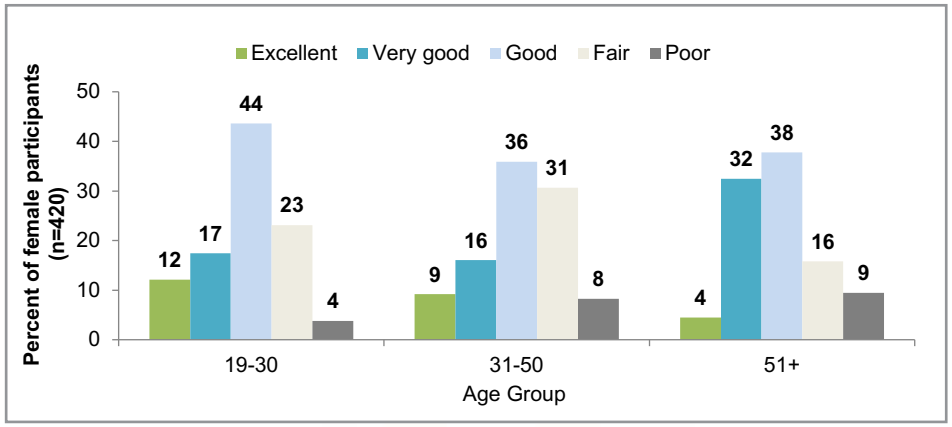



**Figure 14c. Self-perceived health in First Nations men in Quebec, by age group**

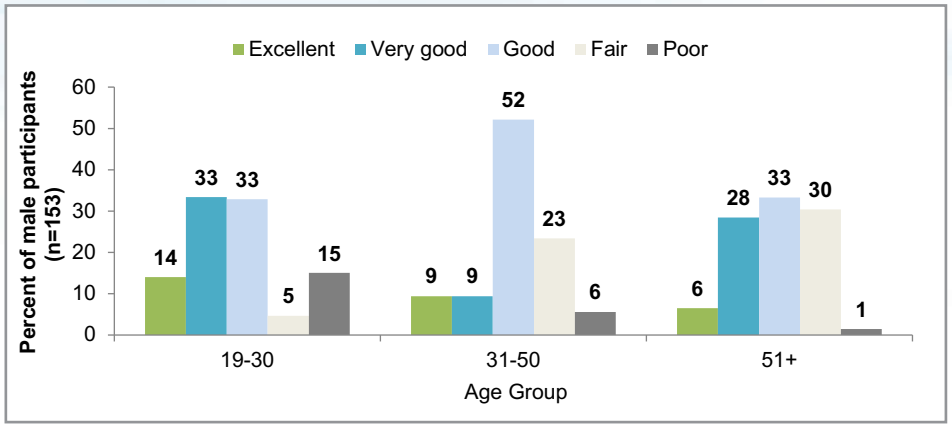


**Table 6. Percentage of First Nations adults consuming traditional foods in the past year, by ecozone area and for all First Nations in Quebec (n=573)**

| Traditional food | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | First Nations in Quebec (n=573) |
|---|---|---|---|---|---|
| **FISH** | **88** | **85** | **42** | **80** | **76** |
| Walleye (yellow pickerel) | 2 | 73 | 27 | 1 | 47 |
| Trout (all combined) | 86 | 44 | 13 | 32 | 42 |
| Lake trout | 75 | 38 | 3 | 9 | 33 |
| Sturgeon | 0 | 42 | 12 | 1 | 26 |
| Northern pike/ jackfish | 18 | 24 | 2 | 0 | 18 |
| Brook trout (speckle) | 41 | 12 | 3 | 9 | 14 |
| Atlantic salmon | 12 | 2 | 7 | 74 | 9 |
| Whitefish (lake, round) | 37 | 5 | 0 | 1 | 9 |
| Sauger | 0 | 13 | 2 | 0 | 7 |
| Rainbow trout | 8 | 2 | 8 | 25 | 5 |
| Arctic char | 19 | 0 | 0 | 0 | 3 |
| Cisco | 2 | 0 | 0 | 0 | 3 |
| Rainbow smelt | 0 | 2 | 0 | 22 | 3 |
| Cod | 4 | 0 | 0 | 28 | 3 |
| Brown trout | 1 | 4 | 0 | 0 | 2 |
| Smallmouth bass | 2 | 0 | 5 | 4 | 2 |
| Yellow perch | 0 | 0 | 10 | 0 | 2 |
| Bullhead (catfish) | 0 | 1 | 7 | 0 | 2 |
| Sucker | 11 | 1 | 0 | 0 | 2 |
| Haddock | 0 | 0 | 0 | 30 | 2 |
| Land-locked Atlantic salmon | 2 | 0 | 1 | 0 | 1 |
| Herring | 4 | 0 | 0 | 9 | 1 |
| Largemouth bass | 2 | 0 | 2 | 1 | 1 |
| White perch/bass | 0 | 0 | 2 | 1 | 1 |
| Striped bass | 3 | 0 | 0 | 11 | 1 |

**Table 6. Percentage of First Nations adults consuming traditional foods in the past year, by ecozone area and for all First Nations in Quebec (n=573)**

| Traditional food | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | First Nations in Quebec (n=573) |
|---|---|---|---|---|---|
| Pickerel (chain) | 0 | 1 | 1 | 3 | 1 |
| Channel catfish | 0 | 0 | 5 | 0 | 1 |
| Atlantic halibut | 0 | 0 | 0 | 14 | 1 |
| Sole/American plaice | 0 | 0 | 0 | 10 | 1 |
| Bluefin tuna | 0 | 0 | 0 | 14 | 1 |
| Pollock | 0 | 0 | 0 | 5 | 0 |
| Flounder | 0 | 0 | 0 | 3 | 0 |
| Mackerel | 0 | 0 | 1 | 2 | 0 |
| Capelin | 0 | 0 | 0 | 2 | 0 |
| Mooneye (flatfish) | 2 | 0 | 0 | 0 | 0 |
| American eel | 0 | 0 | 1 | 1 | 0 |
| Sunfish (pumpkin, blue) | 0 | 0 | 1 | 1 | 0 |
| Burbot (ling) | 1 | 0 | 1 | 0 | 0 |
| Cutthroat trout | 0 | 0 | 0 | 1 | 0 |
| Coho salmon | 0 | 0 | 0 | 1 | 0 |
| Shad | 0 | 0 | 0 | 1 | 0 |
| Carp | 0 | 0 | 1 | 0 | 0 |
| **SEAFOOD** | **9** | **3** | **5** | **76** | **9** |
| Lobster | 2 | 3 | 2 | 71 | 7 |
| Scallops | 0 | 3 | 0 | 36 | 4 |
| Shrimp | 4 | 0 | 2 | 51 | 4 |
| Mussels (saltwater) | 2 | 0 | 1 | 37 | 3 |
| Crab (snow, rock, Jonah) | 0 | 1 | 0 | 52 | 3 |
| Quahog clam | 0 | 0 | 0 | 9 | 1 |
| Soft clam | 0 | 0 | 0 | 20 | 1 |
| Oysters | 2 | 0 | 0 | 7 | 1 |
| Seal meat | 5 | 0 | 0 | 1 | 1 |
| Squid | 0 | 0 | 0 | 5 | 0 |
| Razor clam | 0 | 0 | 0 | 4 | 0 |

**Table 6. Percentage of First Nations adults consuming traditional foods in the past year, by ecozone area and for all First Nations in Quebec (n=573)**

| Traditional food | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | First Nations in Quebec (n=573) |
|---|---|---|---|---|---|
| Seal fat | 2 | 0 | 0 | 0 | 0 |
| Sea urchin | 1 | 0 | 0 | 0 | 0 |
| Other seafood (bar clams, beluga whale, crayfish, frogs) | 2 | 0 | 0 | 1 | 0 |
| **LAND MAMMALS** | **88** | **98** | **52** | **63** | **84** |
| Moose meat | 29 | 95 | 32 | 62 | 69 |
| Beaver meat | 22 | 71 | 3 | 1 | 44 |
| Hare or rabbit meat | 8 | 59 | 2 | 13 | 37 |
| Caribou meat | 82 | 33 | 3 | 1 | 32 |
| Black bear meat | 34 | 38 | 2 | 1 | 28 |
| Moose kidney | 0 | 45 | 0 | 1 | 26 |
| Black bear fat | 29 | 38 | 0 | 0 | 25 |
| Moose liver | 0 | 37 | 1 | 3 | 20 |
| Deer meat | 3 | 3 | 37 | 16 | 11 |
| Porcupine meat | 49 | 7 | 0 | 0 | 11 |
| Caribou kidney | 7 | 6 | 0 | 0 | 4 |
| Caribou liver | 6 | 1 | 0 | 0 | 2 |
| Muskrat meat | 5 | 1 | 3 | 1 | 2 |
| Deer liver | 0 | 0 | 4 | 3 | 1 |
| Other land mammals (caribou heart) | 2 | 1 | 1 | 1 | 1 |
| Deer kidney | 0 | 0 | 1 | 1 | 0 |
| Squirrel meat | 0 | 0 | 1 | 0 | 0 |
| **WILD BIRDS** | **84** | **72** | **15** | **9** | **59** |
| Canada goose | 78 | 68 | 9 | 2 | 54 |
| Grouse (spruce, ruffed, partridge) | 65 | 46 | 3 | 8 | 36 |
| Ptarmigan (willow, white-tailed, rock) | 78 | 37 | 0 | 0 | 33 |
| Ducks (all combined) | 26 | 28 | 5 | 1 | 22 |
| Goose grease | 32 | 16 | 0 | 0 | 14 |
| Mallard | 16 | 15 | 5 | 0 | 13 |

**Table 6. Percentage of First Nations adults consuming traditional foods in the past year, by ecozone area and for all First Nations in Quebec (n=573)**

| Traditional food | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | First Nations in Quebec (n=573) |
|---|---|---|---|---|---|
| Scoter | 1 | 18 | 0 | 0 | 10 |
| Long-tailed duck | 4 | 11 | 0 | 0 | 6 |
| American wigeon | 1 | 7 | 0 | 0 | 4 |
| Northern pintail | 1 | 7 | 1 | 0 | 4 |
| American black duck | 2 | 6 | 1 | 0 | 4 |
| Golden eye | 0 | 7 | 1 | 0 | 4 |
| Snow goose (blue goose) | 18 | 1 | 4 | 0 | 4 |
| Ruddy duck | 0 | 5 | 0 | 0 | 3 |
| Merganser | 5 | 4 | 0 | 0 | 3 |
| Canvasback | 1 | 4 | 0 | 0 | 2 |
| Loon | 7 | 0 | 0 | 0 | 1 |
| Wood duck | 4 | 0 | 1 | 1 | 1 |
| Northern shoveler | 5 | 0 | 0 | 0 | 1 |
| Teal | 1 | 0 | 2 | 0 | 1 |
| Eider (common, king) | 1 | 1 | 0 | 0 | 1 |
| Scaup | 3 | 0 | 0 | 0 | 1 |
| Wild turkey | 0 | 0 | 2 | 0 | 1 |
| Pheasant (ring-necked) | 0 | 1 | 0 | 0 | 1 |
| Harlequin duck | 0 | 1 | 0 | 0 | 1 |
| Gadwall | 0 | 0 | 1 | 0 | 0 |
| Bufflehead | 1 | 0 | 0 | 0 | 0 |
| BIRD EGGS (eider, seagull, herring gull, duck, goose, artic tern) | 8 | 1 | 0 | 0 | 2 |
| Other wild bird (black guillemot/sea pigeon, quail, seagull, swan) | 1 | 1 | 2 | 0 | 1 |

**Table 6. Percentage of First Nations adults consuming traditional foods in the past year, by ecozone area and for all First Nations in Quebec (n=573)**

| Traditional food | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | First Nations in Quebec (n=573) |
|---|---|---|---|---|---|
| **WILD BERRIES/FRUITS** | **80** | **89** | **56** | **68** | **79** |
| Blueberry | 77 | 89 | 30 | 43 | 71 |
| Raspberry (wild, tall) | 9 | 15 | 34 | 36 | 19 |
| Strawberry | 1 | 2 | 25 | 58 | 10 |
| Cranberry, mountain / lingonberry | 14 | 8 | 1 | 3 | 7 |
| Cloudberries (bakeapple) | 35 | 3 | 0 | 0 | 7 |
| Blackberry, large | 13 | 0 | 16 | 5 | 6 |
| Thimbleberries | 0 | 4 | 2 | 0 | 3 |
| Cranberry, bog | 2 | 0 | 0 | 5 | 2 |
| Black raspberry | 0 | 1 | 7 | 8 | 2 |
| Crabapple | 0 | 1 | 4 | 7 | 2 |
| Other berries, fruit | 0 | 0 | 7 | 8 | 2 |
| Crowberry | 4 | 0 | 0 | 0 | 1 |
| Highbush cranberry (Nannyberry, squashberry) | 1 | 0 | 2 | 0 | 1 |
| Elderberry | 0 | 0 | 2 | 1 | 1 |
| Trailing raspberry (dewberry) | 0 | 0 | 1 | 6 | 1 |
| Plum | 0 | 0 | 4 | 8 | 1 |
| Wild grapes | 0 | 0 | 4 | 0 | 1 |
| Rosehips | 0 | 0 | 1 | 2 | 0 |
| Cherry (pin, sand, chokecherry) | 0 | 0 | 2 | 1 | 0 |
| Kinnickinnick (bearberry) | 2 | 0 | 0 | 0 | 0 |
| Gooseberry | 0 | 0 | 0 | 2 | 0 |
| Buffalo berry (soapberry) | 1 | 0 | 0 | 0 | 0 |
| Teaberry (wintergreen, checkerberry) | 0 | 0 | 1 | 0 | 0 |
| Black huckleberry | 1 | 0 | 1 | 0 | 0 |
| Partridge berry (twinberry, pigeon plum) | 0 | 0 | 0 | 1 | 0 |
| Juneberry (service berry, shad-bush) | 0 | 0 | 1 | 0 | 0 |
| Currant | 0 | 0 | 0 | 1 | 0 |
| Sumac | 0 | 0 | 1 | 0 | 0 |

**Table 6. Percentage of First Nations adults consuming traditional foods in the past year, by ecozone area and for all First Nations in Quebec (n=573)**

| Traditional food | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | First Nations in Quebec (n=573) |
|---|---|---|---|---|---|
| **WILD PLANTS** | **70** | **18** | **26** | **75** | **31** |
| Labrador tea | 70 | 18 | 3 | 2 | 21 |
| Fiddleheads | 0 | 0 | 9 | 72 | 6 |
| Wild onion/chives | 0 | 0 | 11 | 4 | 3 |
| Mint | 0 | 0 | 5 | 9 | 2 |
| Dandelions | 0 | 0 | 6 | 6 | 2 |
| Wild leeks | 0 | 0 | 7 | 1 | 2 |
| Sunflower seeds | 0 | 0 | 3 | 4 | 1 |
| Wild ginger root | 0 | 0 | 2 | 2 | 1 |
| Wild rice | 0 | 0 | 1 | 2 | 0 |
| Groundnut | 0 | 0 | 1 | 0 | 0 |
| Stinging nettle | 0 | 0 | 1 | 1 | 0 |
| Burdock | 0 | 0 | 0 | 3 | 0 |
| Yarrow | 0 | 0 | 1 | 2 | 0 |
| Fireweed | 0 | 0 | 0 | 1 | 0 |
| Wintergreen leaves (teaberry) | 0 | 0 | 1 | 0 | 0 |
| Rat root (wihkes, sweet flag) | 0 | 0 | 1 | 1 | 0 |
| Ginseng | 0 | 0 | 0 | 1 | 0 |
| Pitcher plant (turtle socks) | 0 | 0 | 2 | 0 | 0 |
| Arrowhead | 0 | 0 | 0 | 1 | 0 |
| Other wild plants (rhubarb, bear root tea, cow vetch and sweet clover, fennel, horsetail tea, lavender, red clover, wild carrot, red willow) | 0 | 0 | 4 | 1 | 1 |

**Table 6. Percentage of First Nations adults consuming traditional foods in the past year, by ecozone area and for all First Nations in Quebec (n=573)**

| Traditional food | Taiga Shield (n=63) | Boreal Shield (n=118) | Mixedwood Plains (n=221) | Atlantic Maritime (n=115) | First Nations in Quebec (n=573) |
|---|---|---|---|---|---|
| **TREE FOODS** | **7** | **33** | **36** | **59** | **30** |
| Cedar tea | 0 | 23 | 8 | 4 | 14 |
| Maple syrup | 0 | 5 | 32 | 53 | 13 |
| Tamarack bark tea | 5 | 11 | 0 | 0 | 6 |
| Birch twig tea | 0 | 5 | 0 | 0 | 3 |
| Alder tea | 0 | 5 | 0 | 1 | 3 |
| Hazelnuts | 0 | 0 | 2 | 31 | 2 |
| Black walnut | 0 | 1 | 1 | 3 | 1 |
| Maple bark tea | 0 | 2 | 0 | 0 | 1 |
| Juniper tea | 0 | 1 | 0 | 0 | 1 |
| White pine needle tea | 1 | 0 | 5 | 0 | 1 |
| Spruce, white tea | 1 | 1 | 0 | 1 | 1 |
| Spruce, black tea | 4 | 0 | 0 | 1 | 1 |
| Acorns | 0 | 0 | 1 | 2 | 0 |
| Birch syrup tea | 0 | 0 | 1 | 2 | 0 |
| Eastern hemlock tea | 0 | 0 | 0 | 1 | 0 |
| Other tree foods (fir needle tea, maple sap, willow sap, maple water, raw hemlock leaves) | 0 | 0 | 1 | 0 | 0 |
| **MUSHROOMS** | **0** | **0** | **2** | **6** | **1** |
| Morel | 0 | 0 | 1 | 0 | 0 |
| Chanterelle | 0 | 0 | 1 | 1 | 0 |
| Other mushrooms (chaga, puffball) | 0 | 0 | 1 | 8 | 1 |
| **CULTIVATED TRADITIONAL FOODS** | **0** | **1** | **61** | **49** | **17** |
| Corn/hominy | 0 | 1 | 36 | 36 | 11 |
| Beans | 0 | 0 | 45 | 28 | 12 |
| Squash | 0 | 0 | 33 | 26 | 9 |
| Other cultivated traditional food (backyard chicken eggs, beets, turnip) | 0 | 0 | 9 | 1 | 2 |

**Table 7a. Yearly and seasonal frequency of use of top ten traditional food items among First Nations adults in Quebec**

| Traditional food | Participants | Percentage of participants* | Days per year and season - Average (95th percentile) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Year | Summer | Spring | Winter | Fall |
| Blueberry | Total participants | 100 | 9 (30) | 5 (30) | 1 (5) | 1 (5) | 2 (10) |
| | Consumers only | 71 | 13 (41) | 8 (30) | 1 (6) | 2 (5) | 3 (10) |
| Moose meat | Total participants | 100 | 23 (80) | 6 (30) | 5 (20) | 5 (20) | 7 (25) |
| | Consumers only | 69 | 33 (90) | 9 (40) | 7 (30) | 7 (25) | 10 (30) |
| Canada goose | Total participants | 100 | 8 (36) | 2 (10) | 4 (20) | 1 (5) | 1 (6) |
| | Consumers only | 54 | 15 (42) | 4 (12) | 7 (20) | 2 (6) | 2 (6) |
| Trout, all | Total participants | 100 | 6 (40) | 3 (18) | 1 (7) | 1 (4) | 1 (6) |
| | Consumers only | 42 | 15 (69) | 8 (40) | 3 (12) | 1 (6) | 3 (12) |
| Ptarmigan (willow, white-tailed, rock) | Total participants | 100 | 6 (30) | 1 (3) | 1 (6) | 3 (20) | 1 (7) |
| | Consumers only | 33 | 17 (46) | 2 (10) | 3 (12) | 10 (30) | 3 (12) |
| Caribou meat | Total participants | 100 | 5 (32) | 1 (5) | 1 (9) | 2 (9) | 1 (5) |
| | Consumers only | 32 | 17 (100) | 3 (12) | 5 (30) | 6 (30) | 3 (20) |
| Walleye (yellow pickerel) | Total participants | 100 | 5 (22) | 3 (12) | 1 (6) | 0.4 (2) | 1 (4) |
| | Consumers only | 47 | 11 (50) | 6 (25) | 2 (12) | 1 (6) | 2 (6) |
| Black bear fat | Total participants | 100 | 4 (28) | 2 (12) | 1 (10) | 1 (5) | 1 (5) |
| | Consumers only | 25 | 17 (32) | 6 (20) | 4 (12) | 3 (10) | 4 (12) |
| Labrador Tea | Total participants | 100 | 12 (40) | 3 (20) | 3 (20) | 3 (4) | 3 (20) |
| | Consumers only | 21 | 56 (288) | 16 (72) | 14 (72) | 12 (72) | 14 (72) |
| Cedar tea | Total participants | 100 | 4 (12) | 1 (4) | 1 (2) | 1 (2) | 1 (6) |
| | Consumers only | 14 | 28 (120) | 6 (30) | 7 (30) | 6 (39) | 8 (30) |

Note: for the purpose of this report, the year is divided into 4 seasons of 90 days each.

*The frequency is calculated for the total participants (100% of participants) and for consumers only (percentage of participants who reported eating a food item).

## Table 7b. Yearly and seasonal frequency of use of top ten traditional food items by adults in the Taiga Shield

| Traditional food | Participants | Percentage of participants* | Days per year and season - Average (95th percentile) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Year | Summer | Spring | Winter | Fall |
| Trout, all | Total participants | 100 | 15 (62) | 4 (18) | 5 (24) | 2 (12) | 3 (12) |
| | Consumers only | 86 | 17 (62) | 5 (24) | 6 (24) | 3 (12) | 4 (12) |
| Caribou meat | Total participants | 100 | 24 (100) | 4 (24) | 7 (40) | 8 (54) | 5 (20) |
| | Consumers only | 82 | 29 (109) | 5 (24) | 9 (54) | 9 (54) | 6 (30) |
| Canada goose | Total participants | 100 | 17 (60) | 6 (30) | 6 (30) | 2 (12) | 3 (12) |
| | Consumers only | 78 | 22 (78) | 7 (30) | 8 (30) | 3 (12) | 4 (12) |
| Ptarmigan (willow, white-tailed, rock) | Total participants | 100 | 16 (60) | 3 (12) | 4 (20) | 7 (20) | 3 (12) |
| | Consumers only | 78 | 20 (78) | 3 (12) | 5 (20) | 8 (30) | 4 (12) |
| Blueberry | Total participants | 100 | 9 (30) | 5 (12) | 1 (6) | 1 (3) | 3 (12) |
| | Consumers only | 77 | 11 (42) | 6 (15) | 1 (6) | 1 (4) | 3 (12) |
| Labrador Tea | Total participants | 100 | 68 (330) | 19 (90) | 16 (90) | 16 (90) | 16 (90) |
| | Consumers only | 70 | 96 (360) | 27 (90) | 23 (90) | 23 (90) | 22 (90) |
| Grouse (spruce, ruffed, partridge) | Total participants | 100 | 7 (25) | 2 (10) | 1 (10) | 1 (6) | 2 (12) |
| | Consumers only | 65 | 10 (40) | 3 (12) | 2 (12) | 2 (10) | 3 (12) |
| Whitefish (lake, round) | Total participants | 100 | 4 (18) | 1 (6) | 1 (6) | 1 (4) | 1 (6) |
| | Consumers only | 37 | 12 (48) | 3 (12) | 3 (12) | 2 (12) | 3 (12) |
| Goose grease | Total participants | 100 | 11 (72) | 3 (12) | 4 (30) | 2 (10) | 2 (12) |
| | Consumers only | 32 | 34 (74) | 10 (30) | 13 (30) | 5 (10) | 6 (30) |
| Black bear fat | Total participants | 100 | 9 (50) | 2 (12) | 2 (12) | 2 (10) | 2 (15) |
| | Consumers only | 29 | 31 (120) | 8 (30) | 8 (30) | 7 (30) | 8 (30) |

Note: for the purpose of this report, the year is divided into 4 seasons of 90 days each.

*The frequency is calculated for the total participants (100% of participants) and for consumers only (percentage of participants who reported eating a food item).

## Table 7c. Yearly and seasonal frequency of use of top ten traditional food items by adults in the Boreal Shield

| Traditional food | Participants | Percentage of participants* | Days per year and season - Average (95th percentile) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Year | Summer | Spring | Winter | Fall |
| Moose meat | Total participants | 100 | 38 (120) | 10 (40) | 9 (30) | 8 (25) | 11 (30) |
| | Consumers only | 95 | 40 (120) | 11 (40) | 9 (30) | 8 (25) | 11 (30) |
| Blueberry | Total participants | 100 | 11 (30) | 7 (30) | 1 (5) | 1 (5) | 2 (10) |
| | Consumers only | 89 | 13 (41) | 8 (36) | 1 (6) | 1 (5) | 2 (10) |
| Walleye (yellow pickerel) | Total participants | 100 | 8 (48) | 5 (25) | 2 (6) | 1 (2) | 1 (5) |
| | Consumers only | 73 | 12 (50) | 7 (30) | 2 (6) | 1 (3) | 2 (5) |
| Beaver meat | Total participants | 100 | 5 (12) | 1 (4) | 1 (2) | 2 (5) | 2 (6) |
| | Consumers only | 71 | 7 (12) | 1 (6) | 1 (2) | 2 (5) | 2 (6) |
| Canada goose | Total participants | 100 | 8 (36) | 2 (10) | 4 (20) | 1 (4) | 1 (5) |
| | Consumers only | 68 | 12 (36) | 3 (10) | 6 (20) | 1 (5) | 2 (5) |
| Trout, all | Total participants | 100 | 6 (40) | 5 (40) | 0.4 (1) | 0.3 (3) | 1 (5) |
| | Consumers only | 44 | 14 (69) | 10 (40) | 1 (7) | 1 (5) | 2 (9) |
| Black bear fat | Total participants | 100 | 6 (30) | 2 (12) | 1 (10) | 1 (5) | 1 (5) |
| | Consumers only | 38 | 15 (32) | 6 (20) | 3 (12) | 2 (5) | 3 (12) |
| Ptarmigan (willow, white-tailed, rock) | Total participants | 100 | 6 (26) | 0.2 (2) | 1 (3) | 4 (20) | 1 (5) |
| | Consumers only | 37 | 15 (46) | 1 (5) | 2 (6) | 11 (30) | 2 (7) |
| Ducks, all | Total participants | 100 | 5 (14) | 0.3 (2) | 4 (9) | 0 (0) | 1 (1) |
| | Consumers only | 28 | 19 (88) | 1 (2) | 14 (66) | 0 (0) | 3 (22) |
| Cedar tea | Total participants | 100 | 7 (24) | 2 (6) | 2 (6) | 2 (6) | 2 (12) |
| | Consumers only | 23 | 31 (216) | 7 (54) | 7 (54) | 7 (54) | 9 (54) |

Note: for the purpose of this report, the year is divided into 4 seasons of 90 days each.

*The frequency is calculated for the total participants (100% of participants) and for consumers only (percentage of participants who reported eating a food item).

## Table 7d. Yearly and seasonal frequency of use of top ten traditional food items by adults in the Mixedwood Plains

| Traditional food | Participants | Percentage of participants* | Days per year and season - Average (95th percentile) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Year | Summer | Spring | Winter | Fall |
| Deer meat | Total participants | 100 | 11 (48) | 3 (12) | 3 (12) | 3 (12) | 3 (30) |
| | Consumers only | 37 | 30 (216) | 7 (54) | 7 (54) | 7 (54) | 8 (54) |
| Maple syrup | Total participants | 100 | 10 (54) | 2 (13) | 4 (24) | 2 (13) | 2 (12) |
| | Consumers only | 32 | 32 (96) | 6 (24) | 13 (54) | 7 (24) | 6 (24) |
| Squash | Total participants | 100 | 8 (48) | 3 (30) | 1 (3) | 1 (4) | 3 (24) |
| | Consumers only | 33 | 24 (144) | 9 (36) | 3 (36) | 4 (36) | 8 (36) |
| Beans | Total participants | 100 | 6 (48) | 4 (24) | 0.5 (3) | 1 (3) | 2 (12) |
| | Consumers only | 45 | 14 (56) | 8 (30) | 1 (12) | 2 (12) | 4 (24) |
| Corn/hominy | Total participants | 100 | 6 (30) | 3 (30) | 1 (6) | 1 (6) | 1 (12) |
| | Consumers only | 36 | 16 (60) | 9 (30) | 2 (12) | 2 (12) | 4 (30) |
| Raspberry | Total participants | 100 | 6 (48) | 4 (30) | 0.4 (0) | 0.3 (0) | 1 (2) |
| | Consumers only | 34 | 17 (72) | 13 (72) | 1 (12) | 1 (12) | 2 (12) |
| Blueberry | Total participants | 100 | 5 (30) | 2 (12) | 1 (3) | 1 (4) | 1 (6) |
| | Consumers only | 30 | 17 (60) | 7 (30) | 3 (12) | 3 (12) | 4 (21) |
| Moose meat | Total participants | 100 | 4 (24) | 1 (2) | 1 (3) | 1 (6) | 2 (6) |
| | Consumers only | 32 | 12 (60) | 2 (6) | 2 (10) | 3 (30) | 5 (30) |
| Strawberry | Total participants | 100 | 4 (24) | 3 (21) | 0.3 (0) | 0.3 (0) | 0.4 (0) |
| | Consumers only | 25 | 15 (72) | 12 (72) | 1 (4) | 1 (4) | 2 (24) |
| Blackberry | Total participants | 100 | 3 (16) | 3 (9) | 0.1 (0) | 0.1 (0) | 0.2 (0) |
| | Consumers only | 16 | 19 (72) | 17 (72) | 0.4 (4) | 0.4 (4) | 1 (4) |

Note: for the purpose of this report, the year is divided into 4 seasons of 90 days each.

*The frequency is calculated for the total participants (100% of participants) and for consumers only (percentage of participants who reported eating a food item).

**Table 7e. Yearly and seasonal frequency of use of top ten traditional food items by adults in the Atlantic Maritime**

| Traditional food | Participants | Percentage of participants* | Days per year and season - Average (95th percentile) | | | | |
|---|---|---|---|---|---|---|---|
| | | | Year | Summer | Spring | Winter | Fall |
| Atlantic salmon | Total participants | 100 | 8 (20) | 3 (12) | 1 (5) | 1 (5) | 1 (5) |
| | Consumers only | 74 | 10 (24) | 5 (15) | 2 (5) | 2 (5) | 2 (5) |
| Fiddleheads | Total participants | 100 | 7 (22) | 2 (6) | 3 (10) | 1 (4) | 1 (3) |
| | Consumers only | 72 | 10 (25) | 3 (8) | 4 (10) | 2 (5) | 2 (4) |
| Lobster | Total participants | 100 | 5 (21) | 2 (9) | 1 (3) | 0.3 (2) | 2 (12) |
| | Consumers only | 71 | 8 (27) | 3 (20) | 1 (4) | 0.5 (3) | 3 (14) |
| Moose meat | Total participants | 100 | 13 (65) | 2 (10) | 2 (10) | 5 (25) | 5 (24) |
| | Consumers only | 62 | 21 (144) | 3 (15) | 3 (15) | 8 (36) | 8 (36) |
| Wild Strawberry | Total participants | 100 | 8 (20) | 3 (10) | 1 (3) | 1 (3) | 2 (3) |
| | Consumers only | 58 | 14 (24) | 6 (20) | 3 (5) | 3 (5) | 3 (5) |
| Maple syrup | Total participants | 100 | 5 (24) | 1 (6) | 1 (8) | 2 (6) | 1 (6) |
| | Consumers only | 53 | 10 (28) | 2 (6) | 3 (10) | 4 (10) | 2 (6) |
| Shrimp | Total participants | 100 | 5 (20) | 2 (8) | 1 (5) | 1 (5) | 1 (5) |
| | Consumers only | 51 | 10 (27) | 4 (15) | 2 (9) | 2 (7) | 2 (6) |
| Blueberry | Total participants | 100 | 12 (36) | 4 (15) | 3 (9) | 3 (9) | 3 (10) |
| | Consumers only | 43 | 29 (192) | 9 (48) | 7 (48) | 6 (48) | 7 (48) |
| Raspberry | Total participants | 100 | 6 (10) | 2 (8) | 1 (1) | 1 (1) | 1 (2) |
| | Consumers only | 36 | 18 (192) | 7 (48) | 4 (48) | 4 (48) | 4 (48) |
| Wild onion/chives | Total participants | 100 | 5 (0) | 1 (0) | 1 (0) | 1 (0) | 1 (0) |
| | Consumers only | 4 | 122 (226) | 35 (54) | 28 (54) | 31 (64) | 29 (54) |

Note: for the purpose of this report, the year is divided into 4 seasons of 90 days each.

*The frequency is calculated for the total participants (100% of participants) and for consumers only (percentage of participants who reported eating a food item).

**Table 8. Average portion size for traditional food categories, as reported from 24-hour recalls, by gender and age group for First Nations adults in Quebec, unweighted**

| Traditional food category | First Nations Women | | | First Nations Men | | |
|---|---|---|---|---|---|---|
| | Age 19-50 | Age 51-70 | Age 71+ | Age 19-50 | Age 51-70 | Age 71+ |
| | Mean grams/serving | | | Mean grams/serving | | |
| Fish and seafood[a] | 106 | 106 | 106 | 106 | 106 | 106 |
| Land mammals meat[b] | 142 | 109 | 128 | 167 | 170 | 170 |
| Land mammals, organs[a] | 62 | 62 | 62 | 62 | 62 | 62 |
| Land mammal fat[c] | 43 | 43 | 43 | 43 | 43 | 43 |
| Wild birds[a] | 125 | 125 | 125 | 125 | 125 | 125 |
| Bird egg (goose)[d] | 144 | 144 | 144 | 144 | 144 | 144 |
| Bird egg (duck)[d] | 70 | 70 | 70 | 70 | 70 | 70 |
| Wild berries[a] | 70 | 70 | 70 | 70 | 70 | 70 |
| Wild plants, roots, or greens[c] | 160 | 160 | 160 | 160 | 160 | 160 |
| Teas from plants and trees[a] | 5 | 5 | 5 | 5 | 5 | 5 |
| Tree foods (wild apples and pears)[e] | 139 | 139 | 139 | 139 | 139 | 139 |
| Maple syrup[f] | 51 | 51 | 51 | 51 | 51 | 51 |
| Mushrooms[g] | 48 | 48 | 48 | 48 | 48 | 48 |

Notes:

Only 18% of the 24-hour recalls contained traditional food. Therefore, portion sizes are based on the number of occasions of consumption in the sample.

[a] portion sizes calculated from values for all consumers due to the low number of observations

[b] portion sizes calculated by gender and age groups of consumers, with the exception of age 71+ for women and age >50 for men, which were based on values by gender due to low number of observations for these age groups

[c] only 1 observation from Quebec therefore used average of portion sizes from Chan et al 2011, 2012, 2014, 2016 and 2018.

[d] none reported to be consumed on 24-hour recalls therefore used portion size from Canadian nutrient file values for one goose egg and one duck egg; Health Canada, 2010.

[e] only 2 observations of tree foods reported to be consumed on Quebec 24-hour recalls (wild apple) therefore used portion size from Canadian nutrient file values for one apple; Health Canada, 2010.

[f] none reported consumed on Quebec 24-hour recalls therefore used portion size values from Chan et al, 2014 (Ontario) and 2017 (Atlantic region).

[g] none reported consumed on Quebec 24-hour recalls therefore used portion size values from Chan et al, 2011 (British Columbia).

**Table 9a. Daily intake (average and 95th percentile) of traditional food (grams) for all adults and consumers only, by gender and age group**

| Food category | Adults | Intake level | Women | | Men | | All First Nations in Quebec (n=573) |
|---|---|---|---|---|---|---|---|
| | | | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| TOTAL TRADITIONAL FOOD | All | Average | 31.5 | 33.6 | 57.6 | 35.4 | 36.9 |
| | | 95th pctile | 106.5 | 132.2 | 138.6 | 120.7 | 112.8 |
| | Consumers only | Average | 32.7 | 36.0 | 58.0 | 37.6 | 38.4 |
| | | 95th pctile | 109.1 | 158.7 | 138.6 | 120.7 | 120.7 |
| FISH | All | Average | 3.9 | 5.8 | 7.7 | 9.8 | 5.5 |
| | | 95th pctile | 13.9 | 26.1 | 23.5 | 38.9 | 20.9 |
| | Consumers only | Average | 5.2 | 8.2 | 8.7 | 13.9 | 7.2 |
| | | 95th pctile | 14.8 | 27.9 | 23.5 | 52.3 | 26.7 |
| SEAFOOD | All | Average | 0.5 | 0.6 | 0.2 | 0.5 | 0.5 |
| | | 95th pctile | 2.0 | 2.6 | 1.2 | 3.5 | 2.0 |
| | Consumers only | Average | 5.6 | 6.4 | 2.8 | 5.3 | 5.3 |
| | | 95th pctile | 22.7 | 20.6 | 9.3 | 13.4 | 20.6 |
| GAME MEAT | All | Average | 12.3 | 9.5 | 22.4 | 13.0 | 13.6 |
| | | 95th pctile | 39.3 | 44.2 | 86.9 | 46.1 | 49.9 |
| | Consumers only | Average | 14.6 | 12.2 | 24.6 | 15.8 | 16.1 |
| | | 95th pctile | 42.4 | 44.2 | 131.8 | 46.1 | 49.9 |
| GAME ORGANS | All | Average | 1.4 | 0.2 | 0.5 | 0.4 | 0.9 |
| | | 95th pctile | 8.2 | 0.9 | 2.0 | 4.1 | 4.1 |
| | Consumers only | Average | 4.0 | 0.9 | 1.0 | 1.1 | 2.6 |
| | | 95th pctile | 20.4 | 5.1 | 4.1 | 4.1 | 8.2 |
| BIRDS | All | Average | 5.7 | 4.3 | 17.0 | 4.5 | 7.3 |
| | | 95th pctile | 29.5 | 21.4 | 53.4 | 14.4 | 35.9 |
| | Consumers only | Average | 9.4 | 9.1 | 24.3 | 8.8 | 12.4 |
| | | 95th pctile | 41.1 | 25.0 | 53.4 | 53.4 | 53.4 |
| BERRIES/ PLANTS | All | Average | 3.7 | 7.7 | 4.6 | 4.6 | 4.8 |
| | | 95th pctile | 11.3 | 32.1 | 13.3 | 9.5 | 13.4 |
| | Consumers only | Average | 4.2 | 9.5 | 5.1 | 5.6 | 5.6 |
| | | 95th pctile | 11.3 | 53.6 | 14.6 | 11.1 | 16.0 |

See Appendix F for conversion from usual household measures to grams

**Table 9b. Daily average and high (95th percentile) gram consumption of traditional food by category and top three species by category (based on seasonal frequency), for consumers only**

| Category | Intake level | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | Total |
| **TOTAL TRADITIONAL FOOD** | Average | 33.6 | 51.5 | 38.4 |
| | 95th pctile | 112.2 | 128.0 | 120.7 |
| **FISH** | Average | 6.0 | 10.2 | 7.2 |
| | 95th pctile | 20.9 | 38.9 | 26.7 |
| Walleye (yellow pickerel) | Average | 2.7 | 4.4 | 3.2 |
| | 95th pctile | 7.0 | 14.5 | 14.5 |
| All trout | Average | 4.1 | 4.6 | 4.3 |
| | 95th pctile | 13.9 | 26.1 | 20.0 |
| Sturgeon | Average | 2.2 | 3.0 | 2.6 |
| | 95th pctile | 15.7 | 9.0 | 9.0 |
| **SEAFOOD** | Average | 5.9 | 3.6 | 5.3 |
| | 95th pctile | 22.7 | 13.4 | 20.6 |
| Lobster | Average | 2.4 | 1.9 | 2.2 |
| | 95th pctile | 7.8 | 6.4 | 7.3 |
| Scallops | Average | 1.8 | 1.3 | 1.7 |
| | 95th pctile | 6.1 | 2.9 | 5.8 |
| Shrimp | Average | 2.8 | 1.6 | 2.6 |
| | 95th pctile | 7.8 | 4.4 | 7.8 |
| **GAME MEAT** | Average | 13.9 | 21.8 | 16.1 |
| | 95th pctile | 44.2 | 71.8 | 49.9 |
| Moose meat | Average | 10.6 | 19.5 | 12.9 |
| | 95th pctile | 35.0 | 54.9 | 36.6 |
| Beaver meat | Average | 2.1 | 3.7 | 2.6 |
| | 95th pctile | 9.3 | 5.5 | 5.5 |
| Hare or rabbit meat | Average | 1.9 | 3.6 | 2.5 |
| | 95th pctile | 7.2 | 8.2 | 8.2 |

| Category | Intake level | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | Total |
| **GAME ORGANS** | Average | 3.3 | 1.0 | 2.6 |
| | 95th pctile | 9.3 | 4.1 | 8.2 |
| Moose kidney | Average | 2.0 | 0.3 | 1.5 |
| | 95th pctile | 4.1 | 0.7 | 4.1 |
| Moose liver | Average | 2.5 | 0.8 | 2.1 |
| | 95th pctile | 20.4 | 4.1 | 5.1 |
| Caribou kidney | Average | 0.3 | 0.9 | 0.8 |
| | 95th pctile | 0.9 | 2.0 | 2.0 |
| **BIRDS** | Average | 9.3 | 20.2 | 12.4 |
| | 95th pctile | 37.0 | 53.4 | 53.4 |
| Canada goose | Average | 4.9 | 5.3 | 5.0 |
| | 95th pctile | 17.1 | 13.7 | 14.4 |
| Grouse (spruce, ruffed, partridge) | Average | 2.2 | 4.2 | 2.9 |
| | 95th pctile | 7.5 | 12.3 | 8.2 |
| Ptarmigan (willow, white-tailed, rock) | Average | 5.2 | 6.6 | 5.8 |
| | 95th pctile | 17.1 | 15.8 | 15.8 |
| **BERRIES/PLANTS** | Average | 5.7 | 5.3 | 5.6 |
| | 95th pctile | 17.3 | 13.6 | 16.0 |
| Blueberry | Average | 2.2 | 3.4 | 2.5 |
| | 95th pctile | 5.8 | 7.9 | 7.9 |
| Raspberry | Average | 2.3 | 1.2 | 2.0 |
| | 95th pctile | 9.2 | 5.8 | 9.2 |
| Strawberry | Average | 2.9 | 1.3 | 2.6 |
| | 95th pctile | 13.8 | 5.8 | 13.8 |

**Table 10a. Daily average and high (95th percentile) gram consumption of traditional food by category and ecozone, for consumers only**

| Food Category | Intake level | Traditional food consumers | | | | |
|---|---|---|---|---|---|---|
| | | All First Nations in Quebec | Taiga Shield | Boreal Shield | Mixedwood Plains | Atlantic Maritime |
| TOTAL TRADITIONAL FOOD | Average | 38.4 | 41.7 | 40.4 | 33.5 | 37.8 |
| | 95th pctile | 120.7 | 135.5 | 111.5 | 138.6 | 166.9 |
| FISH | Average | 7.2 | 8.0 | 7.3 | 5.9 | 8.4 |
| | 95th pctile | 26.7 | 45.3 | 26.7 | 21.8 | 30.8 |
| SEAFOOD | Average | 5.3 | 2.7 | 4.1 | 2.1 | 7.3 |
| | 95th pctile | 20.6 | 6.5 | 13.4 | 16.3 | 22.9 |
| GAME MEAT | Average | 16.1 | 12.1 | 18.9 | 12.6 | 9.6 |
| | 95th pctile | 49.9 | 42.4 | 49.9 | 54.9 | 56.4 |
| GAME ORGANS | Average | 2.6 | 3.5 | 2.7 | 2.0 | 1.8 |
| | 95th pctile | 8.2 | 9.3 | 8.2 | 20.4 | 6.3 |
| BIRDS | Average | 12.4 | 18.4 | 11.5 | 6.4 | 0.7 |
| | 95th pctile | 53.4 | 56.7 | 53.4 | 41.1 | 1.7 |
| BERRIES/PLANTS | Average | 5.6 | 4.1 | 2.9 | 13.0 | 16.0 |
| | 95th pctile | 16.0 | 18.5 | 8.3 | 56.2 | 34.3 |

**Table 10b. Average and high (95th percentile) grams of traditional food consumed per day by category and by top 3 species per category, for consumers only, Taiga Shield**

| Taiga Shield | | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | All |
| **TOTAL TRADITIONAL FOOD** | Average | 48.3 | 27.7 | 41.7 |
| | 95th pctile | 146.7 | 77.6 | 135.5 |
| **FISH** | Average | 7.8 | 8.4 | 8.0 |
| | 95th pctile | 45.3 | 52.3 | 45.3 |
| All trout | Average | 4.7 | 5.9 | 5.1 |
| | 95th pctile | 18.0 | 27.9 | 18.0 |
| Whitefish (lake, round) | Average | 3.8 | 1.8 | 3.5 |
| | 95th pctile | 13.9 | 3.5 | 13.9 |
| Arctic char | Average | 1.3 | 0.6 | 1.2 |
| | 95th pctile | 4.4 | 0.6 | 4.4 |
| **SEAFOOD/ SEA MAMMALS** | Average | 2.6 | 3.5 | 2.7 |
| | 95th pctile | 6.5 | 3.5 | 6.5 |
| Seal meat | Average | 0.8 | . | 0.8 |
| | 95th pctile | 1.7 | . | 1.7 |
| Shrimp | Average | 1.1 | . | 1.1 |
| | 95th pctile | 1.7 | . | 1.7 |
| Lobster | Average | 0.0 | 3.5 | 3.5 |
| | 95th pctile | 0.0 | 3.5 | 3.5 |
| **GAME MEAT** | Average | 15.4 | 5.7 | 12.1 |
| | 95th pctile | 42.4 | 22.4 | 42.4 |
| Caribou meat | Average | 13.3 | 5.9 | 11.1 |
| | 95th pctile | 42.4 | 22.4 | 42.4 |
| Porcupine meat | Average | 2.0 | 1.5 | 1.8 |
| | 95th pctile | 9.0 | 3.7 | 3.9 |
| Black bear meat | Average | 2.8 | 0.8 | 2.6 |
| | 95th pctile | 9.3 | 0.9 | 7.5 |

| Taiga Shield | | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | All |
| **GAME ORGANS** | Average | 3.9 | 3.1 | 3.5 |
| | 95th pctile | 9.3 | 4.1 | 9.3 |
| Caribou kidney | Average | 0.2 | 1.7 | 1.2 |
| | 95th pctile | 0.2 | 2.0 | 2.0 |
| Caribou liver | Average | 6.8 | 2.0 | 4.3 |
| | 95th pctile | 9.3 | 2.0 | 9.3 |
| Caribou heart | Average | 0.6 | 0.0 | 0.6 |
| | 95th pctile | 1.0 | 0.0 | 1.0 |
| **BIRDS** | Average | 21.6 | 11.6 | 18.4 |
| | 95th pctile | 69.4 | 53.4 | 56.7 |
| Canada goose | Average | 9.5 | 3.3 | 7.4 |
| | 95th pctile | 31.5 | 14.4 | 26.7 |
| Ptarmigan (willow, white-tailed, rock) | Average | 8.3 | 4.1 | 7.0 |
| | 95th pctile | 27.4 | 16.4 | 26.7 |
| Grouse (spruce, ruffed, partridge) | Average | 3.8 | 2.8 | 3.4 |
| | 95th pctile | 13.7 | 16.4 | 13.7 |
| **BERRIES/PLANTS** | Average | 4.6 | 2.9 | 4.1 |
| | 95th pctile | 14.5 | 18.5 | 18.5 |
| Blueberry | Average | 2.4 | 1.6 | 2.2 |
| | 95th pctile | 9.2 | 3.1 | 8.1 |
| Labrador tea | Average | 1.6 | 0.6 | 1.3 |
| | 95th pctile | 4.9 | 3.0 | 4.9 |
| Cloudberries (bakeapple) | Average | 0.7 | 4.3 | 1.3 |
| | 95th pctile | 4.6 | 13.8 | 4.8 |

**Table 10c. Average and high (95th percentile) grams of traditional food consumed per day by category and by top 3 species per category, for consumers only, Boreal Shield**

| Boreal Shield | | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | All |
| **TOTAL TRADITIONAL FOOD** | Average | 29.7 | 69.0 | 40.4 |
| | 95th pctile | 70.9 | 126.9 | 111.5 |
| **FISH** | Average | 5.6 | 11.5 | 7.3 |
| | 95th pctile | 20.9 | 38.9 | 26.7 |
| Walleye (yellow pickerel) | Average | 2.8 | 4.8 | 3.4 |
| | 95th pctile | 13.9 | 14.5 | 14.5 |
| All trout | Average | 4.0 | 4.4 | 4.2 |
| | 95th pctile | 11.6 | 26.1 | 20.0 |
| Sturgeon | Average | 2.5 | 3.1 | 2.8 |
| | 95th pctile | 15.7 | 9.0 | 9.0 |
| **SEAFOOD** | Average | 4.4 | 3.6 | 4.1 |
| | 95th pctile | 16.0 | 7.3 | 13.4 |
| Lobster | Average | 2.8 | 2.4 | 2.6 |
| | 95th pctile | 7.3 | 6.4 | 7.0 |
| Scallops | Average | 2.1 | 1.4 | 1.8 |
| | 95th pctile | 11.6 | 2.3 | 8.7 |
| Crab | Average | 0.5 | 0.6 | 0.6 |
| | 95th pctile | 0.6 | 0.6 | 0.6 |
| **GAME MEAT** | Average | 15.2 | 29.0 | 18.9 |
| | 95th pctile | 44.2 | 71.8 | 49.9 |
| Moose meat | Average | 13.0 | 23.8 | 15.9 |
| | 95th pctile | 35.0 | 131.8 | 43.0 |
| Beaver meat | Average | 2.2 | 3.7 | 2.7 |
| | 95th pctile | 9.3 | 5.5 | 5.5 |
| Hare or rabbit meat | Average | 1.7 | 3.8 | 2.4 |
| | 95th pctile | 9.3 | 8.2 | 8.2 |

| Boreal Shield | | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | All |
| **GAME ORGANS** | Average | 3.5 | 0.9 | 2.7 |
| | 95th pctile | 8.2 | 4.1 | 8.2 |
| Moose kidney | Average | 2.2 | 0.3 | 1.6 |
| | 95th pctile | 20.4 | 0.7 | 4.1 |
| Moose liver | Average | 2.6 | 0.8 | 2.1 |
| | 95th pctile | 20.4 | 4.1 | 5.1 |
| Caribou kidney | Average | 0.6 | 0.7 | 0.7 |
| | 95th pctile | 0.9 | 0.7 | 0.7 |
| **BIRDS** | Average | 5.6 | 25.2 | 11.5 |
| | 95th pctile | 13.9 | 53.4 | 53.4 |
| Canada goose | Average | 3.3 | 6.2 | 4.2 |
| | 95th pctile | 6.9 | 12.3 | 12.3 |
| Grouse (spruce, ruffed, partridge) | Average | 1.6 | 5.0 | 2.8 |
| | 95th pctile | 4.1 | 12.3 | 8.2 |
| Ptarmigan (willow, white-tailed, rock) | Average | 3.1 | 7.7 | 5.3 |
| | 95th pctile | 5.1 | 15.8 | 15.8 |
| **BERRIES/PLANTS** | Average | 2.2 | 4.7 | 2.9 |
| | 95th pctile | 6.6 | 8.3 | 8.3 |
| Blueberry | Average | 1.8 | 4.0 | 2.5 |
| | 95th pctile | 5.8 | 7.9 | 7.9 |
| Cedar tea | Average | 0.5 | 0.1 | 0.4 |
| | 95th pctile | 3.0 | 0.2 | 3.0 |
| Labrador tea | Average | 0.2 | 0.3 | 0.2 |
| | 95th pctile | 0.4 | 0.6 | 0.6 |

## Table 10d. Average and high (95th percentile) grams of traditional food consumed per day by category and by top 3 species per category, for consumers only, Mixedwood Plains

| Mixedwood Plains | | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | All |
| **TOTAL TRADITIONAL FOOD** | Average | 34.3 | 31.0 | 33.5 |
| | 95th pctile | 155.8 | 138.6 | 138.6 |
| **FISH** | Average | 5.6 | 6.5 | 5.9 |
| | 95th pctile | 27.9 | 21.8 | 21.8 |
| Walleye (yellow pickerel) | Average | 2.7 | 2.4 | 2.6 |
| | 95th pctile | 7.0 | 7.0 | 7.0 |
| All trout | Average | 3.4 | 1.0 | 2.8 |
| | 95th pctile | 13.9 | 3.5 | 13.9 |
| Sturgeon | Average | 1.1 | 2.2 | 1.5 |
| | 95th pctile | 2.9 | 5.8 | 5.8 |
| **SEAFOOD** | Average | 2.5 | 0.6 | 2.1 |
| | 95th pctile | 16.3 | 1.2 | 16.3 |
| Lobster | Average | 0.5 | 0.6 | 0.6 |
| | 95th pctile | 1.2 | 1.2 | 1.2 |
| Shrimp | Average | 1.5 | . | 1.5 |
| | 95th pctile | 4.7 | . | 4.7 |
| Mussels | Average | 2.6 | 2.6 | . |
| | 95th pctile | 4.7 | 4.7 | . |
| **GAME MEAT** | Average | 10.1 | 18.6 | 12.6 |
| | 95th pctile | 37.4 | 137.3 | 54.9 |
| Deer meat | Average | 8.1 | 19.2 | 12.2 |
| | 95th pctile | 42.1 | 137.3 | 84.0 |
| Moose meat | Average | 5.0 | 2.6 | 4.5 |
| | 95th pctile | 23.3 | 7.5 | 23.3 |
| Beaver meat | Average | 0.3 | 3.8 | 2.4 |
| | 95th pctile | 0.4 | 11.2 | 11.2 |

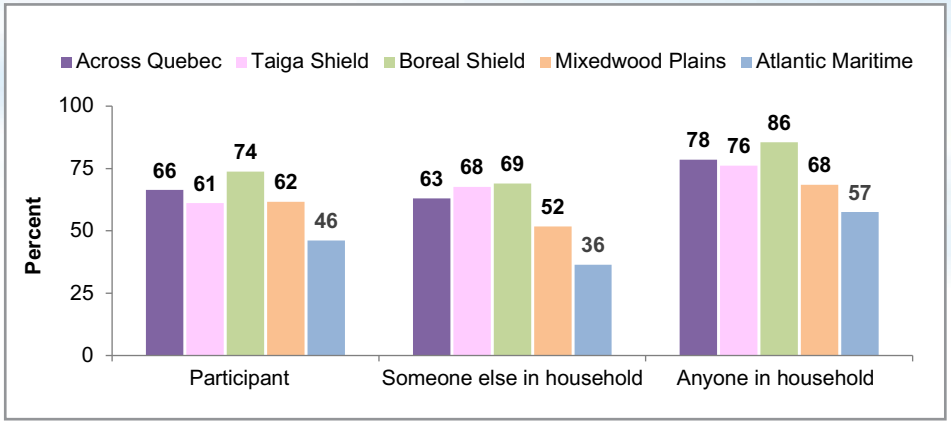
| Mixedwood Plains | | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | All |
| **GAME ORGANS** | Average | 2.7 | 0.4 | 2.0 |
| | 95th pctile | 20.4 | 0.7 | 20.4 |
| Deer liver | Average | 4.3 | 0.5 | 2.8 |
| | 95th pctile | 20.4 | 0.7 | 20.4 |
| Moose liver | Average | 0.2 | . | 0.2 |
| | 95th pctile | 0.2 | . | 0.2 |
| Deer kidney | Average | 1.0 | . | 1.0 |
| | 95th pctile | 1.0 | . | 1.0 |
| **BIRDS** | Average | 7.4 | 3.4 | 6.4 |
| | 95th pctile | 41.1 | 10.6 | 41.1 |
| Canada goose | Average | 1.9 | 1.6 | 1.8 |
| | 95th pctile | 8.2 | 8.2 | 8.2 |
| All ducks | Average | 4.4 | 2.3 | 3.8 |
| | 95th pctile | 30.1 | 4.1 | 30.1 |
| Snow goose (blue goose) | Average | 4.9 | 1.3 | 2.8 |
| | 95th pctile | 8.2 | 2.7 | 8.2 |
| **BERRIES/PLANTS** | Average | 13.7 | 10.6 | 13.0 |
| | 95th pctile | 62.9 | 42.5 | 56.2 |
| Beans | Average | 6.6 | 5.3 | 6.3 |
| | 95th pctile | 23.7 | 24.6 | 24.6 |
| Corn/hominy | Average | 7.7 | 5.1 | 7.1 |
| | 95th pctile | 26.3 | 21.0 | 26.3 |
| Raspberry | Average | 3.4 | 2.3 | 3.2 |
| | 95th pctile | 13.8 | 13.8 | 13.8 |

**Table 10e. Average and high (95th percentile) grams of traditional food consumed per day by category and by top 3 species per category, for consumers only, Atlantic Maritime**

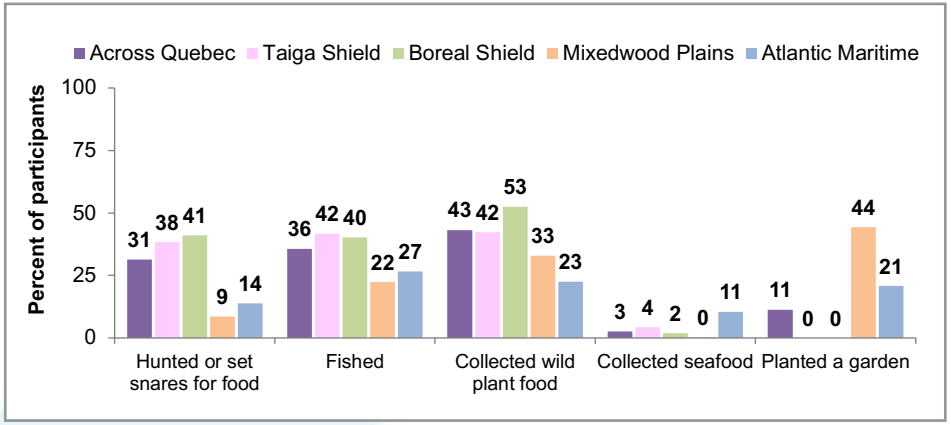
| Atlantic Maritime | | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | All |
| **TOTAL TRADITIONAL FOOD** | Average | 40.3 | 30.2 | 37.8 |
| | 95th pctile | 166.9 | 120.9 | 166.9 |
| **FISH** | Average | 7.1 | 12.4 | 8.4 |
| | 95th pctile | 30.2 | 160.3 | 30.8 |
| Atlantic salmon | Average | 2.5 | 4.6 | 3.0 |
| | 95th pctile | 7.0 | 55.8 | 7.0 |
| All trout | Average | 2.8 | 3.2 | 2.9 |
| | 95th pctile | 7.8 | 28.5 | 8.1 |
| Haddock | Average | 2.0 | 12.0 | 3.0 |
| | 95th pctile | 7.0 | 34.9 | 9.3 |
| **SEAFOOD** | Average | 8.1 | 4.5 | 7.3 |
| | 95th pctile | 34.3 | 13.4 | 22.9 |
| Lobster | Average | 2.4 | 1.4 | 2.2 |
| | 95th pctile | 8.1 | 6.4 | 7.8 |
| Crab | Average | 1.6 | 1.4 | 1.5 |
| | 95th pctile | 5.8 | 3.5 | 5.8 |
| Shrimp | Average | 3.4 | 1.6 | 3.0 |
| | 95th pctile | 11.3 | 4.4 | 7.8 |
| **GAME MEAT** | Average | 10.1 | 8.1 | 9.6 |
| | 95th pctile | 56.4 | 23.8 | 56.4 |
| Moose meat | Average | 8.9 | 6.5 | 8.3 |
| | 95th pctile | 56.0 | 12.4 | 56.0 |
| Deer meat | Average | 3.6 | 3.9 | 3.7 |
| | 95th pctile | 9.3 | 11.0 | 9.3 |
| Hare/rabbit meat | Average | 1.6 | 1.0 | 1.5 |
| | 95th pctile | 3.1 | 1.9 | 3.1 |

| Atlantic Maritime | | Traditional food consumers | | |
|---|---|---|---|---|
| | | Women | Men | All |
| **GAME ORGANS** | Average | 1.8 | 1.5 | 1.8 |
| | 95th pctile | 6.3 | 3.4 | 6.3 |
| Moose liver | Average | 1.4 | 0.2 | 1.1 |
| | 95th pctile | 3.4 | 0.2 | 3.4 |
| Deer liver | Average | 1.0 | 1.4 | 1.1 |
| | 95th pctile | 2.9 | 3.4 | 3.4 |
| Moose kidney | Average | 1.3 | . | 1.3 |
| | 95th pctile | 2.4 | . | 2.4 |
| **BIRDS** | Average | 0.7 | 0.8 | 0.7 |
| | 95th pctile | 1.7 | 1.4 | 1.7 |
| Grouse (spruce, ruffed, partridge) | Average | 0.7 | 0.7 | 0.7 |
| | 95th pctile | 1.7 | 1.4 | 1.7 |
| Canada goose | Average | 0.6 | . | 0.6 |
| | 95th pctile | 0.7 | . | 0.7 |
| All ducks | Average | . | 0.3 | 0.3 |
| | 95th pctile | . | 0.3 | 0.3 |
| **BERRIES/PLANTS** | Average | 18.7 | 6.9 | 16.0 |
| | 95th pctile | 117.0 | 25.7 | 34.3 |
| Fiddleheads | Average | 5.0 | 2.6 | 4.4 |
| | 95th pctile | 11.0 | 11.0 | 11.0 |
| Wild strawberry | Average | 3.3 | 1.0 | 2.6 |
| | 95th pctile | 4.6 | 3.8 | 4.6 |
| Maple syrup | Average | 1.4 | 1.1 | 1.3 |
| | 95th pctile | 5.3 | 3.3 | 3.7 |

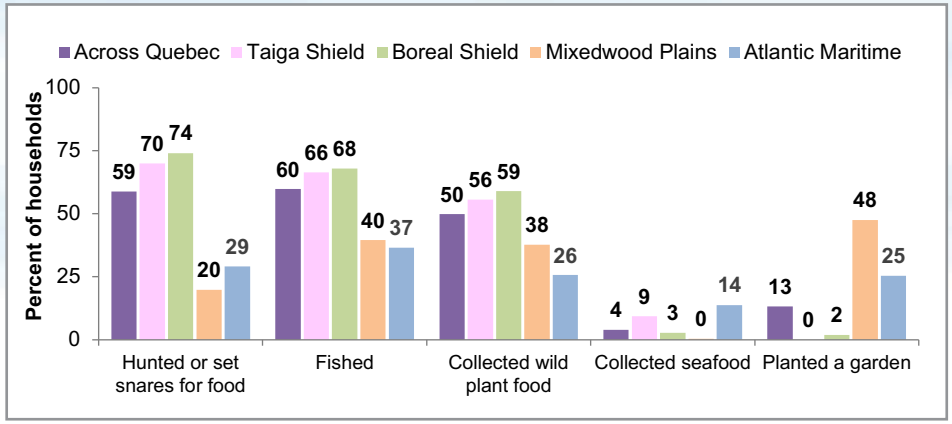
## Figure 15a. Participation in traditional food harvest and cultivation practices across Quebec and by ecozone (n=573)




## Figure 15b. Types of traditional food harvesting and cultivation practices reported by participants across Quebec and by ecozone (n=573)




## Figure 15c. Types of food harvesting and production practices reported at the household level across Quebec and by ecozone (n=573)




## Figure 16. Percent of First Nations adults who ate vegetables or fruit grown from a private and/or community garden, across Quebec and by ecozone

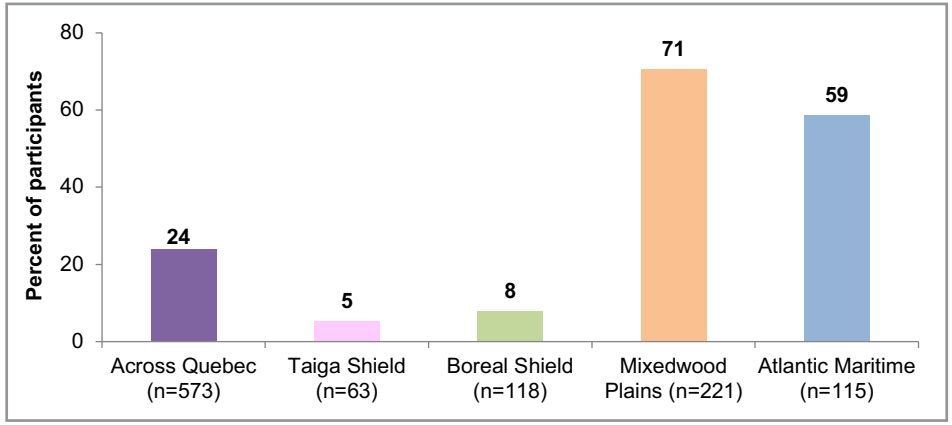


**Figure 17. Percent of First Nations adults whose households would like more traditional food across Quebec and by ecozone**

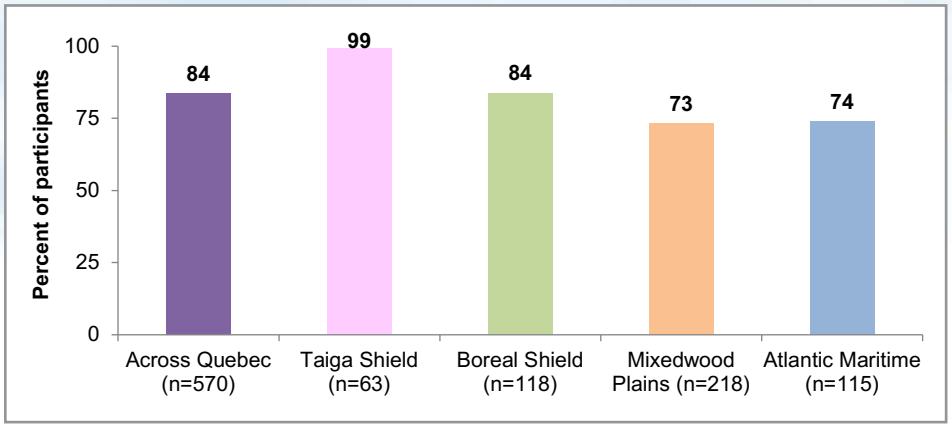
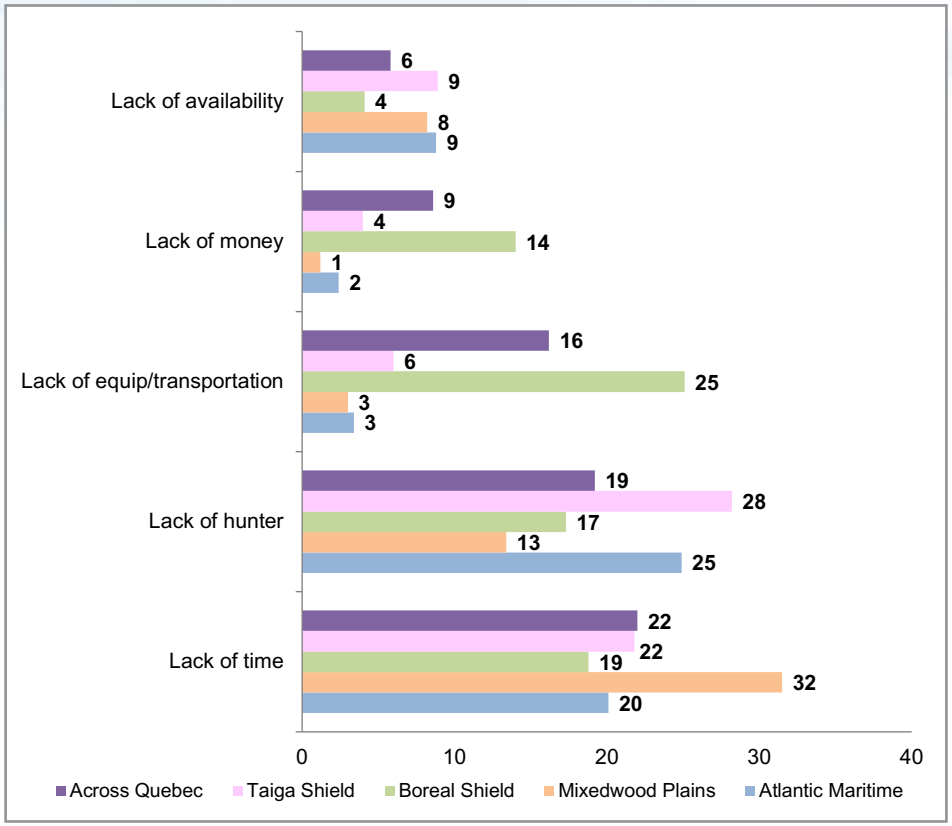
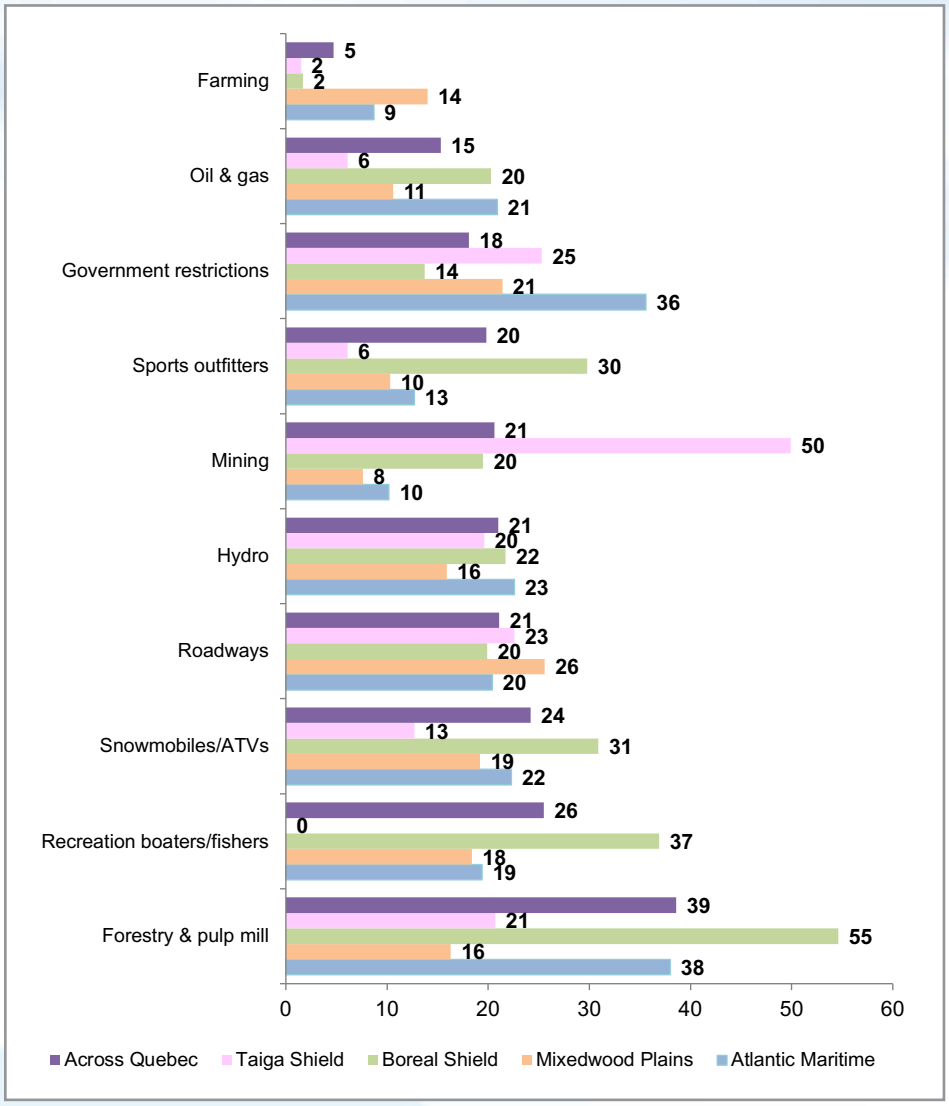



**Figure 18. Top 5 barriers preventing First Nations households from using more traditional food across Quebec and by ecozone**

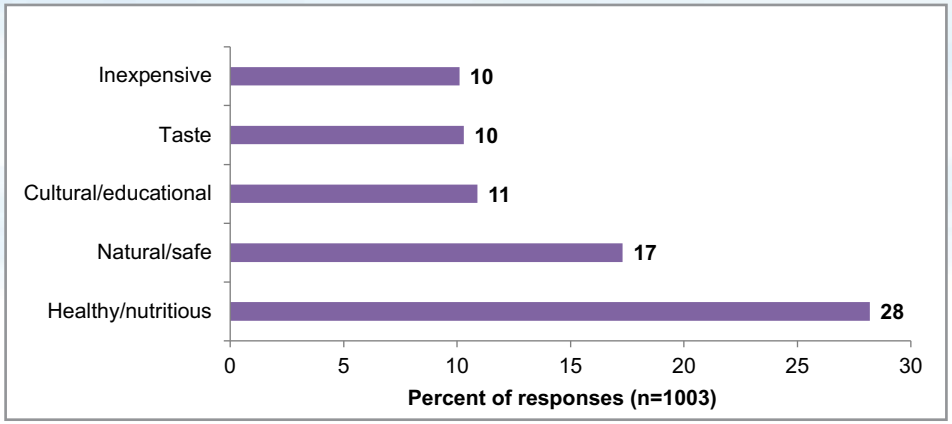



Note: verbatim comments to this open-ended question were grouped according to similar categories

## Figure 19. Percent of First Nations adults that agreed that the listed factors affected (or limited) where they could hunt, fish or collect berries across Quebec and by ecozone

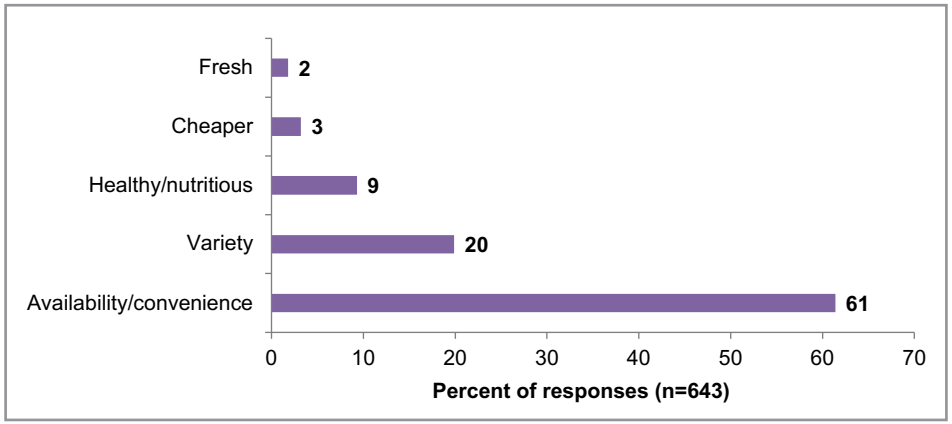



## Figure 20. Top 5 benefits of traditional food reported by First Nations adults in Quebec




Note: verbatim comments to this open-ended question were grouped according to similar categories

## Figure 21. Top 5 benefits of store-bought food reported by First Nations adults in Quebec




Note: verbatim comments to this open-ended question were grouped according to similar categories

# Nutrient Intake

## Table 11.1 Total energy intake (kcal/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 2338 (85) | 1969 (212) | 2041 (192) | 2168 (151) | 2318 (92) | 2468 (774) | 2622 (237) | 2729 (303) |
| | 51-70 | 49 | 2165 (196) | 1256 (230) | 1430 (218) | 1728 (210) | 2071 (227) | 2454 (283) | 2863 (371) | 3142 (453) |
| Female | 19-50 | 241 | 1986 (69) | 1567 (154) | 1654 (127) | 1803 (82) | 1979 (52) | 2167 (103) | 2352 (187) | 2471 (248) |
| | 51-70 | 118 | 1765 (31) | 1198 (57) | 1298 (49) | 1477 (27) | 1701 (25) | 1968 (61) | 2265 (99) | 2477 (131) |

## Table 11.2 Protein (g/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 95 (5) | 60 (5) | 66 (6) | 77 (5) | 88 (5) | 104 (19) | 124 (27) | 140 (21) |
| | 51-70 | 49 | 92 (14) | (-) | 53 (15) | 67 (14) | 81 (15) | 102 (19) | 134 (23) | 155 (26) |
| Female | 19-50 | 241 | 79 (3) | 60 (6) | 64 (5) | 71 (3) | 79 (4) | 87 (6) | 95 (9) | 100 (11) |
| | 51-70 | 118 | 80 (5) | 63 (4) | 66 (4) | 71 (4) | 78 (5) | 85 (5) | 93 (6) | 97 (7) |

Notes:

The SIDE SAS sub-routine nutrient analyses were performed on data from a total of 495 participants (359 women and 136 men) to obtain the distribution (percentiles) of usual intake. Nutrient data for 78 individuals were excluded: 28 pregnant and/or lactating women due to different nutrient requirements for these groups and 50 participants aged 71 and over due to low sample size.

In Tables 11.1-11.37 the following symbol, (-) indicates data have a coefficient of variation (CV) >33.3% and as such, are suppressed due to extreme sampling variability.

## Table 11.3 Total carbohydrates (g/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 290 (12) | 199 (32) | 218 (29) | 249 (27) | 283 (30) | 320 (42) | 362 (61) | 394 (77) | 100 | 0 (0-0.2) |
| | 51-70 | 49 | 263 (17) | 158 (28) | 179 (28) | 215 (26) | 254 (23) | 296 (18) | 338 (21) | 366 (31) | 100 | (-*) |
| Female | 19-50 | 241 | 240 (10) | 163 (15) | 178 (13) | 206 (10) | 239 (9) | 275 (15) | 310 (22) | 332 (28) | 100 | 0 (0-0.6) |
| | 51-70 | 118 | 204 (8) | 158 (20) | 166 (17) | 181 (25) | (-) | 219 (14) | 240 (22) | 254 (33) | 100 | 0 (0-3) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the intake is adequate.

## Table 11.4 Total fats (g/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 93 (4) | 57 (11) | 65 (10) | 77 (8) | 90 (5) | 102 (7) | 117 (13) | 129 (18) |
| | 51-70 | 49 | 84 (15) | 55 (13) | 60 (12) | 69 (12) | 80 (15) | 92 (20) | 104 (27) | 112 (32) |
| Female | 19-50 | 241 | 81 (4) | 60 (8) | 64 (7) | 71 (4) | 80 (3) | 90 (6) | 101 (11) | 108 (15) |
| | 51-70 | 118 | 71 (2) | 54 (2) | 57 (2) | 63 (2) | 70 (2) | 78 (3) | 85 (3) | 90 (4) |

## Table 11.5 Total saturated fats (g/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 31 (2) | 19 (4) | 22 (4) | 27 (3) | 31 (3) | 35 (6) | 39 (24) | 42 (12) |
| | 51-70 | 49 | 26 (6) | 15 (4) | 17 (4) | 20 (5) | 24 (6) | 29 (8) | 35 (10) | 38 (12) |
| Female | 19-50 | 241 | 25 (0.5) | 18 (3) | 20 (2) | 22 (1) | 25 (1) | 28 (1) | 32 (3) | 34 (4) |
| | 51-70 | 118 | 23 (1) | 18 (3) | 19 (3) | 20 (2) | 22 (1) | 25 (1) | 27 (3) | 29 (5) |

**Table 11.6 Total monounsaturated fats (g/d): Usual intakes from food, by DRI age-sex group, household population**

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 34 (2) | 21 (4) | 23 (3) | 27 (3) | 32 (2) | 38 (3) | 44 (5) | 49 (7) |
| | 51-70 | 49 | 32 (5) | 21 (5) | 23 (4) | 26 (4) | 31 (5) | 35 (8) | 41 (11) | 45 (14) |
| Female | 19-50 | 241 | 31 (2) | 22 (3) | 24 (3) | 27 (2) | 31 (2) | 35 (3) | 39 (5) | 41 (6) |
| | 51-70 | 118 | 26 (2) | 20 (1) | 21 (1) | 23 (2) | 26 (2) | 29 (2) | 32 (3) | 35 (3) |

**Table 11.7 Total polyunsaturated fats (g/d): Usual intakes from food, by DRI age-sex group, household population**

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 19 (1) | 14 (1) | 15 (1) | 16 (1) | 18 (1) | 21 (1) | 23 (1) | 24 (2) |
| | 51-70 | 49 | 16 (2) | 12 (2) | 12 (2) | 14 (1) | 16 (1) | 18 (3) | 20 (4) | 21 (6) |
| Female | 19-50 | 241 | 17 (2) | 11 (1) | 12 (1) | 13 (1) | 16 (2) | 19 (3) | 23 (5) | 26 (7) |
| | 51-70 | 118 | 14 (0.4) | 10 (1) | 11 (1) | 12 (1) | 14 (1) | 16 (1) | 18 (1) | 19 (1) |

**Table 11.8 Linoleic acid (g/d): Usual intakes from food, by DRI age-sex group, household population**

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | AI | % > AI (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 14.6 (0.6) | 11.5 (0.9) | 12.1 (0.8) | 13.0 (0.8) | 14.2 (0.7) | 15.4 (0.7) | 16.7 (0.8) | 17.5 (0.9) | 17 | (-) |
| | 51-70 | 49 | 12.7 (0.9) | 11 (1.8) | 11.3 (1.5) | 11.9 (1.1) | 12.5 (0.7) | 13.1 (1.4) | 13.7 (2.8) | 14.0 (3.9) | 14 | (-) |
| Female | 19-50 | 241 | 12.7 (0.8) | 7.8 (1.5) | 8.7 (1.3) | 10.3 (1) | 12.4 (0.7) | 14.7 (1) | 17.2 (1.7) | 18.7 (2.2) | 12 | 54.3 (39.5-86.7) |
| | 51-70 | 118 | 12.0 (0.3) | 8.8 (0.5) | 9.4 (0.5) | 10.4 (0.6) | 11.8 (0.6) | 13.2 (0.6) | 14.7 (0.6) | 15.7 (0.6) | 11 | 64.9 (49.9-85.8) |

### Table 11.9 Linolenic acid (g/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | AI | % > AI (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 1.6 (0.1) | 1.2 (0.1) | 1.3 (0.1) | 1.5 (0.1) | 1.7 (0.1) | 1.8 (0.1) | 2 (0.2) | 2.2 (0.3) | 1.6 | 59.7 (26.9-66.3) |
| | 51-70 | 49 | 1.2 (0.2) | 0.8 (0.2) | 0.9 (0.2) | 1.0 (0.2) | 1.2 (0.2) | 1.3 (0.2) | 1.5 (0.3) | 1.6 (0.4) | 1.6 | (-) |
| Female | 19-50 | 241 | 1.4 (0.3) | 0.9 (0.1) | 0.9 (0.2) | 1.1 (0.2) | 1.2 (0.2) | 1.5 (0.3) | 1.7 (0.4) | 1.9 (0.4) | 1.1 | 70.5 (19.8-90.6) |
| | 51-70 | 118 | 1.4 (0.1) | 0.9 (0.1) | 1 (0.1) | 1.2 (0.1) | 1.4 (0.1) | 1.7 (0.1) | 1.9 (0.1) | 2.1 (0.2) | 1.1 | 82.1 (67.4-91.3) |

### Table 11.10 Cholesterol (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 501 (99) | 212 (131) | (-) | (-) | 506 (138) | 630 (112) | 726 (106) | 784 (130) |
| | 51-70 | 49 | 373 (57) | (-) | (-) | 264 (72) | 338 (61) | 422 (47) | 506 (70) | 560 (126) |
| Female | 19-50 | 241 | 361 (18) | 225 (16) | 252 (19) | 301 (25) | 362 (29) | 429 (30) | 496 (26) | 539 (24) |
| | 51-70 | 118 | 309 (18) | 187 (9) | 211 (8) | 256 (11) | 310 (19) | 366 (31) | 420 (43) | 453 (51) |

### Table 11.11 Total sugars (g/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 101 (13) | 58 (19) | 68 (18) | 82 (17) | 97 (14) | 114 (10) | 135 (12) | 151 (18) |
| | 51-70 | 49 | 92 (13) | 36 (9) | 44 (9) | 60 (10) | 83 (15) | 114 (22) | 149 (31) | 174 (38) |
| Female | 19-50 | 241 | 79 (5) | 33 (6) | 41 (6) | 55 (7) | 74 (7) | 96 (7) | 119 (8) | 137 (11) |
| | 51-70 | 118 | 63 (6) | 29 (9) | 34 (8) | 43 (7) | 56 (6) | 73 (7) | 95 (13) | 112 (20) |

### Table 11.12 Total dietary fibre (g/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | AI | % > AI (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 15.6 (1.7) | 11.8 (2.2) | 12.4 (2) | 13.6 (1.6) | 15 (1.5) | 16.8 (1.8) | 18.8 (2.6) | 20.1 (3.7) | 38 | 0 (0-1.6) |
| | 51-70 | 49 | 17.5 (1.3) | 10.8 (2.6) | 12.1 (2.5) | 14.3 (2.3) | 16.7 (2.1) | 19.1 (1.9) | 21.2 (1.9) | 22.6 (2.2) | 30 | (-*) |
| Female | 19-50 | 241 | 13.8 (0.4) | 9.6 (0.2) | 10.3 (0.3) | 11.6 (0.3) | 13.3 (0.5) | 15.3 (0.8) | 17.4 (1.1) | 18.9 (1.4) | 25 | (-*) |
| | 51-70 | 118 | 12.8 (0.5) | 9.1 (0.7) | 9.7 (0.7) | 10.9 (0.6) | 12.4 (0.4) | 13.9 (0.4) | 15.5 (0.4) | 16.5 (0.5) | 21 | (-*) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the intakes are inadequate.

### Table 11.13 Vitamin A (RAE/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 697 (36) | (-) | 321 (86) | 433 (62) | 622 (46) | 875 (64) | 1149 (178) | 1352 (320) | 625 | 50 (14-65) |
| | 51-70 | 49 | 563 (71) | (-) | (-) | 345 (82) | 502 (92) | 701 (138) | 918 (199) | 1067 (267) | 625 | 67 (41-98) |
| Female | 19-50 | 241 | 521 (30) | 266 (74) | 310 (68) | 394 (58) | 505 (48) | 637 (54) | 776 (87) | 869 (117) | 500 | 49 (16-80) |
| | 51-70 | 118 | 533 (77) | 252 (77) | 290 (70) | 367 (55) | 477 (62) | 615 (128) | 763 (204) | 859 (262) | 500 | 55 (30-90) |

### Table 11.14 Vitamin C (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 133 (14) | (-) | (-) | (-) | 91 (18) | 181 (27) | 267 (57) | 352 (94) | 75 | 43 (1-62) | 2000 | 0 (0-0.5) |
| | 51-70 | 49 | 83 (28) | 17 (5) | 23 (6) | 36 (9) | 59 (16) | 93 (28) | (-) | (-) | 75 | 64 (37-94) | 2000 | 0 (0-0) |
| Female | 19-50 | 241 | 100 (13) | (-) | (-) | 65 (18) | 95 (16) | 134 (23) | 177 (43) | 207 (61) | 60 | (-*) | 2000 | 0 (0-0) |
| | 51-70 | 118 | 72 (18) | (-) | (-) | 39 (13) | 60 (19) | (-) | 123 (41) | 147 (47) | 60 | 50 (9-80) | 2000 | 0 (0-0) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the intake is adequate.

### Table 11.15 Vitamin C (mg/d): Usual intakes from food (by smoking status)

| Sex | Status | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | Non-smoker | 76 | 76 (16) | (-) | (-) | (-) | 57 (16) | 100 (23) | 158 (35) | 204 (46) | 75 | 63 (41-83) | 2000 | 0 (0-0) |
| | Smoker | 60 | 146 (17) | (-) | (-) | (-) | 105 (17) | 167 (19) | 255 (59) | (-) | 110 | 53 (33-87) | 2000 | 0 (0-0.8) |
| Female | Non-smoker | 202 | 99 (17) | (-) | (-) | 50 (15) | 86 (17) | 129 (26) | 168 (37) | 198 (48) | 60 | 32 (0.1-50) | 2000 | 0 (0-0) |
| | Smoker | 156 | 84 (13) | 54 (17) | 59 (16) | 69 (14) | 82 (11) | 96 (15) | 110 (27) | 119 (36) | 95 | 73 (34-95) | 2000 | 0 (0-0) |

### Table 11.16 Vitamin D (µg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 4.8 (0.6) | (-) | (-) | 3.6 (0.9) | 4.7 (0.7) | 5.9 (0.6) | 7.1 (0.7) | 7.9 (1) | 10 | 99 (96-100) | 100 | 0 (0-0) |
| | 51-70 | 49 | 4.1 (0.5) | (-) | (-) | 2.4 (0.5) | 3.3 (0.6) | 4.6 (0.9) | 6.4 (1.9) | (-) | 10 | 98 (87-100) | 100 | 0 (0-0) |
| Female | 19-50 | 241 | 3.6 (0.2) | (-) | (-) | 2.4 (0.5) | 3.3 (0.3) | 4.5 (1.4) | 5.9 (1.8) | 7 (2) | 10 | 99 (95-100) | 100 | 0 (0-0) |
| | 51-70 | 118 | 2.5 (0.3) | (-) | (-) | 1.3 (0.4) | 2.1 (0.3) | 3.1 (0.4) | 4.4 (0.6) | 5.5 (0.9) | 10 | 100 (98-100) | 100 | 0 (0-0) |

### Table 11.17 Folate (DFE/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 479 (61) | 342 (16) | 378 (19) | 423 (34) | 466 (78) | - | 608 (125) | 655 (164) | 320 | 3.1 (0.5-3.7) |
| | 51-70 | 49 | 485 (39) | 339 (43) | 363 (43) | 407 (42) | 461 (40) | 524 (39) | 587 (40) | 629 (44) | 320 | (-*) |
| Female | 19-50 | 241 | 428 (40) | 323 (58) | 346 (52) | 384 (43) | 430 (39) | 480 (48) | 530 (71) | 563 (87) | 320 | (-*) |
| | 51-70 | 118 | 434 (37) | 280 (49) | 309 (45) | 361 (39) | 424 (37) | 493 (41) | 563 (51) | 609 (61) | 320 | (-*) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the intakes are adequate.

## Table 11.18 Vitamin B6 (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 2.6 (0.6) | 1.7 (0.3) | 1.8 (0.3) | 1.9 (0.3) | 2.1 (0.3) | 2.3 (0.3) | 2.5 (0.4) | 2.7 (0.4) | 1.1 | 0 (0-0.5) | 100 | 0 (0-0) |
| | 51-70 | 49 | 1.8 (0.2) | 1.1 (0.2) | 1.2 (0.2) | 1.4 (0.2) | 1.7 (0.3) | 2 (0.6) | 2.4 (0.5) | 2.7 (0.5) | 1.4 | (-*) | 100 | 0 (0-0) |
| Female | 19-50 | 241 | 1.4 (0.04) | 0.8 (0.03) | 0.9 (0.03) | 1.1 (0.03) | 1.3 (0.04) | 1.6 (0.08) | 1.9 (0.13) | 2.2 (0.17) | 1.1 | 24 (16-27) | 100 | 0 (0-0) |
| | 51-70 | 118 | 1.4 (0.1) | 0.8 (0.04) | 0.9 (0.05) | 1.1 (0.1) | 1.3 (0.1) | 1.5 (0.1) | 1.8 (0.1) | 2 (0.1) | 1.3 | 51 (34-68) | 100 | 0 (0-0) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the adequacy of intake is inconclusive.

## Table 11.19 Vitamin B12 (µg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 5.9 (0.5) | 3.4 (0.6) | 3.9 (0.6) | 4.6 (0.6) | 5.5 (0.5) | 6.5 (0.6) | 7.6 (1) | 8.4 (1.4) | 2.0 | (-*) |
| | 51-70 | 49 | 3.8 (0.6) | (-) | (-) | 1.9 (0.6) | 2.7 (0.7) | 3.9 (1.2) | 5.7 (4) | (-) | 2.0 | (-*) |
| Female | 19-50 | 241 | 4.8 (1.1) | 2.3 (0.5) | 2.6 (0.6) | 3.3 (0.8) | 4.3 (1.1) | 5.4 (1.3) | 6.7 (1.6) | 7.5 (2) | 2.0 | (-*) |
| | 51-70 | 118 | 4.7 (0.3) | 2.2 (0.2) | 2.6 (0.2) | 3.2 (0.2) | 4.1 (0.4) | 5.2 (0.5) | 6.5 (0.7) | 7.4 (0.9) | 2.0 | 2.8 (1.3-6) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake values indicate that the intakes are adequate for men aged 19-50 and all women but the adequacy of intake is inconclusive for men aged 51-70.

## Table 11.20 Thiamin (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 1.9 (0.3) | 1.5 (0.3) | 1.6 (0.2) | 1.7 (0.2) | 1.8 (0.2) | 1.9 (0.3) | 2 (0.4) | 2.1 (0.6) | 1.0 | 0 (0-8.4) |
| | 51-70 | 49 | 2 (0.2) | 1.7 (0.3) | 1.8 (0.2) | 1.9 (0.2) | 2 (0.2) | 2.2 (0.3) | 2.3 (0.3) | 2.4 (0.4) | 1.0 | 0 (0-11.6) |
| Female | 19-50 | 241 | 1.6 (0.1) | 1 (0.1) | 1.1 (0.1) | 1.3 (0.1) | 1.5 (0.1) | 1.8 (0.1) | 2.1 (0.1) | 2.3 (0.1) | 0.9 | (-*) |
| | 51-70 | 118 | 1.7 (0.04) | 1.1 (0.2) | 1.3 (0.2) | 1.4 (0.1) | 1.7 (0.1) | 1.9 (0.1) | 2.2 (0.2) | 2.3 (0.2) | 0.9 | (-*) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the intakes are adequate.

## Table 11.21 Riboflavin (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 2.8 (0.3) | 1.8 (0.5) | 2 (0.4) | 2.3 (0.4) | 2.7 (0.3) | 3.1 (0.2) | 3.5 (0.3) | 3.8 (0.4) | 1.1 | 0 (0-7.1) |
| | 51-70 | 49 | 2.2 (0.1) | 1.2 (0.3) | 1.4 (0.3) | 1.7 (0.2) | 2 (0.2) | 2.4 (0.3) | 3 (0.5) | 3.5 (0.8) | 1.1 | (-*) |
| Female | 19-50 | 241 | 1.9 (0.1) | 1.6 (0.2) | 1.6 (0.1) | 1.8 (0.1) | 1.9 (0.1) | 2.1 (0.1) | 2.2 (0.2) | 2.3 (0.2) | 0.9 | 0 (0-0.6) |
| | 51-70 | 118 | 2.0 (0.1) | 1.3 (0.2) | 1.5 (0.2) | 1.7 (0.1) | 1.9 (0.1) | 2.2 (0.1) | 2.5 (0.2) | 2.8 (0.3) | 0.9 | (-*) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the intakes are adequate.

## Table 11.22 Niacin (NE/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 47.9 (2.9) | 40.6 (5.4) | 42 (4.9) | 44.3 (4.3) | 47 (3.7) | 50 (3.7) | 52.8 (5.6) | 54.6 (8.1) | 12 | 0 (0-0) |
| | 51-70 | 49 | 43.3 (6.3) | 23.3 (7.3) | 26.6 (6.9) | 32.3 (6.6) | 39.5 (7.1) | 48.3 (8.6) | 59.0 (10.8) | 67.1 (12.6) | 12 | 0 (0-1.8) |
| Female | 19-50 | 241 | 36.2 (0.8) | 26.1 (0.6) | 28.1 (0.6) | 31.5 (0.7) | 35.6 (0.8) | 40 (1.1) | 44.4 (1.6) | 47.2 (2) | 11 | 0 (0-0) |
| | 51-70 | 118 | 38.0 (2.4) | 25.5 (1.9) | 27.7 (2.1) | 31.7 (2.4) | 36.6 (2.5) | 42.1 (2.5) | 47.8 (2.6) | 51.6 (2.7) | 11 | 0 (0-0) |

## Table 11.23 Calcium (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 876 (102) | 766 (143) | 793 (127) | 837 (112) | 886 (104) | 934 (105) | 977 (120) | 1003 (143) | 800 | (-*) | 2500 | 0 (0-0) |
| | 51-70 | 49 | 694 (107) | 304 (77) | 350 (76) | 434 (75) | 550 (96) | 736 (173) | 1040 (312) | (-) | 800 | 80 (51-88) | 2000 | (-) |
| Female | 19-50 | 241 | 644 (24) | 413 (66) | 453 (57) | 527 (42) | 624 (31) | 742 (47) | 868 (85) | 953 (115) | 800 | 83 (77-100) | 2500 | 0 (0-0) |
| | 51-70 | 118 | 666 (59) | 356 (67) | 406 (63) | 490 (58) | 613 (65) | 797 (96) | 1022 (138) | 1182 (178) | 1000 | 89 (76-100) | 2000 | 0 (0-0.6) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the adequacy of intake is inconclusive.

### Table 11.24 Iron (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 16.8 (1.6) | 15.5 (4) | (-) | 16.1 (2.3) | 16.5 (3.1) | 17 (4.5) | 17.4 (6.6) | (-) | 6.0 | 0 (0-0) | 45 | 0 (0-0) |
| | 51-70 | 49 | 15.0 (1.7) | 13.2 (1.7) | 13.4 (1.8) | 13.8 (1.8) | 14.2 (1.8) | 14.6 (1.8) | 14.9 (1.9) | 15.2 (1.9) | 6.0 | 0 (0-0) | 45 | 0 (0-0) |
| Female | 19-50 | 241 | 14.1 (0.6) | 12.8 (0.6) | 13.1 (0.6) | 13.5 (0.6) | 14 (0.6) | 14.5 (0.7) | 15 (0.7) | 15.3 (0.7) | 8.1 | 0 (0-0) | 45 | 0 (0-0) |
| | 51-70 | 118 | 14.5 (0.9) | 10.2 (1.5) | 11 (1.3) | 12.3 (1) | 14 (0.7) | 16.1 (1.2) | 18.4 (2.6) | 20 (4.1) | 5.0 | 0 (0-0.5) | 45 | 0 (0-1.4) |

### Table 11.25 Potassium (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | AI | % > AI (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-50 | 87 | 2915 (79) | 1862 (251) | 2069 (245) | 2387 (214) | 2739 (131) | 3169 (87) | 3739 (256) | 4241 (376) | 4700 | (-) |
| | 51-70 | 49 | 2794 (230) | 1523 (293) | 1696 (268) | 2008 (271) | 2563 (345) | 3214 (553) | 3861 (901) | 4260 (1216) | 4700 | (-) |
| Female | 19-50 | 241 | 2322 (93) | 1748 (260) | 1861 (227) | 2058 (162) | 2295 (76) | 2554 (177) | 2812 (379) | 2979 (534) | 4700 | 0 (0-2.9) |
| | 51-70 | 118 | 2210 (64) | 1997 (241) | 2034 (212) | 2097 (155) | 2169 (85) | 2244 (111) | 2314 (237) | 2357 (375) | 4700 | 0 (0-2.1) |

### Table 11.26 Sodium (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | AI | % > AI (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 3717 (368) | 3182 (239) | 3296 (261) | 3490 (303) | 3709 (358) | 3935 (417) | 4147 (473) | 4280 (507) | 1500 | 100 (100-100) | 2300 | 100 (100-100) |
| | 51-70 | 49 | 3460 (608) | 2730 (586) | 2837 (608) | 3026 (648) | 3251 (697) | 3498 (751) | 3728 (805) | 3869 (840) | 1300 | 100 (100-100) | 2300 | 100 (56-100) |
| Female | 19-50 | 241 | 2998 (197) | 2134 (287) | 2303 (249) | 2602 (198) | 2963 (190) | 3362 (265) | 3760 (386) | 4020 (475) | 1500 | 100 (98-100) | 2300 | 90 (75-100) |
| | 51-70 | 118 | 2722 (77) | 1606 (287) | 1803 (243) | 2165 (157) | 2620 (71) | 3131 (87) | 3643 (220) | 3974 (334) | 1300 | 99 (93-100) | 2300 | 68 (58-95) |

## Table 11.27 Magnesium* (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | |
| Male | 19-30 | 19 | - | - | - | - | - | - | - | - | 330 | - |
| | 31-70 | 117 | 284 (14) | 173 (11) | 191 (10) | 220 (11) | 251 (52) | 303 (35) | 384 (81) | 453 (134) | 350 | 86 (75-95) |
| Female | 19-30 | 69 | - | - | - | - | - | - | - | - | 255 | - |
| | 31-70 | 290 | 232 (4) | 159 (18) | 172 (15) | 196 (11) | 226 (7) | 261 (7) | 299 (19) | 326 (31) | 265 | 77 (73-98) |

*age-groups categorized differently from other SIDE tables due to different EAR values; percentiles and SE of usual intake for males and females aged 19-30 were not estimable using SIDE.

## Table 11.28 Phosphorus (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 1397 (60) | 922 (93) | 1024 (105) | 1191 (102) | 1369 (80) | 1551 (63) | 1751 (82) | 1906 (110) | 580 | (-*) | 4000 | 0 (0-0) |
| | 51-70 | 49 | 1310 (66) | 683 (160) | 823 (157) | 1032 (140) | 1194 (123) | 1389 (166) | 1743 (237) | 2070 (307) | 580 | (-*) | 4000 | 0.2 (0-1.1) |
| Female | 19-50 | 241 | 1131 (21) | 847 (85) | 904 (70) | 1002 (45) | 1120 (20) | 1252 (44) | 1386 (91) | 1473 (128) | 580 | 0 (0-2.3) | 4000 | 0 (0-0) |
| | 51-70 | 118 | 1129 (31) | 772 (118) | 838 (97) | 959 (61) | 1105 (31) | 1266 (66) | 1423 (120) | 1523 (164) | 580 | (-*) | 4000 | 0 (0-0) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicates that the intakes are adequate.

## Table 11.29 Zinc (mg/d): Usual intakes from food, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | EAR | %<EAR (95% CI) | UL | % > UL (95% CI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 12.0 (1.8) | 9.2 (1.2) | 9.7 (1.1) | 10.5 (1) | 11.5 (1.1) | 12.8 (1.3) | 14.2 (1.8) | 15.1 (2.6) | 9.4 | (-*) | 40 | 0 (0-0.6) |
| | 51-70 | 49 | 11.4 (1.3) | 6.7 (1.4) | 7.4 (1.4) | 8.5 (1.4) | 10.1 (1.5) | 12.1 (2.1) | 14.4 (2.8) | 16.0 (3.6) | 9.4 | (-*) | 40 | 0 (0-0.9) |
| Female | 19-50 | 241 | 11.0 (1.1) | 7.6 (0.7) | 8.2 (0.8) | 9.3 (0.9) | 10.7 (1.1) | 12.3 (1.3) | 13.9 (1.4) | 15.0 (1.5) | 6.8 | (-*) | 40 | 0 (0-0) |
| | 51-70 | 118 | 10.4 (0.3) | 7.1 (1.1) | 7.7 (0.9) | 8.7 (0.6) | 9.9 (0.4) | 11.4 (0.5) | 13.1 (1.1) | 14.2 (1.7) | 6.8 | (-*) | 40 | 0 (0-0.1) |

(-*) data are suppressed due to extreme sampling variability; comparison of the EAR reference value to ± 2 SD of the 50th percentile intake value indicate that the intakes are adequate for women but inconclusive for men.

**Table 11.30 Percentage of total energy intake from protein, by DRI age-sex group, household population**

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | AMDR | % below AMDR (95% CI ) | % within AMDR (95% CI ) | % above AMDR (95% CI ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 16.3 (0.6) | 13.8 (1.4) | 14.3 (1.1) | 15.1 (0.8) | 16.1 (0.5) | 17.3 (2.8) | 18.6 (1.9) | 19.6 (2.7) | 10-35 | 0 (0-2.9) | 100 (96-100) | 0 (0-1.1) |
| | 51-70 | 49 | 17 (0.9) | 13 (1.6) | 13.6 (1.4) | 14.7 (1.2) | 16 (1) | 17.6 (1.1) | 19.4 (1.2) | 20.7 (1.3) | 10-35 | 0 (0-4) | 100 (96-100) | 0 (0-0) |
| Female | 19-50 | 241 | 16.3 (0.6) | 11.7 (0.6) | 12.5 (0.5) | 14 (0.5) | 16 (0.6) | 18.4 (0.9) | 20.9 (1.3) | 22.7 (1.7) | 10-35 | (-) | 100 (99-100) | 0 (0-0.2) |
| | 51-70 | 118 | 18.2 (1) | 13 (1.3) | 13.9 (1.1) | 15.6 (1.1) | 17.7 (1.2) | 20.1 (1.2) | 22.7 (1.7) | 24.6 (2.3) | 10-35 | (-) | 100 (98-100) | 0 (0-0.8) |

**Table 11.31 Percentage of total energy intake from carbohydrates, by DRI age-sex group, household population**

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | AMDR | % below AMDR (95% CI ) | % within AMDR (95% CI ) | % above AMDR (95% CI ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 50.3 (1.2) | 42.5 (3.8) | 44.5 (3) | 47.5 (1.8) | 50.5 (1.3) | 53.6 (2.6) | 56.7 (4.1) | 59 (5.1) | 45-65 | (-) | 88 (61-100) | (-) |
| | 51-70 | 49 | 49.3 (3.9) | 38.2 (4.1) | 41 (4.1) | 45.5 (4.1) | 50.1 (4) | 54.2 (3.9) | 58 (4.1) | 60.5 (4.6) | 45-65 | (-) | 76 (17-100) | (-) |
| Female | 19-50 | 241 | 49.1 (0.9) | 41.1 (3.3) | 43 (2.7) | 46 (1.6) | 49.1 (1) | 52.2 (1.8) | 55 (2.6) | 56.6 (3.1) | 45-65 | (-) | 81 (67-100) | 0 (0-1.6) |
| | 51-70 | 118 | 46.9 (1.2) | 39.8 (2.6) | 41.4 (2.1) | 43.9 (1.6) | 46.7 (1.4) | 49.6 (1.3) | 52.3 (1.8) | 54 (2.4) | 45-65 | 34 (1-56) | 66 (44-100) | 0 (0-0.5) |

**Table 11.32 Percentage of total energy intake from fats, by DRI age-sex group, household population**

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | | AMDR | % below AMDR (95% CI ) | % within AMDR (95% CI ) | % above AMDR (95% CI ) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) | | | | |
| Male | 19-50 | 87 | 35 (1.4) | 26.8 (3.8) | 28.7 (3.2) | 31.7 (2.3) | 35 (1.3) | 37.7 (1.3) | 40.6 (2.5) | 42.3 (3.4) | 20-35 | (-) | 50 (31-86) | 50 (15-69) |
| | 51-70 | 49 | 34.3 (2.7) | 26.7 (3.3) | 28.4 (3) | 31 (3) | 33.9 (3.2) | 36.9 (3.5) | 39.6 (3.7) | 41.2 (3.9) | 20-35 | (-) | (-) | (-) |
| Female | 19-50 | 241 | 35.5 (0.5) | 34 (2) | 34.3 (1.5) | 34.8 (0.9) | 35.4 (0.5) | 36 (0.8) | 36.6 (1.5) | 36.9 (1.9) | 20-35 | 0 (0-0.2) | 32 (17-55) | 69 (45-83) |
| | 51-70 | 118 | 35.3 (0.7) | 32.5 (2.4) | 33.1 (1.9) | 34.2 (1.2) | 35.3 (0.7) | 36.5 (1) | 37.5 (1.6) | 38.1 (2) | 20-35 | 0 (0-0.6) | 42 (15-64) | 58 (36-85) |

## Table 11.33 Percentage of total energy intake from saturated fats, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 11.9 (0.8) | 8.4 (1.7) | 9.3 (1.5) | 10.6 (1.2) | 11.8 (0.8) | 13 (0.7) | 14.2 (0.9) | 15 (1.3) |
| | 51-70 | 49 | 10.5 (1.3) | 7.1 (1.1) | 7.8 (1.1) | 8.9 (1.3) | 10.3 (1.6) | 11.7 (1.8) | 13 (1.9) | 13.7 (2) |
| Female | 19-50 | 241 | 11.4 (0.4) | 9.7 (0.9) | 10.1 (0.7) | 10.6 (0.5) | 11.3 (0.4) | 12 (0.5) | 12.6 (0.7) | 13 (0.9) |
| | 51-70 | 118 | 11.3 (0.5) | 8.7 (0.8) | 9.2 (0.7) | 10.1 (0.5) | 11.2 (0.5) | 12.4 (0.8) | 13.5 (1.2) | 14.2 (1.5) |

## Table 11.34 Percentage of total energy intake from monounsaturated fats, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 12.8 (0.4) | 12.5 (1.4) | 12.6 (1.1) | 12.6 (0.7) | 12.7 (0.4) | 12.8 (0.6) | 12.8 (1) | 12.8 (1.2) |
| | 51-70 | 49 | 13.2 (1.1) | 11 (1.4) | 11.5 (1.2) | 12.3 (1.2) | 13.1 (1.3) | 14 (1.5) | 14.7 (1.7) | 15.2 (1.9) |
| Female | 19-50 | 241 | 13.4 (0.4) | 12.4 (0.3) | 12.6 (0.4) | 13 (0.4) | 13.4 (0.4) | 13.8 (0.4) | 14.2 (0.4) | 14.4 (0.4) |
| | 51-70 | 118 | 13.1 (0.8) | 12.2 (0.8) | 12.4 (0.8) | 12.7 (0.9) | 13.1 (0.9) | 13.5 (0.9) | 13.8 (0.9) | 14.0 (0.9) |

## Table 11.35 Percentage of total energy intake from polyunsaturated fats, by DRI age-sex group, household population

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 7.2 (0.4) | 6.3 (0.7) | 6.5 (0.6) | 6.8 (0.5) | 7.1 (0.5) | 7.5 (0.6) | 7.9 (0.9) | 8.1 (1.2) |
| | 51-70 | 49 | 6.8 (0.3) | 5.7 (0.6) | 6 (0.5) | 6.4 (0.3) | 6.8 (0.3) | 7.3 (0.5) | 7.7 (0.7) | 8 (0.9) |
| Female | 19-50 | 241 | 7.0 (0.5) | 5 (0.3) | 5.3 (0.3) | 6 (0.4) | 6.8 (0.5) | 7.7 (0.6) | 8.7 (0.7) | 9.4 (0.8) |
| | 51-70 | 118 | 7.3 (0.3) | 6.1 (0.7) | 6.3 (0.6) | 6.8 (0.4) | 7.3 (0.4) | 7.8 (0.6) | 8.3 (0.8) | 8.6 (1) |

**Table 11.36 Percentage of energy from linoleic acid, by DRI age-sex group, household population**

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 5.6 (0.3) | 5.1 (0.3) | 5.2 (0.3) | 5.3 (0.3) | 5.5 (0.3) | 5.7 (0.3) | 5.9 (0.3) | 6 (0.3) |
| | 51-70 | 49 | 5.4 (0.4) | 5.2 (0.4) | 5.2 (0.4) | 5.3 (0.4) | 5.5 (0.4) | 5.6 (0.4) | 5.7 (0.4) | 5.7 (0.5) |
| Female | 19-50 | 241 | 5.6 (0.2) | 4.3 (0.5) | 4.6 (0.4) | 5 (0.3) | 5.6 (0.2) | 6.1 (0.3) | 6.7 (0.5) | 7 (0.7) |
| | 51-70 | 118 | 6.1 (0.3) | 5.7 (0.3) | 5.8 (0.3) | 5.9 (0.3) | 6.1 (0.3) | 6.3 (0.4) | 6.5 (0.4) | 6.6 (0.4) |

**Table 11.37 Percentage of energy from linolenic acid, by DRI age-sex group, household population**

| Sex | Age | n | Mean (SE) | Percentiles (SE) of usual intake | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5th (SE) | 10th (SE) | 25th (SE) | 50th (SE) | 75th (SE) | 90th (SE) | 95th (SE) |
| Male | 19-50 | 87 | 0.61 (0.02) | 0.47 (0.02) | 0.5 (0.02) | 0.55 (0.01) | 0.61 (0.02) | 0.66 (0.04) | 0.73 (0.06) | 0.78 (0.07) |
| | 51-70 | 49 | 0.53 (0.06) | 0.37 (0.09) | 0.4 (0.08) | 0.44 (0.08) | 0.5 (0.08) | 0.57 (0.08) | 0.66 (0.1) | 0.73 (0.13) |
| Female | 19-50 | 241 | 0.61 (0.09) | 0.38 (0.06) | 0.42 (0.07) | 0.48 (0.08) | 0.56 (0.1) | 0.65 (0.11) | 0.75 (0.12) | 0.81 (0.12) |
| | 51-70 | 118 | 0.71 (0.02) | 0.49 (0.03) | 0.53 (0.03) | 0.6 (0.03) | 0.69 (0.03) | 0.79 (0.03) | 0.89 (0.04) | 0.96 (0.04) |

**Table 12. Mean number of food guide servings consumed per day by First Nations men (n=321) and women (n=675) in Quebec compared to Eating Well with Canada's Food Guide-First Nations, Inuit and Métis (CGF-FNIM) recommendations (unweighted)**

| Food Group | Gender | First Nations in Quebec current intake | Canada's Food Guide Recommendations |
|---|---|---|---|
| | | Servings per day | |
| Vegetables and Fruit | men | 4.1 | 7-10 |
| | women | 3.7 | 7-8 |
| Grain Products | men | 6.7 | 7-8 |
| | women | 5.3 | 6-7 |
| Milk and Alternatives | men | 1.3 | 2-3 |
| | women | 1.2 | 2-3 |
| Meat and Alternatives | men | 4.0 | 3 |
| | women | 3.0 | 2 |

**Table 13. Top 5 contributors to the four food groups in Canada's Food Guide (% of total group intake), First Nations women and men in Quebec (unweighted)**

| Gender | Canada's Food Guide Food Groups | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Vegetables and Fruit | % | Meat and Alternatives | % | Grain Products | % | Milk and Alternatives | % |
| Women | Fresh/frozen vegetables | 22.8 | Chicken | 20.5 | White bread | 26.6 | Fluid milk | 27.6 |
| | Canned vegetables[a] | 19.1 | Beef | 17.8 | Pasta/noodles | 17.5 | Cheese[d] | 22.4 |
| | Potatoes | 18.0 | Wild meats[b] | 10.1 | Cereal[c] | 9.8 | Mixed dishes with cheese[e] | 17.7 |
| | Fruit/vegetable juice | 13.9 | Pork | 9.9 | Rice | 9.5 | Yogourt | 8.5 |
| | Fresh/frozen fruit | 12.8 | Eggs | 9.8 | Whole wheat bread | 9.1 | Mashed potatoes with milk | 5.2 |
| Men | Potatoes | 19.4 | Beef | 18.6 | White bread | 28.6 | Fluid milk | 26.3 |
| | Canned vegetables | 19.7 | Chicken | 16.5 | Pasta/noodles | 18.2 | Cheese | 26.1 |
| | Fruit/vegetable juice | 14.3 | Pork | 13.1 | Cereal | 8.0 | Mixed dishes with cheese | 24.4 |
| | Fresh/frozen vegetables | 11.7 | Eggs | 12.1 | Rice | 6.8 | Mashed potatoes with milk | 6.4 |
| | Fresh/frozen fruit | 11.3 | Wild meats | 6.4 | Whole wheat bread | 9.5 | Yogourt | 1.8 |

[a] includes canned vegetable soups
[b] includes caribou, moose, deer, beaver, rabbit, bear, goose and ptarmigan
[c] includes both hot and cold cereal (41% hot/59% cold for women and 56% hot/44% cold for men)
[d] includes cheddar, mozzarella, parmesan, Swiss, feta, cottage cheese, provolone and brie
[e] includes macaroni and cheese, lasagna, pizza and cheeseburgers

## Table 14. Ten most important contributors to macro and micronutrients for First Nations adults in Quebec

| a) Energy | | b) Protein | | c) Fat | | d) Carbohydrates | |
|---|---|---|---|---|---|---|---|
| Food | % of total | Food | % of total | Food | % of total | Food | % of total |
| Bread/buns, white | 10.6 | Chicken | 9.9 | Eggs | 7.3 | Bread/buns, white | 16.0 |
| Pasta/noodles | 4.8 | Wild meat[e] | 9.3 | Mixed dishes | 6.0 | Soft drinks, regular | 7.2 |
| Mixed dishes[a] | 4.7 | Bread/buns, white | 8.8 | Cold cuts/sausages | 5.9 | Pasta/noodles | 6.9 |
| Pizza | 4.2 | Eggs | 7.3 | Chicken | 5.7 | Condiments, sweet[h] | 5.4 |
| Pastries[b] | 4.1 | Beef[f] | 6.4 | Snack food | 5.3 | Pastries | 4.9 |
| Chicken[c] | 4.0 | Mixed dishes | 4.8 | Margarine | 5.1 | Fruit drink | 4.5 |
| Eggs | 4.0 | Pasta/noodles | 4.6 | Pizza | 4.8 | Cereal | 4.4 |
| French fries/hash browns | 3.6 | Pizza | 4.3 | Cheese | 4.6 | French fries/hash browns | 3.9 |
| Soft drinks, regular | 3.4 | Cold cuts/sausages | 4.2 | French fries/hash browns | 4.6 | Mixed dishes | 3.8 |
| Snack food[d] | 3.4 | Pork[g] | 3.8 | Pastries | 4.4 | Fruits | 3.7 |

| e) Saturated Fat | | f) Monounsaturated Fat | | g) Polyunsaturated Fat | | h) Cholesterol | |
|---|---|---|---|---|---|---|---|
| Food | % of total | Food | % of total | Food | % of total | Food | % of total |
| Cheese | 8.8 | Eggs | 8.2 | Snack food | 10.9 | Eggs | 46.6 |
| Cream | 6.6 | Cold cuts/sausages | 7.2 | Margarine | 8.3 | Chicken | 7.7 |
| Cold cuts/sausages | 6.5 | Margarine | 6.2 | Bread/buns, white | 6.7 | Wild meat | 6.5 |
| Eggs | 6.5 | Chicken | 6.1 | Chicken | 6.4 | Sandwiches | 4.5 |
| Mixed dishes | 6.1 | Mixed dishes | 6.0 | Eggs | 6.2 | Beef | 4.0 |
| Pizza | 5.7 | French fries/hash browns | 5.8 | Vegetables | 5.3 | Cold cuts/sausages | 3.2 |
| Beef | 5.0 | Snack food | 5.2 | French fries/hash browns | 5.0 | Cheese | 3.0 |
| Chicken | 4.4 | Beef | 5.1 | Mixed dishes | 5.0 | Pork | 2.7 |
| Butter | 4.1 | Pastries | 5.1 | Pastries | 4.7 | Cream | 2.3 |
| Pastries | 3.9 | Pizza | 4.9 | Sandwiches | 4.7 | Turkey | 2.1 |

[a] mixed dishes = chili, stew, shepherd's pie, Caesar salad with chicken, egg roll, chicken fried rice, etc.
[b] pastries = cakes, pies, muffins, doughnuts
[c] chicken = roasted, baked, fried and stewed
[d] snack food = potato chips, pretzels, popcorn
[e] traditional wild meat = moose, caribou, deer, rabbit, goose, duck, ptarmigan, bear, and beaver
[f] beef = ground, steak, ribs and brisket
[g] pork = loin, chops and ribs
[h] condiments, sweet = sugar, jam, syrup, honey
[i] condiments = sauces, ketchup, mustard, salt, vinegar

## Table 14. Ten most important contributors to macro and micronutrients for First Nations adults in Quebec

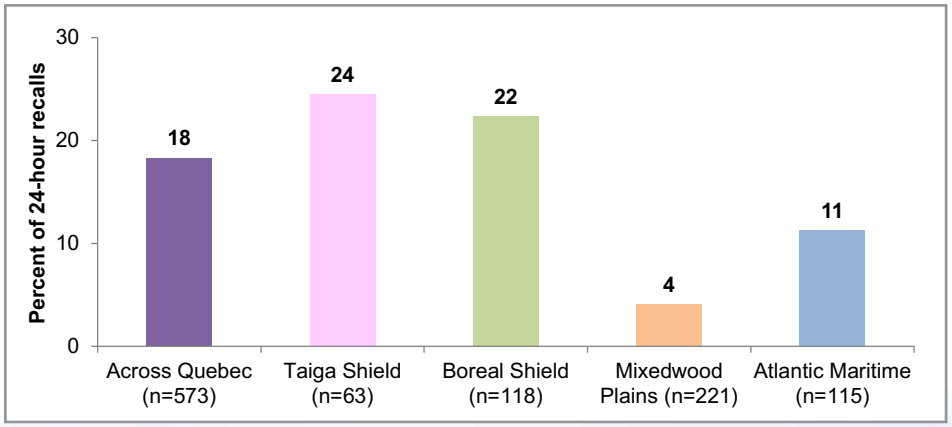
| i) Total Sugars | | j) Fibre | | k) Vitamin A | | l) Vitamin C | |
|---|---|---|---|---|---|---|---|
| Food | % of total | Food | % of total | Food | % of total | Food | % of total |
| Soft drinks, regular | 19.1 | Bread/buns, white | 18.9 | Vegetables | 23.2 | Fruit drink | 35.9 |
| Condiments, sweet | 15.3 | Vegetables | 9.0 | Eggs | 18.8 | Fruit juice | 19.3 |
| Fruits | 7.6 | Cereal | 7.8 | Margarine | 7.6 | Fruits | 12.7 |
| Pastries | 6.0 | Fruits | 7.6 | Milk | 7.3 | Vegetables | 11.7 |
| Fruit juice | 5.9 | Pasta/noodles | 6.0 | Soup | 5.2 | Potatoes | 3.2 |
| Bread/buns, white | 4.4 | French fries/hash browns | 5.9 | Cheese | 5.1 | Soup | 3.0 |
| Milk | 4.3 | Mixed dishes | 5.9 | Cream | 4.8 | Mixed dishes | 2.5 |
| Fruit drink | 4.1 | Snack food | 4.5 | Pizza | 3.6 | French fries/hash browns | 2.1 |
| Cereal | 3.1 | Pizza | 4.4 | Butter | 2.5 | Snack food | 2.1 |
| Chocolate bars | 3.1 | Potatoes | 4.0 | Mixed dishes | 2.4 | Spaghetti/tomato sauce | 1.0 |

| m) Vitamin D | | n) Folate | | o) Calcium | | p) Iron | |
|---|---|---|---|---|---|---|---|
| Food | % of total | Food | % of total | Food | % of total | Food | % of total |
| Eggs | 23.0 | Bread/buns, white | 25.4 | Bread/buns, white | 14.3 | Bread/buns, white | 18.0 |
| Margarine | 18.5 | Pasta/noodles | 15.2 | Milk | 11.7 | Cereal | 10.1 |
| Milk | 18.1 | Eggs | 5.9 | Cheese | 10.9 | Game meat | 9.6 |
| Fish | 8.2 | Pizza | 5.7 | Pizza | 6.8 | Mixed dishes | 5.9 |
| Game meat | 6.0 | Vegetables | 5.5 | Mixed dishes | 4.6 | Pasta/noodles | 5.3 |
| Cold cuts/sausages | 3.4 | Bannock | 4.7 | Bannock | 3.7 | Eggs | 4.2 |
| Pork | 2.8 | Pastries | 3.4 | Eggs | 3.6 | Pizza | 3.7 |
| Cream | 2.4 | Cereal | 2.8 | Vegetables | 3.4 | Beef | 3.6 |
| Pastries | 2.2 | Sandwiches | 2.7 | Sandwiches | 3.1 | Soup | 3.0 |
| Sandwiches | 1.8 | Mixed dishes | 2.5 | Fruit drink | 2.9 | Vegetables | 2.9 |

## Table 14. Ten most important contributors to macro and micronutrients for First Nations adults in Quebec

| q) Sodium | | r) Zinc | |
|---|---|---|---|
| **Food** | **% of total** | **Food** | **% of total** |
| Bread/buns, white | 15.2 | Wild meat | 12.5 |
| Soup | 9.3 | Beef | 10.9 |
| Cold cuts/sausages | 6.9 | Bread/buns, white | 6.9 |
| Mixed dishes | 5.8 | Mixed dishes | 5.7 |
| Pizza | 5.8 | Eggs | 5.3 |
| Eggs | 3.9 | Cereal | 4.3 |
| Sandwiches | 3.9 | Chicken | 4.3 |
| Cheese | 3.7 | Pizza | 4.2 |
| Chicken | 3.7 | Cold cuts/sausages | 3.6 |
| Condiments[i] | 3.5 | Pasta/noodles | 3.6 |

## Figure 22. Percent of 24-hour recalls that included traditional food




## Table 15. Comparison of nutrient intake (mean ± SE) on days with and without traditional food (TF), First Nations adults in Quebec

| Nutrient | Days with TF (n=88 recalls) | Days without TF (n=485 recalls) |
|---|---|---|
| | mean ± SE | |
| Energy (kcals) | 2075 ± 80.49 | 1995 ± 37.35 |
| **Protein** (g) *** | 106 ± 6.27 | 77.3 ± 1.57 |
| Fat (g) | 79.4 ± 3.81 | 81.2 ± 2.08 |
| Carbohydrate (g) | 241 ± 10.3 | 243 ± 4.83 |
| Total sugars (g) | 86.9 ± 6.11 | 80.0 ± 2.43 |
| **Fibre** (g)* | 12.7 ± 0.59 | 14.3 ± 0.35 |
| **Cholesterol** (mg) ** | 495 ± 32.9 | 365 ± 11.3 |
| **Total Saturated Fat** (g)* | 23.3 ± 1.11 | 26.5 ± 0.69 |
| Total Monounsaturated Fat (g) | 30.6 ± 1.61 | 30.3 ± 0.82 |
| Total Polyunsaturated Fat (g) | 17.8 ± 1.04 | 16.2 ± 0.65 |
| **Linoleic acid** (g)* | 14.6 ± 0.87 | 12.5 ± 0.36 |
| **Linolenic acid** (g) ** | 1.92 ± 0.16 | 1.32 ± 0.04 |
| Calcium (mg) | 645 ± 33.1 | 705 ± 19.7 |
| **Iron** (mg) *** | 19.7 ± 1.16 | 13.7 ± 0.28 |
| **Zinc** (mg) ** | 14.56 ± 1.19 | 10.3 ± 0.25 |
| Magnesium (mg) | 259.4 ± 14.8 | 247 ± 5.5 |
| **Copper** (mg) ** | 1.74 ± 0.1 | 1.27 ± 0.19 |
| **Potassium** (mg) ** | 2721 ± 146 | 2367 ± 47.4 |
| Sodium (mg) | 2859 ± 159 | 3159 ± 76.1 |
| **Phosphorus** (mg) ** | 1347 ± 63.2 | 1146 ± 23.6 |
| Vitamin A (µg) | 526.1 ± 44.5 | 571 ± 20.5 |
| **Vitamin D** (µg) ** | 5.69 ± 0.64 | 3.23 ± 0.13 |
| Vitamin C (mg) | 83.9 ± 10.1 | 98.8 ± 5.77 |
| Folate (µg) | 463 ± 23.1 | 449 ± 10.4 |
| Thiamin (mg) | 1.71 ± 0.1 | 1.72 ± 0.04 |
| **Riboflavin** (mg) ** | 2.33 ± 0.11 | 2.06 ± 0.04 |
| **Niacin** (mg) ** | 45.9 ± 2.64 | 37.5 ± 0.74 |
| Vitamin B6 (mg) | 1.63 ± 0.13 | 1.63 ± 0.07 |
| **Vitamin B12** (µg) *** | 9.93 ± 0.99 | 3.88 ± 0.32 |

*significantly different, unpaired t-test, *p<0.05; **p<0.01; ***p<0.0001

**Table 16. Top 10 consumed store-bought beverages and foods (grams/person/day), consumers and non-consumers combined, ranked by overall decreasing amount of consumption, by region and ecozones**

See Appendix K for a more complete list of store-bought foods.

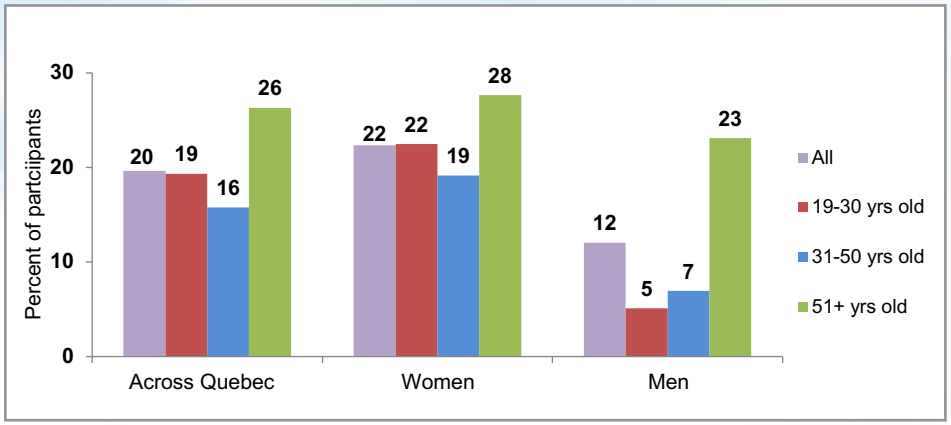
| Across Quebec | | Taiga Shield | | Boreal Shield | | Mixedwood Plains | | Atlantic Maritime | |
|---|---|---|---|---|---|---|---|---|---|
| Beverages | grams/ person/day | Beverages | grams/ person/day | Beverages | grams/ person/day | Beverages | grams/ person/day | Beverages | grams/ person/day |
| Water, bottled | 570 | Water, tap | 437 | Water, bottled | 753 | Water, bottled | 564 | Water, tap | 571 |
| Coffee | 417 | Tea | 329 | Coffee | 461 | Coffee | 436 | Coffee | 456 |
| Water, tap[a] | 247 | Coffee | 283 | Soft drinks, regular | 191 | Water, tap | 327 | Soft drinks, regular | 140 |
| Soft drinks regular | 182 | Soft drinks, regular | 258 | Tea | 168 | Soft drinks, regular | 126 | Milk | 127 |
| Tea | 167 | Water, bottled | 253 | Water, tap | 130 | Milk | 90 | Water, bottled | 125 |
| Fruit drinks[b] | 101 | Fruit drinks | 167 | Fruit drinks | 122 | Tea | 72 | Soft drinks, diet | 93 |
| Milk | 67 | Fruit juice | 88 | Milk | 58 | Soft drinks, diet | 60 | Tea | 74 |
| Fruit juice[c] | 52 | Milk | 46 | Fruit juice | 50 | Fruit drinks | 36 | Fruit drinks | 42 |
| Soft drinks, diet | 47 | Water, flavoured | 14 | Soft drinks, diet | 44 | Fruit juice | 33 | Fruit juice | 36 |
| Energy drink | 20 | Soft drinks, diet | 11 | Energy drink | 26 | Energy drink | 22 | Iced tea | 19 |

| Across Quebec | | Taiga Shield | | Boreal Shield | | Mixedwood Plains | | Atlantic Maritime | |
|---|---|---|---|---|---|---|---|---|---|
| Beverages | grams/ person/day | Beverages | grams/ person/day | Beverages | grams/ person/day | Beverages | grams/ person/day | Beverages | grams/ person/day |
| Soup[d] | 104 | Bread/buns, white | 89 | Soup | 124 | Soup | 109 | Soup | 106 |
| Bread/buns, white | 77 | Fruits | 69 | Bread/buns, white | 86 | Vegetables | 87 | Vegetables | 79 |
| Vegetables[e] | 70 | Vegetables | 57 | Vegetables | 69 | Pasta/noodles | 77 | Pasta/noodles | 78 |
| Pasta/noodles | 60 | Pasta/noodles | 57 | Mixed dishes | 62 | Fruits | 74 | Bread/buns, white | 55 |
| Fruits | 59 | Chicken | 56 | Eggs | 62 | Mixed dishes | 67 | Mixed dishes | 54 |
| Mixed dishes | 57 | Pizza | 56 | Fruits | 55 | Bread/buns, white | 56 | Fruits | 47 |
| Eggs | 51 | Eggs | 53 | Pasta/noodles | 53 | Chicken | 47 | Sandwiches | 43 |
| Potatoes[f] | 38 | Cereal | 49 | Potatoes | 46 | Pizza | 37 | Chicken | 42 |
| Chicken[g] | 35 | Fried vegetables | 44 | Grains | 33 | Cream | 31 | Cereal | 42 |
| Cereal | 34 | Soup | 34 | Sandwiches | 30 | Cereal | 31 | Pizza | 35 |

[a] although tap water is technically not a store-bought food, it is categorized as such for the purpose of these analyses
[b] fruit drinks= fruit flavoured, sweetened drinks, frozen/crystals/canned
[c] fruit juice= pure fruit juice, fresh/frozen/canned
[d] soups=canned soups and ramen noodles
[e] vegetables= fresh, frozen, canned (excludes potatoes)
[f] potatoes= boiled, baked, mashed (excludes French fries)
[g] chicken= roasted, baked, fried and stewed

**Figure 23. Use of nutritional supplements by First Nations adults in Quebec by gender and age group (n=573)**

See Appendix L for a list of the types of supplements reported




La Nation Anishnabe du Lac Simon. Photo by Marie Pier Bolduc.

# Food Security

**Figure 24. Percent of households that worried that their traditional food would run out before they could get more, in the previous 12 months (n=573)**

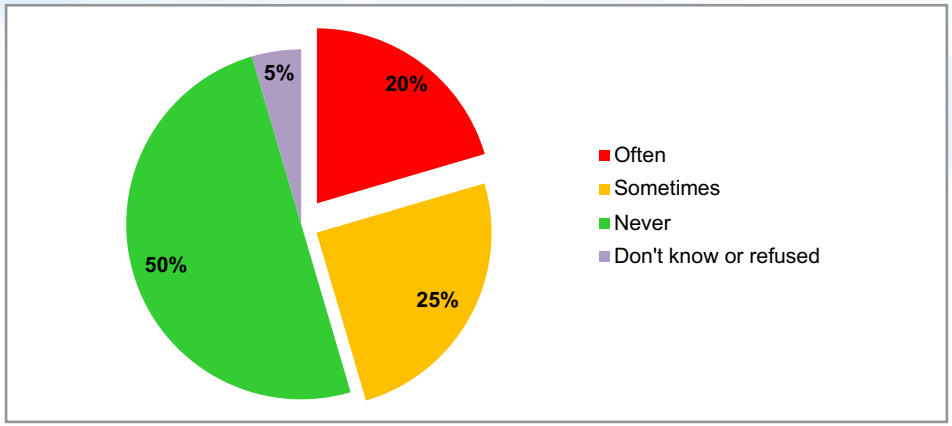



**Figure 25. Percent of households that worried that their traditional food would not last and they couldn't get more in the previous 12 months (n=573)**

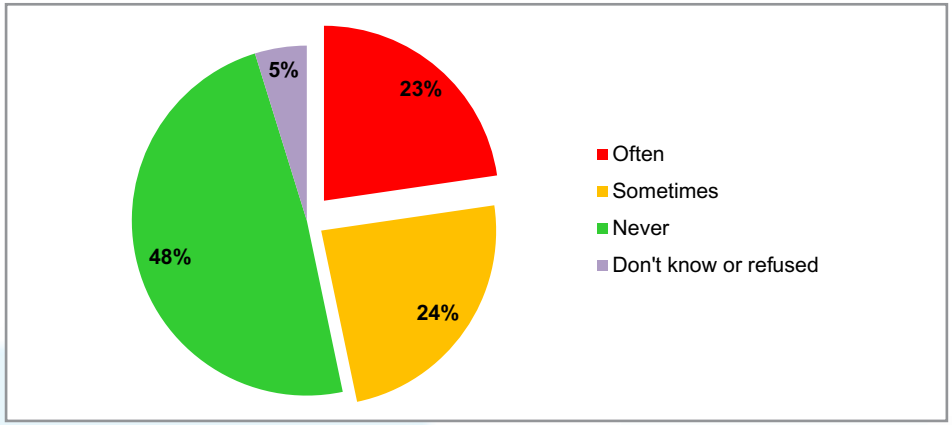



**Table 17. Percent of First Nations adults in Quebec that responded affirmatively to food insecurity questions (in the previous 12 months)**

| | Households affirming item | | |
|---|---|---|---|
| | All Households (n=556) | Households with children (n=308) | Households without children (n=248) |
| **Adult Food Security Scale** | | | |
| You and other household members worried food would run out before you got money to buy more | 30.8 | 34.1 | 23.5 |
| Food you and other household members bought didn't last and there wasn't any money to get more | 31.1 | 31 | 31.3 |
| You and other household members couldn't afford to eat balanced meals | 37.3 | 37.2 | 37.6 |
| You or other adults in your household ever cut size of meals or skipped meals | 11.5 | 9.8 | 15.1 |
| You or other adults in your household ever cut size of meals or skipped meals in 3 or more months | 7.1 | 7 | 7.3 |
| You (personally) ever ate less than you felt you should | 11.1 | 10.6 | 12.2 |
| You (personally) were ever hungry but did not eat | 4.5 | 4.5 | 4.7 |
| You (personally) lost weight | 4.3 | 3.1 | 7.1 |
| You or other adults in your household ever did not eat for a whole day | 2.5 | 2 | 3.8 |
| You or other adults in your household ever did not eat for a whole day in 3 or more months | 1.7 | 1.1 | 2.9 |
| **Child Food Security Scale** | | | |
| You or other adults in your household relied on less expensive foods to feed children | 17.9 | 33.1 | - |
| You or other adults in your household couldn't feed children a balanced meal | 11.7 | 21.7 | - |
| Children were not eating enough | 6.3 | 11.6 | - |
| You or other adults in your household ever cut size of any of the children's meals | 1.7 | 3.1 | - |
| Any of the children were ever hungry | 2.1 | 4.0 | - |
| Any of the children ever skipped meals | 1.7 | 3.1 | - |
| Any of the children ever skipped meals in 3 or more months | 1.2 | 2.2 | - |
| Any of the children ever did not eat for a whole day | 0.1 | 0.2 | - |

(-) denotes not applicable

**Table 18. Income-related household food security status for First Nations in Quebec, by households with and without children, in the previous 12 months**

| | | Income-related food security status | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Food Secure | | | Food Insecure | | | | | | | | |
| | | All | | | All | | | Moderate | | | Severe | | |
| | | n | % | 95% CI | n | % | 95% CI | n | % | 95% CI | n | % | 95% CI |
| All households | Household status | 414 | 64.0 | 57-71 | 142 | 36.0 | 29-43 | 108.0 | 28.1 | 22-34 | 34 | 7.9 | 3-13 |
| | Adult status | 420 | 65.6 | 59-72 | 136 | 34.4 | 28-41 | 103.0 | 26.7 | 21-33 | 33 | 7.8 | 3-12 |
| | Child status | 254 | 84.2 | 79-89 | 54 | 15.8 | 11-21 | 51.0 | 15.5 | 11-20 | 3 | 0.4 | 0-1 |
| Households with children | Household status | 216 | 62.7 | 54-71 | 92 | 37.3 | 29-46 | 76.0 | 29.2 | 22-37 | 16 | 8.1 | 2-14 |
| | Adult status | 222 | 65.0 | 57-73 | 86 | 35.1 | 27-43 | 71.0 | 27.1 | 20-34 | 15 | 8.0 | 2-14 |
| | Child status | 254 | 84.2 | 79-89 | 54 | 15.8 | 11-21 | 51.0 | 15.5 | 11-20 | 3 | 0.4 | 0-1 |
| Households without children | Household status | 198 | 67.0 | 57-77 | 50 | 33.0 | 23-43 | 32.0 | 25.7 | 15-36 | 18 | 7.3 | 2-12 |

**Figure 26. Income-related household food insecurity in First Nations households in Quebec* (n=556)**

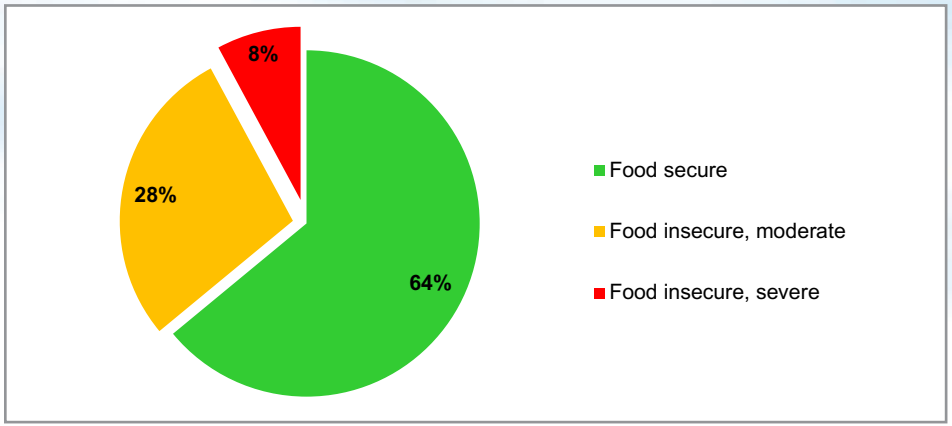
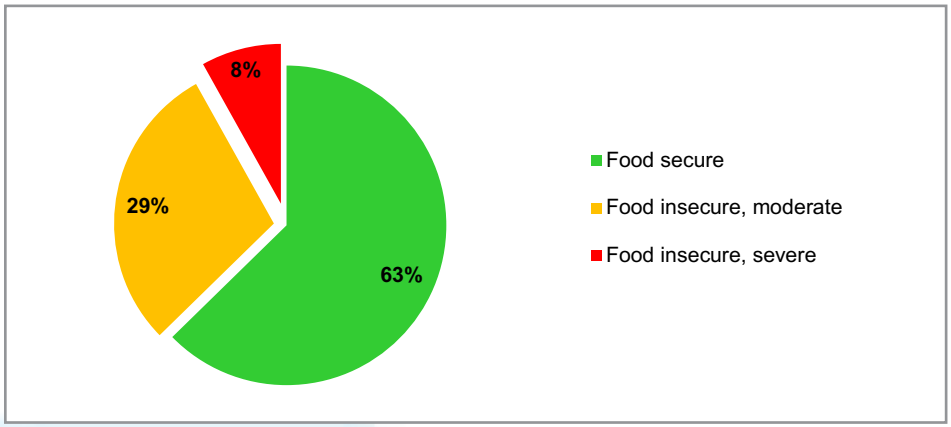



**Figure 27. Income-related household food insecurity in First Nations households with children in Quebec* (n=308)**




*Classification of food security scale based on Canadian Community Health Survey Cycle 2.2, Nutrition (2004), Income-Related Household Food Security in Canada. Health Canada. 2007, Her Majesty the Queen in Right of Canada: Ottawa.

**Figure 28. Income-related household food insecurity in First Nations households without children in Quebec* (n=248)**

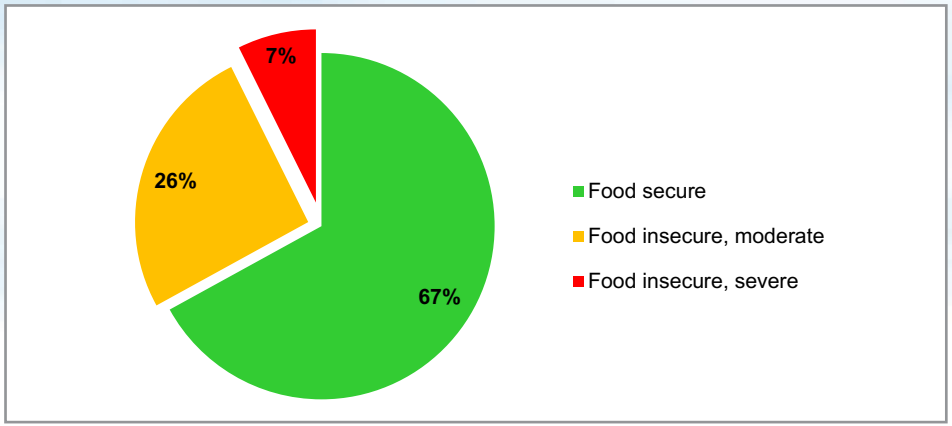
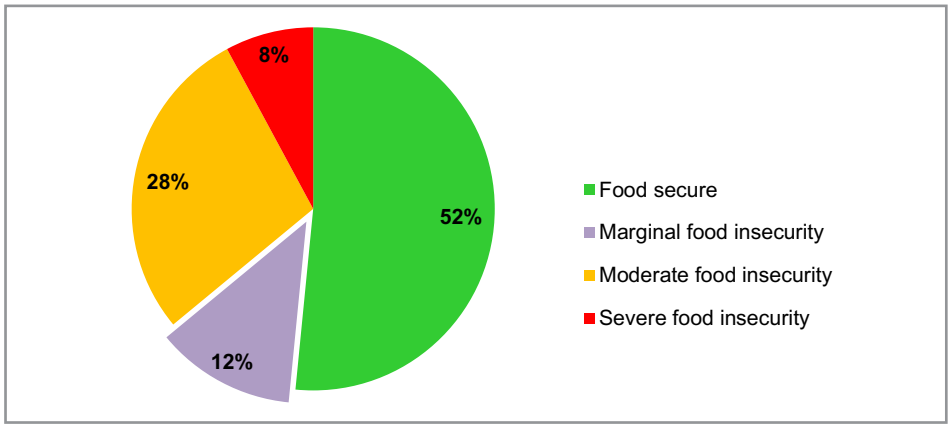
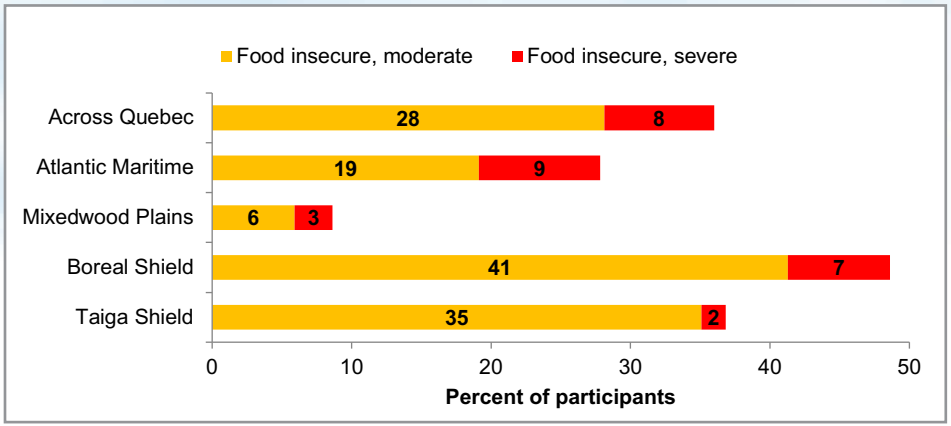



**Figure 29. Income-related marginal food insecurity in First Nations households in Quebec (n=556) * ***

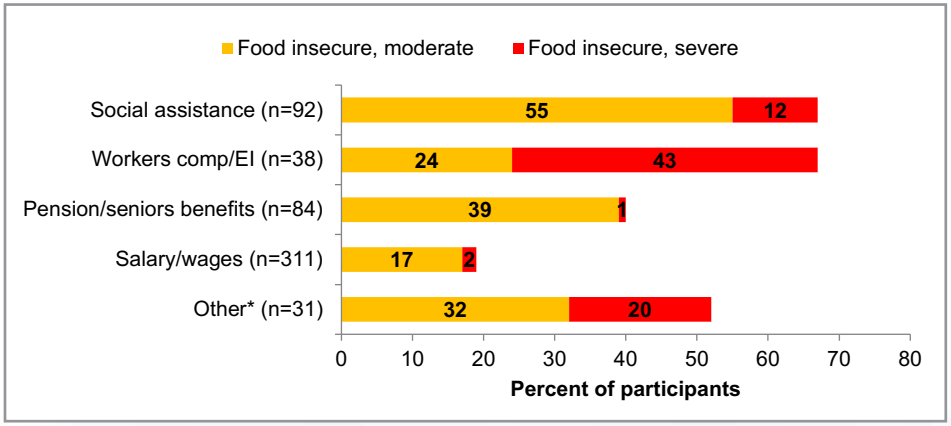



**Classification as per food security category scale from PROOF (Tarasuk et al., 2013)

## Figure 30. Income-related household food insecurity in First Nations communities in Quebec, by ecozone and region

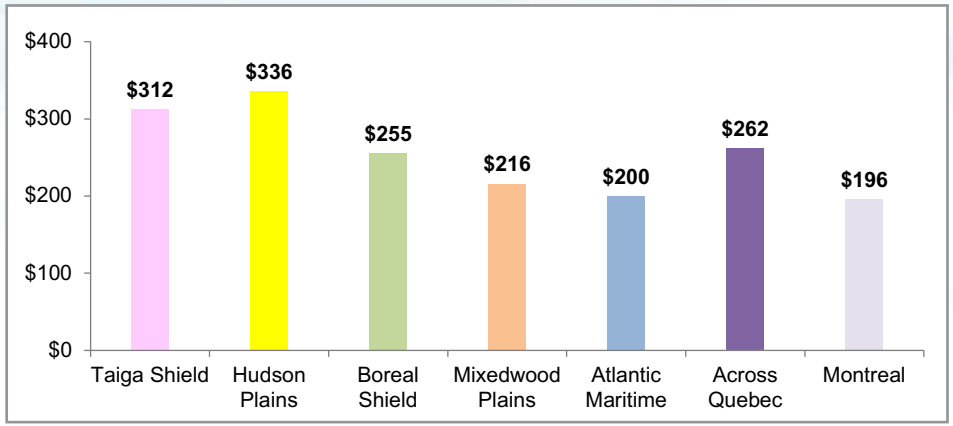



## Figure 31. Income-related household food insecurity in First Nations communities in Quebec, by income sources




*Other=foster parent compensation, student/training allowance, spousal support, none, refused to say

## Figure 32. Comparison of healthy food basket cost for a family of four*




*Family of four consisting of 1 adult male aged 31-50 years old, 1 adult female aged 31-50, 1 male child aged 14-18, and 1 female child aged 4-8. Prices were obtained in fall 2016.

# Concerns about Climate Change

**Figure 33. Percent of First Nations adults in Quebec that noticed any significant climate change in their traditional territory in the last 10 years**

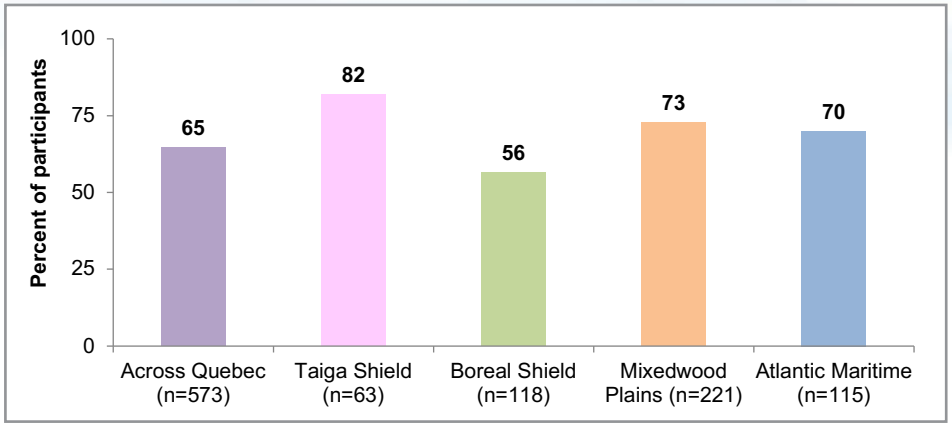
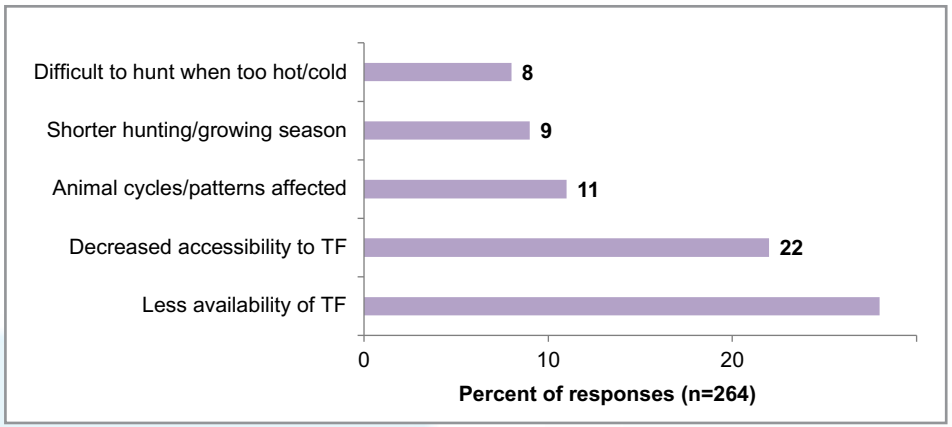



**Figure 34. How climate change has affected traditional food availability in First Nations in Quebec**




*TF=traditional food

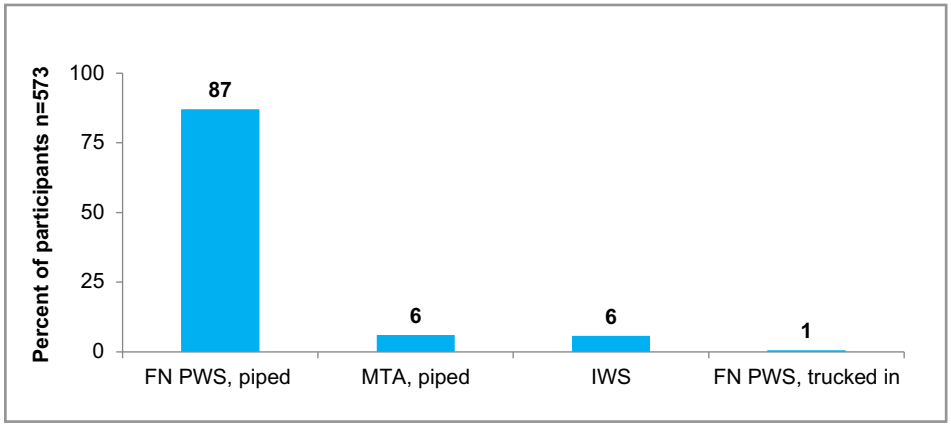
Drying caribou hide. Photo by Rebecca Hare.

# Tap Water Analyses

## Table 19. Characteristics of homes and plumbing, First Nations in Quebec

| Characteristic | Answer |
|---|---|
| Average year home was built (range) (n=440) | 1992 (1717, 2016) |
| Percent of households (HH) with upgraded plumbing (n=573) | 21 |
| Average year plumbing upgraded (range) (n= 91) | 2009 (1975, 2016) |
| Percent of HH that treat water (e.g. boiling, with filters, etc.) (n=573) | 29 |
| Percent of HH with a water storage system (n= 572) | 14 |
| Location of water storage system (n=65): | |
| % Inside | 100 |
| % Outside | 0 |
| Type of water storage system (n=65): | |
| % Able to be carried (bucket) | 85 |
| % Fixed in place | 15 |
| Percent of type of pipes under kitchen sink (n=478) | |
| Steel flex line | 26 |
| Braided flex line | 21 |
| Metal attached to PEX/flex line | 18 |
| Metal only | 17 |
| Plastic | 12 |
| Plastic with metal fittings | 6 |

## Figure 35. Source of tap water, First Nations households in Quebec




Note:
FN PWS, piped in: FN operated public water system (PWS) with piped distribution to households.
FN PWS, trucked in: FN PWS with reliance on water trucks for delivery to households.
MTA, piped indicates that there is an agreement with a nearby municipality to provide treated water to on-reserve households.
IWS: indicates the use of a private well to provide water to less than 5 housing units and does not include any public access buildings. The water may not be treated with chlorine.

## Figure 36. Household (HH) tap water use, First Nations in Quebec

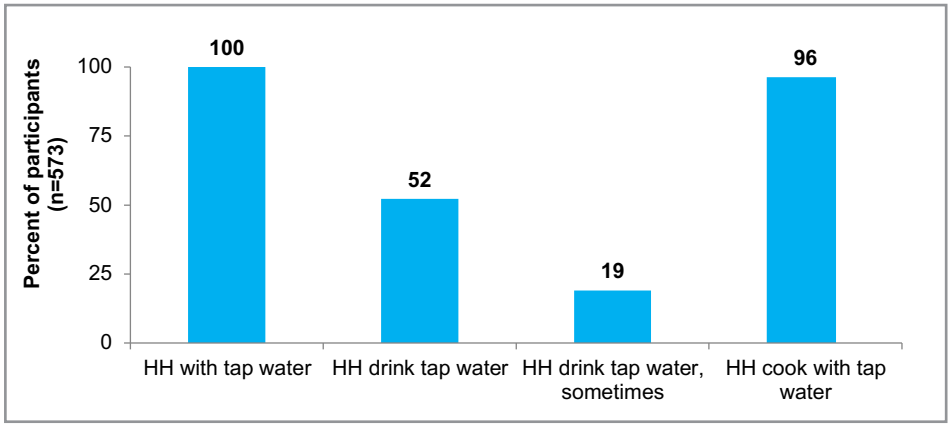


**Figure 37. Source of drinking and cooking water in households that do not use tap water, First Nations in Quebec**

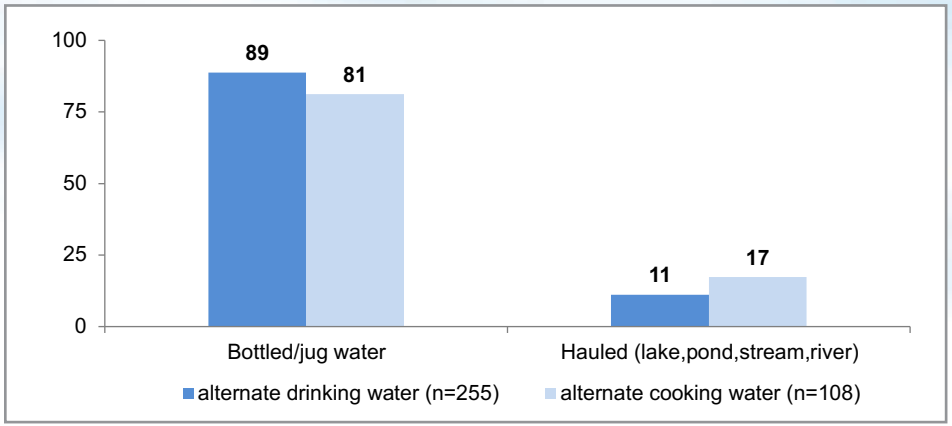



**Figure 38. Deterrents to drinking the tap water**


**Figure 39. Types of water treatment methods for those who treat their drinking water**

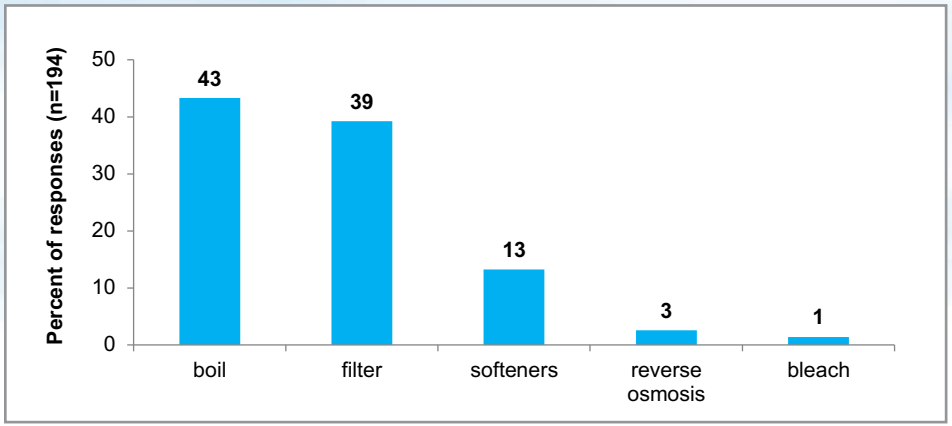



**Figure 40. If tap water is used for drinking, from which tap is the water taken from?**

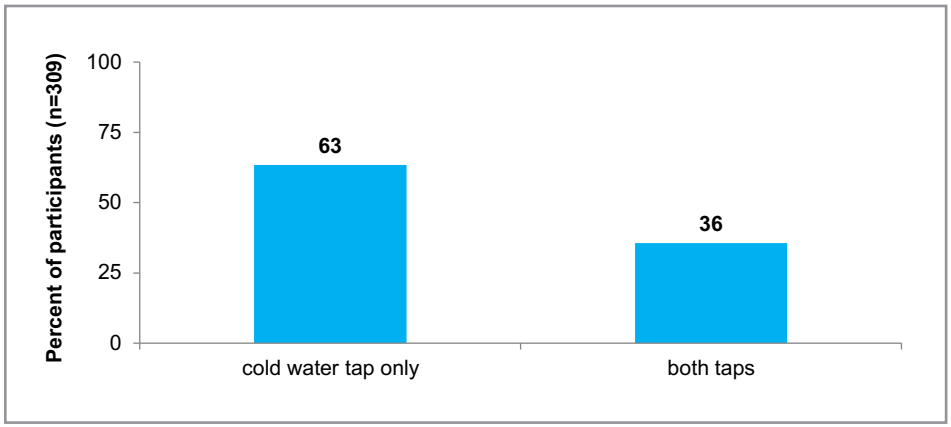


**Figure 41. If tap water is used for cooking, from which tap is the water taken from?**

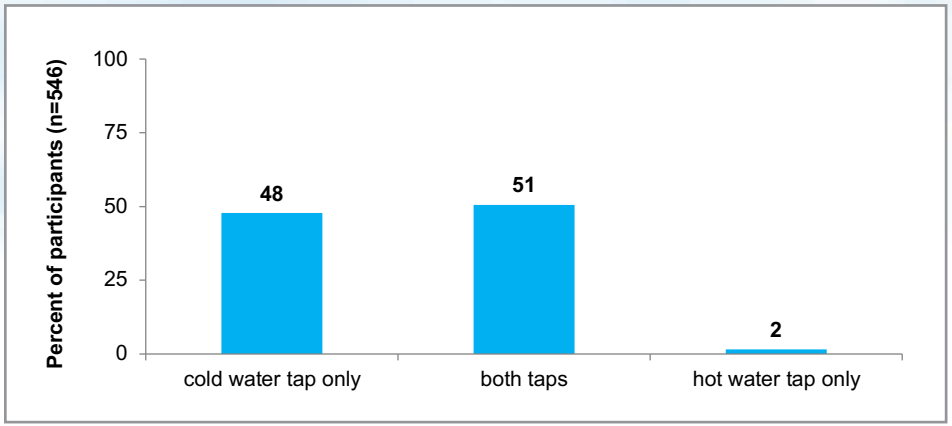



**Table 20: Trace metals analysis results for parameters of health concern**

| Trace metal detected | Maximum detected µg/L | Detection limit µg/L | Maximum allowable concentration µg/L (GCDWQ, 2017) | Number of communities exceeding the guideline value | Total number of samples in excess | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | First Draw | Flushed (5 Min) | Duplicate | |
| **Across Quebec** | | | | | | | | |
| Antimony, Sb | 0.3 | 0.1 | **6** | 0 | 0 | 0 | 0 | Below guideline value. |
| Arsenic, As | 1.77 | 0.1 | **10** | 0 | 0 | 0 | 0 | Below guideline value. |
| Barium, Ba | 716 | 0.2 | **1,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| Boron, B | 3000 | 10 | **5,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| Cadmium, Cd | 0.241 | 0.01 | **5** | 0 | 0 | 0 | 0 | Below guideline value. |
| Chromium, Cr | 2.61 | 0.5 | **50** | 0 | 0 | 0 | 0 | Below guideline value. |
| Lead, Pb | 25.3 | 0.1 | **10** | 0 | **2** | 0 | 0 | **Flushed samples were below guideline value.** |
| Mercury, Hg | 0.013 | 0.01 | **1** | 0 | 0 | 0 | 0 | Below guideline value. |
| Selenium, Se | 0.315 | 0.05 | **50** | 0 | 0 | 0 | 0 | Below guideline value. |
| Uranium, U | 9.62 | 0.01 | **20** | 0 | 0 | 0 | 0 | Below guideline value. |

## Table 21. Trace metals analysis results for parameters of aesthetic or operational concern

| Trace metal detected | Maximum detected µg/L | Detection limit µg/L | Maximum allowable concentration µg/L (GCDWQ, 2017) | Number of communities exceeding the guideline value | Total number of samples in excess | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | First Draw | Flushed (5 Min) | Duplicate | |
| **Across Quebec** | | | | | | | | |
| Aluminum, Al | 157 | 10 | **100/200*** | **1** | 2 | **2** | 0 | Above guideline in 2 homes in 1 community. Elevated levels pose no health concern. |
| Copper, Cu | 1,310 | 1 | **1,000** | 0 | 2 | 0 | 0 | Flushed samples below guideline value. |
| Iron, Fe | 5,070 | 50 | **300** | **1** | 3 | **3** | 0 | Above guideline in 3 homes in 1 community. Elevated levels pose no health concern. |
| Manganese, Mn | 975 | 0.5 | **50** | **2** | 3 | **3** | 0 | Above guideline in 3 homes spread between 2 communities. Elevated levels pose no health concern. |
| Sodium, Na | 866,000 | 500 | **200,000** | **1** | 9 | **9** | **1** | Above guideline in 9 homes in 1 community. Elevated levels pose no health concern. |
| Zinc, Zn | 2,760 | 3 | **5,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| **Taiga Shield** | | | | | | | | |
| Aluminum, Al | <10 | 10 | **100/200*** | 0 | 0 | 0 | 0 | Below guideline value. |
| Copper, Cu | 1270 | 1 | **1,000** | 0 | 1 | 0 | 0 | Flushed samples below guideline value. |
| Iron, Fe | 119 | 50 | **300** | 0 | 0 | 0 | 0 | Below guideline value. |
| Manganese, Mn | 5.2 | 0.5 | **50** | 0 | 0 | 0 | 0 | Below guideline value. |
| Sodium, Na | 10,700 | 500 | **200,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| Zinc, Zn | 330 | 3 | **5,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| **Boreal Shield** | | | | | | | | |
| Aluminum, Al | 157 | 10 | **100/200*** | **1** | 2 | **2** | 0 | Above guideline in 2 homes in 1 community. Elevated levels pose no health concern. |
| Copper, Cu | 565 | 1 | **1,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| Iron, Fe | 73 | 50 | **300** | 0 | 0 | 0 | 0 | Below guideline value. |
| Manganese, Mn | 73 | 0.5 | **50** | 0 | 0 | 0 | 0 | Below guideline value. |
| Sodium, Na | 18,700 | 500 | **200,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| Zinc, Zn | 980 | 3 | **5,000** | 0 | 0 | 0 | 0 | Below guideline value. |

**Table 21. Trace metals analysis results for parameters of aesthetic or operational concern**

| Trace metal detected | Maximum detected µg/L | Detection limit µg/L | Maximum allowable concentration µg/L (GCDWQ, 2017) | Number of communities exceeding the guideline value | Total number of samples in excess | | | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | First Draw | Flushed (5 Min) | Duplicate | |
| **Mixedwood Plains** | | | | | | | | |
| Aluminum, Al | 32 | 10 | **100/200*** | 0 | 0 | 0 | 0 | Below guideline value. |
| Copper, Cu | 1,310 | 1 | **1,000** | 0 | 1 | 0 | 0 | Flushed samples below guideline value. |
| Iron, Fe | 5,070 | 50 | **300** | **1** | 3 | **3** | 0 | Above guideline in 3 homes in 1 community. Elevated levels pose no health concern. |
| Manganese, Mn | 370 | 0.5 | **50** | **1** | 2 | **2** | 0 | Above guideline in 2 homes in 1 community. Elevated levels pose no health concern |
| Sodium, Na | 866,000 | 500 | **200,000** | **1** | 9 | **9** | **1** | Above guideline in 9 homes in 1 community. Elevated levels pose no health concern |
| Zinc, Zn | 2,760 | 3 | **5,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| **Atlantic Maritime** | | | | | | | | |
| Aluminum, Al | 57 | 10 | **100/200*** | 0 | 0 | 0 | 0 | Below guideline value. |
| Copper, Cu | 256 | 1 | **1,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| Iron, Fe | 72 | 50 | **300** | 0 | 0 | 0 | 0 | Below guideline value. |
| Manganese, Mn | 975 | 0.5 | **50** | **1** | 1 | **1** | 0 | Above guideline in 1 home in 1 community. Elevated levels pose no health concern |
| Sodium, Na | 129,000 | 500 | **200,000** | 0 | 0 | 0 | 0 | Below guideline value. |
| Zinc, Zn | 800 | 3 | **5,000** | 0 | 0 | 0 | 0 | Below guideline value. |

*This is an operational guidance value, designed to apply only to drinking water treatment plants using aluminum-based coagulants. The operational guidance values of 0.1mg/L applies to conventional treatment plants, and 0.2 mg/ L applies to other types of treatment systems.

# Pharmaceutical Analyses in Surface Water

**Table 22. Pharmaceuticals tested for and quantified in First Nations communities in Quebec**

| Pharmaceutical | Areas of Use | | | Detected Surface Water | Detected Drinking Water |
|---|---|---|---|---|---|
| | Human | Veterinary | Aquaculture | | |
| **Analgesic** | | | | | |
| Codeine | X | | | **Yes** | No |
| **Analgesic/Anti-inflammatory** | | | | | |
| Acetaminophen | X | | | **Yes** | No |
| Diclofenac | X | | | **Yes** | No |
| Ibuprofen | X | | | **Yes** | No |
| Indomethacin | X | | | No | No |
| Ketoprofen | X | X | | **Yes** | **Yes** |
| Naproxen | X | | | **Yes** | No |
| **Antacid** | | | | | |
| Cimetidine | X | | | **Yes** | No |
| Ranitidine | X | | | **Yes** | No |
| **Antianginal metabolite** | | | | | |
| Dehydronifedipine | X | | | No | No |
| **Antibiotic** | | | | | |
| Chlortetracycline | | X | | No | No |
| Ciprofloxacin | X | | | **Yes** | No |
| Clarithromycin | X | | | **Yes** | No |
| Erythromycin | X | X | | No | No |
| Isochlortetracycline | | X | | No | No |
| Lincomycin | | X | | No | No |
| Monensin | | X | | No | No |
| Oxytetracycline | | X | X | No | No |
| Roxithromycin | X | | | No | No |
| Sulfamethazine | | X | | **Yes** | No |
| Sulfamethoxazole | X | | | **Yes** | No |
| Tetracycline | X | X | | No | No |
| Trimethoprim | X | X | X | No | No |

## Table 22. Pharmaceuticals tested for and quantified in First Nations communities in Quebec

| Pharmaceutical | Areas of Use | | | Detected Surface Water | Detected Drinking Water |
|---|---|---|---|---|---|
| | Human | Veterinary | Aquaculture | | |
| **Anticoagulant** | | | | | |
| Warfarin | X | X | | No | No |
| **Anticonvulsant** | | | | | |
| Carbamazepine | X | | | **Yes** | No |
| **Antidepressant** | | | | | |
| Fluoxetine | X | X | | No | No |
| **Antidiabetic** | | | | | |
| Metformin | X | | | **Yes** | No |
| Pentoxifylline | X | X | | **Yes** | No |
| **Antihistamine** | | | | | |
| Diphenhydramine | X | | | **Yes** | No |
| **Antihypertensive** | | | | | |
| Diltiazem | X | | | No | No |
| **Antihypertensive (Beta-blocker)** | | | | | |
| Atenolol | X | | | **Yes** | No |
| Metoprolol | X | | | **Yes** | No |
| **Diuretic** | | | | | |
| Furosemide | X | | | **Yes** | No |
| Hydrochlorothiazide | X | | | **Yes** | No |
| **Lipid regulator** | | | | | |
| Atorvastatin | X | | | **Yes** | No |
| Bezafibrate | X | | | **Yes** | No |
| Clofibric Acid | X | X | | No | No |
| Gemfibrozil | X | | | **Yes** | No |
| **Nicotine metabolite (smoking cessation)** | | | | | |
| Cotinine | X | | | **Yes** | No |
| **Oral contraceptive** | | | | | |
| 17-alpha-Ethinylestradiol | X | | | No | No |
| **Steroid** | | | | | |
| 17-alpha-Trenbolone | | X | | No | No |
| 17-beta-Trenbolone | | X | | No | No |
| **Stimulant** | | | | | |
| Caffeine | X | | | **Yes** | No |

## Table 23: Level of pharmaceuticals detected in surface water and drinking water in First Nation communities in Quebec and by ecozone

| Pharmaceutical detected | Detection limit (ng/l) | FNFNES Quebec Results | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Surface water | | | | | | | Drinking water | | | | | | |
| | | Max Concentration (ng/l) | Number of samples | | Number of sites | | Number of communities | | Max Concentration (ng/l) | Number of samples | | Number of sites | | Number of communities | |
| | | | Collected | Detected | Collected | Detected | Collected | Detected | | Collected | Detected | Collected | Detected | Collected | Detected |
| **Across Quebec** | | | | | | | | | | | | | | | |
| Analgesic | | | | | | | | | | | | | | | |
| Codeine | 5 | 9.6 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | | 2 | | | |
| **Analgesic/Anti-inflammatory** | | | | | | | | | | | | | | | |
| Acetaminophen | 10 | 20 | 39 | 8 | 28 | 5 | 9 | **2** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Diclofenac | 15 | 16 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Ibuprofen | 20 | 150 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Ketoprofen | 2 | 9.3 | 39 | 2 | 28 | 2 | 9 | **2** | 5.5 | 3 | 2 | 2 | 2 | 1 | 1 |
| Naproxen | 5 | 244 | 39 | 9 | 28 | 6 | 9 | **3** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Antacid** | | | | | | | | | | | | | | | |
| Cimetidine | 2 | 4 | 39 | 4 | 28 | 3 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Ranitidine | 10 | 12 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Antibiotic** | | | | | | | | | | | | | | | |
| Ciprofloxacin | 20 | 25 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Clarithromycin | 2 | 21.3 | 39 | 9 | 28 | 6 | 9 | **3** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Sulfamethazine | 5 | 24.2 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Sulfamethoxazole | 2 | 22 | 39 | 16 | 28 | 10 | 9 | **3** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Anticonvulsant** | | | | | | | | | | | | | | | |
| Carbamazepine | 0.5 | 37.6 | 39 | 16 | 28 | 10 | 9 | **3** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Antidiabetic** | | | | | | | | | | | | | | | |
| Metformin | 10 | 5880 | 39 | 17 | 28 | 11 | 9 | **4** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Pentoxifylline | 2 | 26.9 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Antihistamine** | | | | | | | | | | | | | | | |
| Diphenhydramine | 10 | 30 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Antihypertensive (Beta-blocker)** | | | | | | | | | | | | | | | |
| Atenolol | 5 | 15.5 | 39 | 11 | 28 | 7 | 9 | **2** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Metoprolol | 5 | 25.3 | 39 | 5 | 28 | 4 | 9 | **2** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Diuretic** | | | | | | | | | | | | | | | |
| Furosemide | 5 | 30.7 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Hydrochlorothiazide | 5 | 39.3 | 39 | 4 | 28 | 2 | 9 | **2** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |

**Table 23: Level of pharmaceuticals detected in surface water and drinking water in First Nation communities in Quebec and by ecozone**

| Pharmaceutical detected | Detection limit (ng/l) | FNFNES Quebec Results | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Surface water | | | | | | | Drinking water | | | | | | |
| | | Max Concentration (ng/l) | Number of samples | | Number of sites | | Number of communities | | Max Concentration (ng/l) | Number of samples | | Number of sites | | Number of communities | |
| | | | Collected | Detected | Collected | Detected | Collected | Detected | | Collected | Detected | Collected | Detected | Collected | Detected |
| **Lipid regulator** | | | | | | | | | | | | | | | |
| Atorvastatin | 5 | 8.8 | 39 | 2 | 28 | 1 | 9 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Bezafibrate | 1 | 1.8 | 39 | 4 | 28 | 3 | 9 | **2** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| Gemfibrozil | 1 | 2.7 | 39 | 5 | 28 | 4 | 9 | **2** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Nicotine metabolite (smoking cessation)** | | | | | | | | | | | | | | | |
| Cotinine | 5 | 90 | 39 | 11 | 28 | 7 | 9 | **4** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Stimulant** | | | | | | | | | | | | | | | |
| Caffeine | 5 | 850.4 | 39 | 25 | 28 | 16 | 9 | **7** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Taiga Shield** | | | | | | | | | | | | | | | |
| **Nicotine metabolite (smoking cessation)** | | | | | | | | | | | | | | | |
| Cotinine | 5 | 56.6 | 8 | 3 | 6 | 2 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Stimulant** | | | | | | | | | | | | | | | |
| Caffeine | 5 | 40.1 | 8 | 4 | 6 | 3 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Boreal Shield** | | | | | | | | | | | | | | | |
| **Analgesic/Anti-Inflammatory** | | | | | | | | | | | | | | | |
| Ketoprofen | 2 | 9.3 | 9 | 1 | 7 | 1 | 3 | **1** | 5.5 | 3 | 2 | 2 | 2 | 1 | 1 |
| **Antidiabetic** | | | | | | | | | | | | | | | |
| Metformin | 10 | 20 | 9 | 1 | 7 | 1 | 3 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Stimulant** | | | | | | | | | | | | | | | |
| Caffeine | 5 | 40.1 | 9 | 3 | 7 | 2 | 3 | **1** | 0 | 3 | 0 | 2 | 0 | 1 | 0 |
| **Mixedwood Plains** | | | | | | | | | | | | | | | |
| **Analgesic/Anti-Inflammatory** | | | | | | | | | | | | | | | |
| Acetaminophen | 10 | 20 | 14 | 8 | 9 | 5 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ketoprofen | 2 | 3.1 | 14 | 1 | 9 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Naproxen | 5 | 62 | 14 | 7 | 9 | 5 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Antacid** | | | | | | | | | | | | | | | |
| Cimetidine | 2 | 4 | 14 | 4 | 9 | 3 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Table 23: Level of pharmaceuticals detected in surface water and drinking water in First Nation communities in Quebec and by ecozone

| Pharmaceutical detected | Detection limit (ng/l) | FNFNES Quebec Results | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Surface water | | | | | | | Drinking water | | | | | | |
| | | Max Concentration (ng/l) | Number of samples | | Number of sites | | Number of communities | | Max Concentration (ng/l) | Number of samples | | Number of sites | | Number of communities | |
| | | | Collected | Detected | Collected | Detected | Collected | Detected | | Collected | Detected | Collected | Detected | Collected | Detected |
| **Antibiotic** | | | | | | | | | | | | | | | |
| Ciprofloxacin | 20 | 25 | 14 | 2 | 9 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Clarithromycin | 2 | 7.6 | 14 | 7 | 9 | 5 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sulfamethoxazole | 2 | 12.1 | 14 | 14 | 9 | 9 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Anticonvulsant** | | | | | | | | | | | | | | | |
| Carbamazepine | 0.5 | 15.7 | 14 | 14 | 9 | 9 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Antidiabetic** | | | | | | | | | | | | | | | |
| Metformin | 10 | 2020 | 14 | 14 | 9 | 9 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Antihypertensive (Beta-blocker)** | | | | | | | | | | | | | | | |
| Atenolol | 5 | 15 | 14 | 9 | 9 | 6 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Metoprolol | 5 | 9.6 | 14 | 3 | 9 | 3 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Diuretic** | | | | | | | | | | | | | | | |
| Hydrochlorothiazide | 5 | 7.7 | 14 | 2 | 9 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Lipid Regulator** | | | | | | | | | | | | | | | |
| Bezafibrate | 1 | 1.8 | 14 | 4 | 9 | 3 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gemfibrozil | 1 | 2.7 | 14 | 5 | 9 | 4 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Nicotine metabolite (smoking cessation)** | | | | | | | | | | | | | | | |
| Cotinine | 5 | 31.3 | 14 | 6 | 9 | 4 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Stimulant** | | | | | | | | | | | | | | | |
| Caffeine | 5 | 161 | 14 | 14 | 9 | 9 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Atlantic Maritime** | | | | | | | | | | | | | | | |
| **Analgesic** | | | | | | | | | | | | | | | |
| Codeine | 5 | 9.6 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Analgesic/Anti-Inflammatory** | | | | | | | | | | | | | | | |
| Diclofenac | 15 | 16 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ibuprofen | 20 | 150 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Naproxen | 5 | 244 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Antacid** | | | | | | | | | | | | | | | |
| Ranitidine | 10 | 12 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 23: Level of pharmaceuticals detected in surface water and drinking water in First Nation communities in Quebec and by ecozone**

| Pharmaceutical detected | Detection limit (ng/l) | FNFNES Quebec Results | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Surface water | | | | | | | Drinking water | | | | | | |
| | | Max Concentration (ng/l) | Number of samples | | Number of sites | | Number of communities | | Max Concentration (ng/l) | Number of samples | | Number of sites | | Number of communities | |
| | | | Collected | Detected | Collected | Detected | Collected | Detected | | Collected | Detected | Collected | Detected | Collected | Detected |
| **Antibiotic** | | | | | | | | | | | | | | | |
| Clarithromycin | 2 | 21.3 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sulfamethazine | 5 | 24.2 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sulfamethoxazole | 2 | 22 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Anticonvulsant** | | | | | | | | | | | | | | | |
| Carbamazepine | 0.5 | 37.6 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Antidiabetic** | | | | | | | | | | | | | | | |
| Metformin | 10 | 5880 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pentoxifylline | 2 | 26.9 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Antihistamine** | | | | | | | | | | | | | | | |
| Diphenhydramine | 10 | 30 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Antihypertensive (Beta-blocker)** | | | | | | | | | | | | | | | |
| Atenolol | 5 | 15.5 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Metoprolol | 5 | 25.3 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Diuretic** | | | | | | | | | | | | | | | |
| Furosemide | 5 | 30.7 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hydrochlorothiazide | 5 | 39.3 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Lipid Regulators** | | | | | | | | | | | | | | | |
| Atorvastatin | 5 | 8.8 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Metabolite of nicotine (smoking cessation)** | | | | | | | | | | | | | | | |
| Cotinine | 5 | 90 | 8 | 2 | 6 | 1 | 2 | **1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Stimulant** | | | | | | | | | | | | | | | |
| Caffeine | 5 | 850.4 | 8 | 4 | 6 | 2 | 2 | **2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 24. Comparison of pharmaceutical levels detected in First Nations communities in Quebec to findings from Canadian, U.S. and Global studies**

| Pharmaceutical | | # of communities | # of sites | | FNFNES Max Concentration (ng/l) | Canadian & US Studies (ng/l) | Global Studies (ng/l) | Reference |
|---|---|---|---|---|---|---|---|---|
| | | | Surface Water | Drinking Water | | | | |
| **Analgesic** | | | | | | | | |
| 1 | Codeine | 1 | 1 | 0 | 10 | 1,000 [a] | 815 [ad] (Wales) | (a) (Kolpin et al. 2002); (ad) (Kasprzyk-Hordern, Dinsdale and Guwy 2008) |
| **Analgesic/Anti-Inflammatory** | | | | | | | | |
| 2 | Acetaminophen | 5 | 2 | 0 | 20 | 10,000 [a] | 17,699 [b] (Spain) | (a) (Kolpin et al. 2002); (b) (Pascual-Aguilar, Andreu and Pico 2013) |
| 3 | Diclofenac | 1 | 1 | 0 | 16 | 500 [c] | 18,740 [d] (Spain) | (c) (Chiu and Westerhoff 2010) (d) (Ginebreda et al. 2010) |
| 4 | Ibuprofen | 1 | 1 | 0 | 150 | 6,400 [e] | 303,000 [f] (Bulgaria) | (e) (Sadezky et al. 2010); (f) (Aus der Beek et al. 2016) |
| 5 | Ketoprofen | 4 | 2 | 2 | 9 | 79 [g] | 9,808 [h] (Costa Rica) | (g) (Brun et al. 2006); (h) (Spongberg et al. 2011) |
| 6 | Naproxen | 6 | 3 | 0 | 244 | 4,500 [g] | 32,000 [i] (Pakistan) | (g) (Brun et al., 2006); (i) (Selke et al. 2010) |
| **Antacid** | | | | | | | | |
| 7 | Cimetidine | 3 | 1 | 0 | 4 | 688 [o] | 1,338 [q] (Korea) | (o) (Bradley et al. 2014); (q) (Choi et al. 2008) |
| 8 | Ranitidine | 1 | 1 | 0 | 12 | 2,200 [o] | 1,944 [l] (Spain) | (o) (Bradley et al. 2014); (l) (Valcarcel et al. 2011b) |

**Table 24. Comparison of pharmaceutical levels detected in First Nations communities in Quebec to findings from Canadian, U.S. and Global studies**

| Pharmaceutical | | # of communities | # of sites | | FNFNES Max Concentration (ng/l) | Canadian & US Studies (ng/l) | Global Studies (ng/l) | Reference |
|---|---|---|---|---|---|---|---|---|
| | | | Surface Water | Drinking Water | | | | |
| **Antibiotic** | | | | | | | | |
| 9 | Ciprofloxacin | 1 | 1 | 0 | 25 | 360 [e] | 6,500,000 [j] (India) | (e) (Sadezky et al., 2010); (j) (Khan et al. 2013) |
| 10 | Clarithromycin | 6 | 3 | 0 | 21 | 243 [k] | 1,727 [l] (Spain) | (k) (de Solla et al. 2016); (l) (Valcarcel et al. 2011b) |
| 11 | Sulfamethazine | 1 | 1 | 0 | 24 | 408 [m] | 6,192 [n] (Spain) | (m) (Lissemore et al. 2006); (n) (Diaz-Cruz, Garcia-Galan and Barcelo 2008) |
| 12 | Sulfamethoxazole | 10 | 3 | 0 | 22 | 3,280 [o] | 49,000 [j] (Pakistan) | (o) (Bradley et al. 2014); (j) (Khan et al. 2013) |
| **Anticonvulsant** | | | | | | | | |
| 13 | Carbamazepine | 10 | 3 | 0 | 38 | 3,480 [z] | 67,715 [l] (Spain) | (z) (Roden 2013); (l) (Valcarcel et al. 2011b) |
| **Anti-diabetic** | | | | | | | | |
| 14 | Metformin | 11 | 4 | 0 | 5,880 | 10,100 [k] | 20,015 [s] (China) | (k) (de Solla et al. 2016); (s) (Kong et al. 2015) |
| 15 | Pentoxifylline | 1 | 1 | 0 | 27 | 92 [c] | 570 [p] (Germany) | (c) (Chiu and Westerhoff 2010); (p) (Sacher et al. 2008) |
| **Antihistamine** | | | | | | | | |
| 16 | Diphenhydramine | 1 | 1 | 0 | 30 | 1,411 [aa] | 121 [ab] (South Korea) | (aa) (Bartelt-Hunt et al. 2009); (ab) (Bayen et al. 2013) |

**Table 24. Comparison of pharmaceutical levels detected in First Nations communities in Quebec to findings from Canadian, U.S. and Global studies**

| Pharmaceutical | | # of communities | # of sites | | FNFNES Max Concentration (ng/l) | Canadian & US Studies (ng/l) | Global Studies (ng/l) | Reference |
|---|---|---|---|---|---|---|---|---|
| | | | Surface Water | Drinking Water | | | | |
| **Antihypertensive (Beta-blocker)** | | | | | | | | |
| 17 | Atenolol | 7 | 2 | 0 | 16 | 1,610 [o] | 30,900 [t] (South Africa) | (o) (Bradley et al, 2014) (t) (Agunbiade and Moodley 2014) |
| 18 | Metoprolol | 4 | 2 | 0 | 25 | 571 [u] | 8,041 [v] (Spain) | (u) (Fono, Kolodziej and Sedlak 2006); (v) (Lopez-Roldan et al. 2010) |
| **Diuretic** | | | | | | | | |
| 19 | Furosemide | 1 | 1 | 0 | 31 | 284 [k] | 630 [x] (Wales) | (k) (de Solla et al. 2016); (x) (Kasprzyk-Hordern, Dinsdale and Guwy 2009) |
| 20 | Hydrochlorothiazide | 2 | 2 | 0 | 39 | 620 [r] | 17,589 [ac] (Spain) | (r) (Batt, et al. 2016); (ac) (Valcarcel et al. 2011a) |
| **Lipid Regulator** | | | | | | | | |
| 21 | Atorvastatin | 1 | 1 | 0 | 9 | 101.3 [w] | 233 [y] (South Africa) | (w) (Conley et al. 2008); (y) (Archer et al. 2017) |
| 22 | Bezafibrate | 3 | 2 | 0 | 2 | 470 [g] | 15,060 [d] (Spain) | (g) (Brun et al. 2006); (d) (Ginebreda et al. 2010) |
| 23 | Gemfibrozil | 4 | 2 | 0 | 3 | 4,200 [ae] | 17,036 [h] (Costa Rica) | (ae) (Waiser et al. 2011); (h) (Spongberg et al. 2011) |
| **Metabolite of nicotine (smoking cessation)** | | | | | | | | |
| 24 | Cotinine | 7 | 4 | 0 | 90 | 1,400 [c] | 6,582 [l] (Spain) | (c) (Chiu et al. 2010); (l) (Valcarcel et al. 2011b) |
| **Stimulant** | | | | | | | | |
| 25 | Caffeine | 16 | 7 | 0 | 850 | 7,110 [af] | 1,121,446 [h] (Costa Rica) | (af) (Young et al. 2008); (h) (Spongberg et al. 2011) |

**Table 25. Comparison of FNFNES Quebec results to drinking water guidelines in Australia, California and New York**

| Pharmaceuticals detected | FNFNES Max concentration (ng/L) | | Australian guideline (ng/L) | California monitoring trigger level (ng/L) | New York State standard (ng/L) |
|---|---|---|---|---|---|
| | Surface Water | Drinking Water | | | |
| **Across Quebec** | | | | | |
| **Analgesic** | | | | | |
| Codeine | 9.6 | 0 | 50,000 | NA | NA |
| **Analgesic/Anti-inflammatory** | | | | | |
| Acetaminophen | 20 | 0 | 175,000 | 350,000 | 5,000 |
| Diclofenac | 16 | 0 | 1,800 | 1,800 | NA |
| Ibuprofen | 150 | 0 | 400,000 | 34,000 | 50,000 |
| Ketoprofen | 9.3 | 5.5 | 3,500 | 3,500 | NA |
| Naproxen | 244 | 0 | 220,000 | 220,000 | NA |
| **Antacid** | | | | | |
| Cimetidine | 4 | 0 | 200,000 | NA | NA |
| Ranitidine | 12 | 0 | NA | NA | NA |
| **Antibiotic** | | | | | |
| Ciprofloxacin | 25 | 0 | 250,000 | 17,000 | NA |
| Clarithromycin | 21.3 | 0 | 250,000 | NA | NA |
| Sulfamethazine | 24.2 | 0 | 35,000 | NA | NA |
| Sulfamethoxazole | 22 | 0 | 35,000 | 35,000 | 5,000 |
| **Anticonvulsant** | | | | | |
| Carbamazepine | 37.6 | 0 | 100,000 | 1,000 | 50,000 |
| **Antidiabetic** | | | | | |
| Metformin | 5880 | 0 | 250,000 | NA | NA |
| Pentoxifylline | 26.9 | 0 | NA | NA | NA |

**Table 25. Comparison of FNFNES Quebec results to drinking water guidelines in Australia, California and New York**

| Pharmaceuticals detected | FNFNES Max concentration (ng/L) | | Australian guideline (ng/L) | California monitoring trigger level (ng/L) | New York State standard (ng/L) |
|---|---|---|---|---|---|
| | Surface Water | Drinking Water | | | |
| **Antihistamine** | | | | | |
| Diphenhydramine | 30 | 0 | NA | NA | NA |
| **Antihypertensive (Beta-blocker)** | | | | | |
| Atenolol | 15.5 | 0 | NA | 70,000 | NA |
| Metoprolol | 25.3 | 0 | 25,000 | 25,000 | NA |
| **Diuretic** | | | | | |
| Furosemide | 30.7 | 0 | NA | NA | NA |
| Hydrochlorothiazide | 39.3 | 0 | NA | NA | NA |
| **Lipid regulator** | | | | | |
| Atorvastatin | 8.8 | 0 | 5,000 | 5,000 | NA |
| Bezafibrate | 1.8 | 0 | 300,000 | NA | NA |
| Gemfibrozil | 2.7 | 0 | 600,000 | 45,000 | 50,000 |
| **Nicotine metabolite (smoking cessation)** | | | | | |
| Cotinine | 90 | 0 | 10,000 | NA | 50,000 |
| **Stimulant** | | | | | |
| Caffeine | 850.4 | 0 | 350 | 350 | 50,000 |

# Mercury in Hair Analyses

## Table 26. Arithmetic (A.M.) and geometric (G.M.) means of total mercury in hair concentration (µg/g or ppm) for First Nations in Quebec

| First Nations living in Quebec on-reserve | | | | Unweighted means | | Weighted means | | | | | | | | Weighted percentiles | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gender | Age group | Sample size | %<LOD | A.M. | G.M. | A.M. | Lower 95% CI | Upper 95% CI | C.V.% | G.M. | Lower 95% CI | Upper 95% CI | C.V.% | 90th | Lower 95% CI | Upper 95% CI | 95th | Lower 95% CI | Upper 95%CI |
| Adults | 19-30 | 65 | 30.77 | 0.67 | 0.25 | 0.74 | <LOD | 1.54 | 55.70 | 0.28 | 0.08 | 0.99 | 63.94 | 2.61 | 0.36 | 4.87 | 2.89 | 0.88 | 4.91 |
| | 31-50 | 162 | 19.75 | 0.73 | 0.29 | 0.69 | 0.43 | 0.95 | 19.26 | 0.37 | 0.25 | 0.54 | 20.26 | 1.42 | 0.69 | 2.15 | 3.21 | 1.05 | 5.37 |
| | 51-70 | 118 | 22.88 | 0.95 | 0.31 | 0.99 | 0.58 | 1.41 | 21.21 | 0.37 | 0.19 | 0.69 | 32.43 | 3.69 | 1.65 | 5.73 | 4.97 | 3.51 | 6.43 |
| | 71+ | 36 | 19.44 | 1.83 | 0.32 | 6.65 | 2.49 | 10.81 | 31.92 | 1.82 | 0.50 | 6.68 | 66.19 | 12.21 | <LOD | 28.32 | 23.52 | 5.68 | 41.35 |
| | **Total** | 381 | 22.57 | 0.89 | 0.29 | 1.45 | 0.61 | 2.29 | 29.64 | 0.42 | 0.22 | 0.78 | 31.77 | 3.38 | <LOD | 7.21 | 6.92 | <LOD | 14.59 |
| Males | 19-30 | 8 | 37.50 | 0.64 | 0.23 | 0.88 | <LOD | 2.01 | 65.67 | 0.38 | 0.08 | 1.77 | 78.24 | 2.61 | 0.15 | 5.08 | 2.61 | 0.15 | 5.08 |
| | 31-50 | 39 | 23.08 | 0.75 | 0.24 | 0.49 | 0.35 | 0.63 | 14.97 | 0.31 | 0.19 | 0.51 | 25.24 | 0.91 | 0.33 | 1.49 | 1.42 | 0.32 | 2.52 |
| | 51-70 | 31 | 29.03 | 0.32 | 0.19 | 0.33 | 0.14 | 0.53 | 30.27 | 0.20 | 0.08 | 0.48 | 44.06 | 0.77 | 0.44 | 1.09 | 0.77 | 0.56 | 0.97 |
| | 71+ | 10 | 0.00 | 4.65 | 1.01 | 9.78 | 1.02 | 18.53 | 45.70 | 5.08 | 0.37 | 70.24 | 133.99 | 23.52 | <LOD | 47.25 | 23.52 | <LOD | 47.25 |
| | **Total** | 88 | 23.86 | 1.03 | 0.26 | 1.80 | 0.35 | 3.25 | 40.98 | 0.44 | 0.22 | 0.85 | 34.16 | 6.92 | <LOD | 15.75 | 12.21 | 1.80 | 22.61 |
| Females | 19-30 | 57 | 29.82 | 0.68 | 0.25 | 0.67 | <LOD | 1.40 | 55.49 | 0.24 | <LOD | 0.86 | 64.02 | 2.09 | 0.31 | 3.86 | 2.89 | 1.31 | 4.48 |
| | 31-50 | 123 | 18.70 | 0.73 | 0.32 | 0.99 | 0.38 | 1.60 | 31.41 | 0.46 | 0.31 | 0.70 | 21.25 | 3.21 | 0.82 | 5.60 | 3.59 | <LOD | 7.45 |
| | 51-70 | 87 | 20.69 | 1.17 | 0.38 | 1.42 | 0.91 | 1.94 | 18.45 | 0.54 | 0.29 | 1.00 | 31.33 | 4.97 | 3.22 | 6.72 | 5.81 | 4.55 | 7.07 |
| | 71+ | 26 | 26.92 | 0.75 | 0.21 | 2.08 | <LOD | 4.72 | 64.64 | 0.41 | 0.10 | 1.59 | 69.38 | 8.83 | <LOD | 18.74 | 8.83 | <LOD | 17.75 |
| | **Total** | 293 | 22.18 | 0.85 | 0.31 | 1.11 | 0.44 | 1.77 | 30.65 | 0.40 | 0.20 | 0.79 | 35.28 | 3.21 | 1.16 | 5.27 | 4.97 | 2.69 | 7.25 |
| **Females of child-bearing age** | **19-50** | 180 | 22.22 | 0.71 | 0.29 | 0.85 | 0.20 | 1.49 | 38.98 | 0.35 | 0.16 | 0.75 | 39.33 | 2.89 | 0.84 | 4.95 | 3.21 | 0.94 | 5.48 |

Notes:

Use with caution, CV between 15% and 35%

CV greater than 35% or the estimate is thought to be unreliable

Estimates have been adjusted for non-response and are post-stratified to population counts within age groups for males. Even with post-stratification, estimates for males aged 19-30 and 71+ are likely to be unstable due to the sample size.

Estimates should be used with caution due to high CVs. Note that CV does not reflect bias, only sampling error: Good (CV is up to 15%), Use with caution (CV is between 15% and 35%), Unreliable (over 35%).

All shaded figures would not normally be released due to high CVs or the high percentage of respondents below the limit of detection. Variance estimation for non-linear statistics such as percentiles is itself subject to variability, particularly with small sample sizes. Confidence intervals that are inconsistent for percentages typically imply all such percentages should only be used with extreme caution.

**Figure 42a. Mercury concentration in hair of participants living in the Taiga Shield ecozone (n=39)**

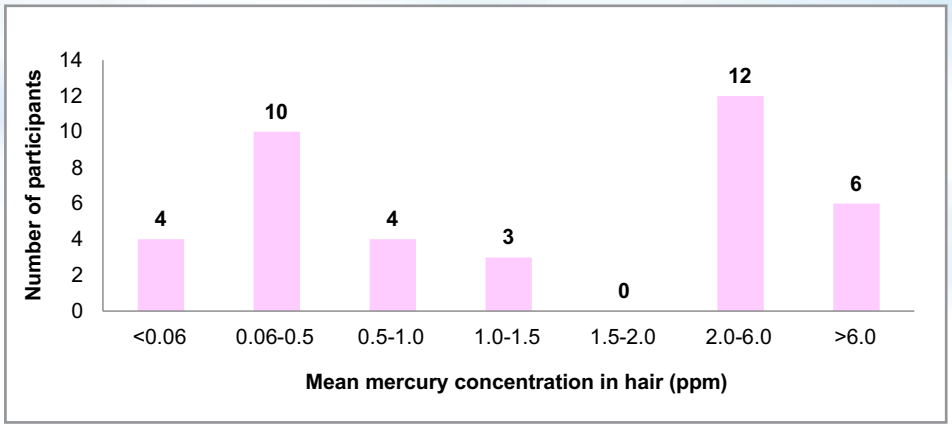



**Figure 42b. Mercury concentration in hair of participants living in the Boreal Shield ecozone (n=80)**

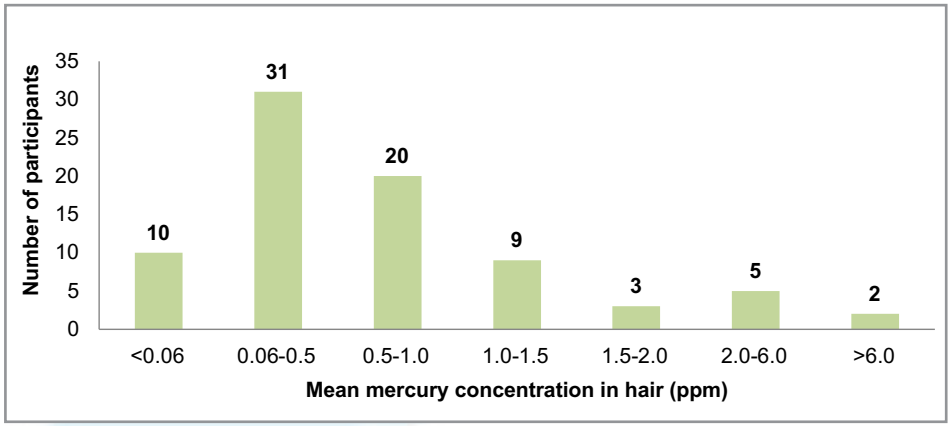



**Figure 42c. Mercury concentration in hair of participants living in the Mixedwood Plains ecozone (n=146)**

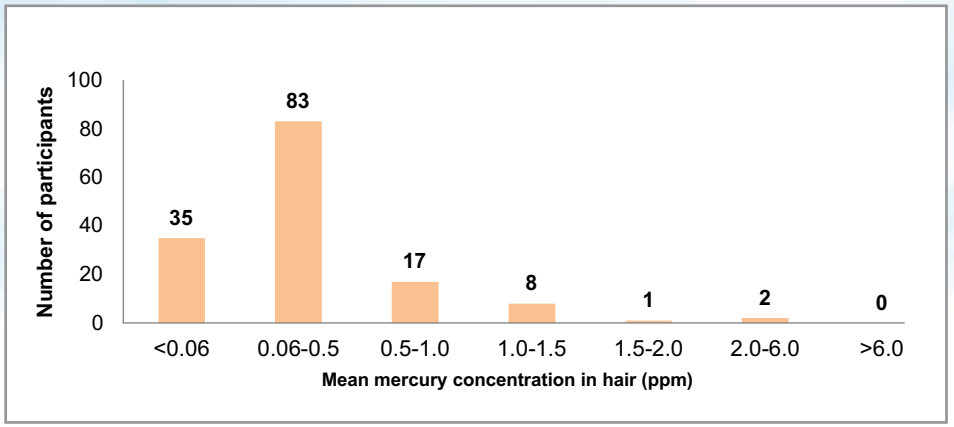



**Figure 42d. Mercury concentration in hair of participants living in the Atlantic Maritime ecozone (n=83)**

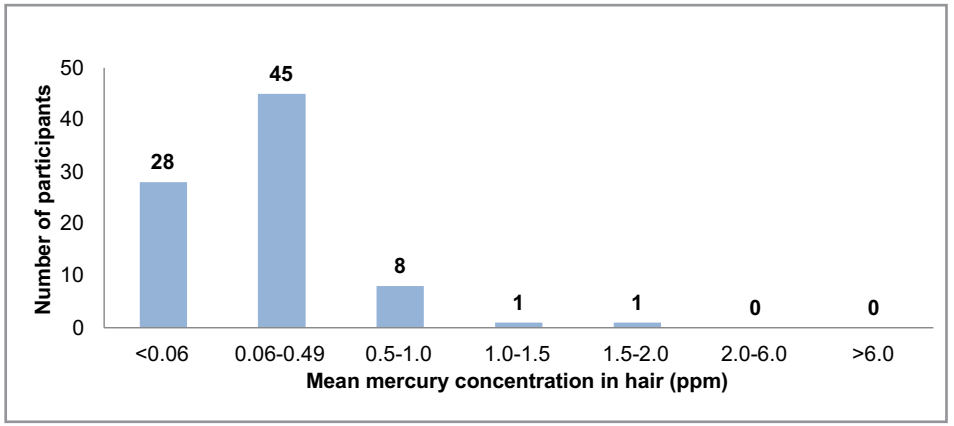


**Figure 43a. Mercury concentration in hair of women of childbearing age (WCBA) living in the Taiga Shield ecozone (n=21)**

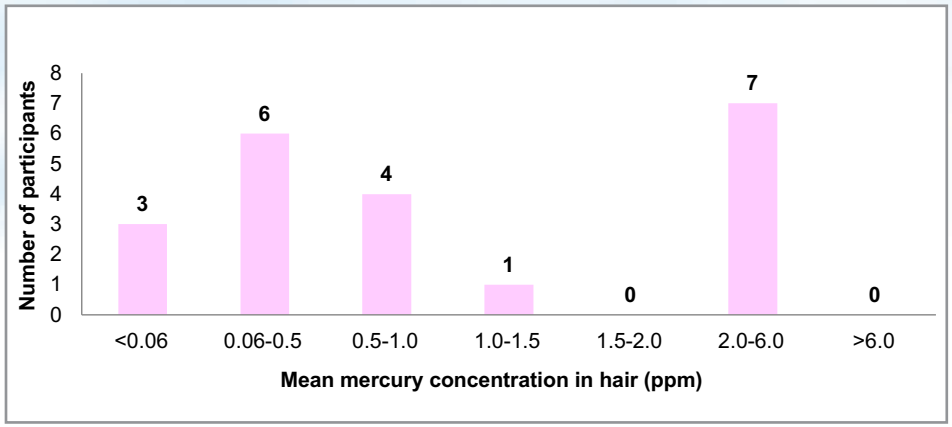



**Figure 43b. Mercury concentration in hair of women of childbearing age (WCBA) living in the Boreal Shield ecozone (n=46)**

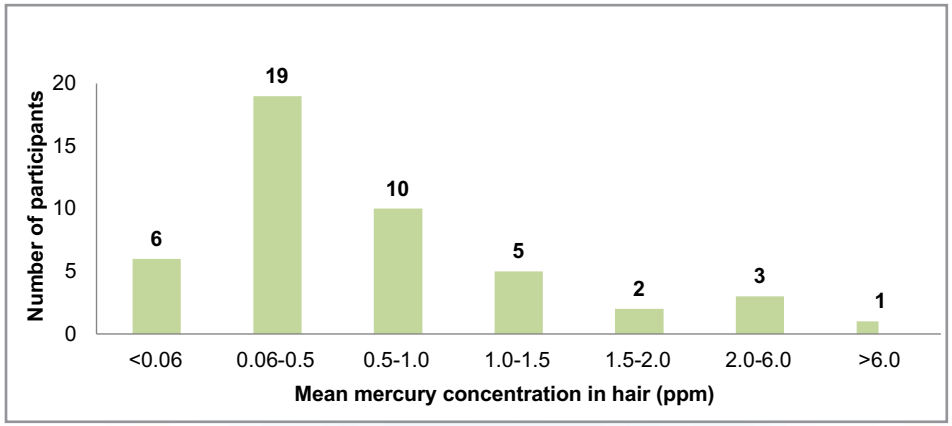



**Figure 43c. Mercury concentration in hair of women of childbearing age (WCBA) living in the Mixedwood Plains ecozone (n=53)**

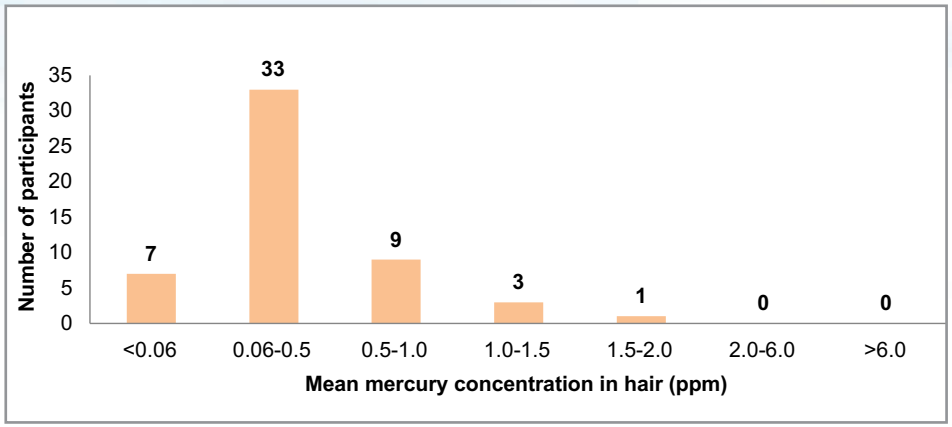



**Figure 43d. Mercury concentration in hair of women of childbearing age (WCBA) living in the Atlantic Maritime ecozone (n=42)**

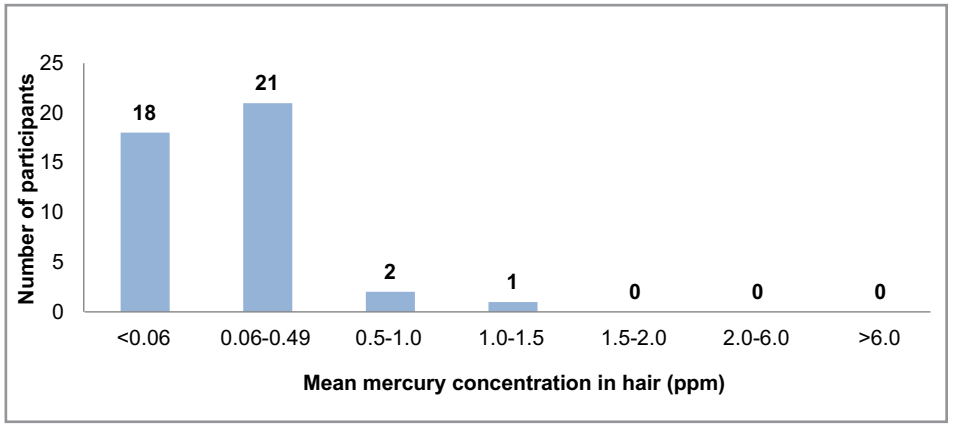


**Table 27. Mean and maximum levels of toxic trace metals in traditional food samples from Quebec (µg/g fresh weight)**

| Traditional food sample | n* | Arsenic (ug/g) | | Cadmium (ug/g) | | Lead (ug/g) | | Mercury (ug/g) | | Methyl Mercury (ug/g) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Max | Mean | Max | Mean | Max | Mean | Max | Mean | Max |
| **Fish** | | | | | | | | | | | |
| Atlantic salmon | 4 | 0.55 | 0.57 | 0.004 | 0.01 | 0.001 | 0.004 | 0.07 | 0.09 | 0.07 | 0.10 |
| Bass | 1 | 0.58 | 0.58 | ND | ND | ND | ND | 0.14 | 0.14 | 0.14 | 0.14 |
| Brook/speckled trout | 4 | 0.13 | 0.43 | 0.003 | 0.01 | 0.00 | 0.01 | 0.29 | 0.35 | 0.25 | 0.37 |
| Brown trout | 1 | 0.25 | 0.25 | 0.005 | 0.01 | 0.03 | 0.03 | 0.11 | 0.11 | 0.08 | 0.08 |
| Catfish | 2 | 0.03 | 0.04 | 0.004 | 0.005 | 0.01 | 0.03 | 0.21 | 0.26 | 0.10 | 0.12 |
| Cisco meat | 1 | 1.93 | 1.93 | ND | ND | ND | ND | 0.03 | 0.03 | 0.04 | 0.04 |
| Cod | 1 | 3.39 | 3.39 | ND | ND | 0.01 | 0.01 | 0.12 | 0.12 | 0.16 | 0.16 |
| Eel | 2 | 0.79 | 1.22 | 0.005 | 0.01 | 0.01 | 0.01 | 0.10 | 0.14 | 0.09 | 0.10 |
| Lake trout eggs | 1 | 0.02 | 0.02 | 0.01 | 0.01 | 0.004 | 0.004 | 0.01 | 0.01 | 0.002 | 0.002 |
| Lake trout meat | 5 | 0.14 | 0.42 | 0.001 | 0.002 | 0.005 | 0.02 | 0.42 | 1.00 | 0.31 | 0.71 |
| Lake trout smoked | 1 | 0.18 | 0.18 | 0.001 | 0.001 | ND | ND | 0.63 | 0.63 | 0.31 | 0.31 |
| Lake whitefish | 4 | 0.41 | 1.30 | 0.01 | 0.04 | 0.11 | 0.45 | 0.17 | 0.26 | 0.11 | 0.17 |
| Mackerel | 1 | 1.31 | 1.31 | 0.01 | 0.01 | ND | ND | 0.04 | 0.04 | 0.05 | 0.05 |
| Northern pike meat | 3 | 0.70 | 2.04 | 0.004 | 0.01 | 0.002 | 0.01 | 0.71 | 1.34 | 0.33 | 0.48 |
| Pike eggs | 1 | 0.75 | 0.75 | 0.04 | 0.04 | ND | ND | 0.05 | 0.05 | 0.04 | 0.04 |
| Rainbow trout | 1 | 1.00 | 1.00 | 0.002 | 0.002 | ND | ND | 0.14 | 0.14 | 0.14 | 0.14 |
| Smallmouth bass | 1 | 0.07 | 0.07 | 0.003 | 0.003 | ND | ND | 0.33 | 0.33 | 0.27 | 0.27 |
| Smelt | 2 | 1.18 | 1.23 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 |
| Sole | 1 | 1.46 | 1.46 | 0.001 | 0.001 | ND | ND | 0.02 | 0.02 | 0.01 | 0.01 |
| Striped bass | 1 | 0.55 | 0.55 | ND | ND | ND | ND | 0.19 | 0.19 | 0.10 | 0.10 |
| Sturgeon | 2 | 0.42 | 0.71 | 0.01 | 0.02 | ND | ND | 0.25 | 0.27 | 0.27 | 0.30 |
| Sucker eggs | 1 | 0.01 | 0.01 | 0.02 | 0.02 | 0.05 | 0.05 | 0.01 | 0.01 | 0.003 | 0.003 |
| Walleye | 5 | 0.14 | 0.60 | 0.002 | 0.004 | ND | ND | 0.75 | 1.27 | 0.76 | 1.49 |
| White bass | 1 | 0.21 | 0.21 | 0.002 | 0.002 | 0.01 | 0.01 | 0.11 | 0.11 | 0.05 | 0.05 |
| Yellow perch | 1 | 0.08 | 0.08 | 0.001 | 0.001 | 0.01 | 0.01 | 0.25 | 0.25 | 0.15 | 0.15 |

**Table 27. Mean and maximum levels of toxic trace metals in traditional food samples from Quebec (µg/g fresh weight)**

| Traditional food sample | n* | Arsenic (ug/g) | | Cadmium (ug/g) | | Lead (ug/g) | | Mercury (ug/g) | | Methyl Mercury (ug/g) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Max | Mean | Max | Mean | Max | Mean | Max | Mean | Max |
| **Seafood** | | | | | | | | | | | |
| Lobster | 3 | 4.75 | 6.93 | 0.10 | 0.11 | 0.004 | 0.01 | 0.13 | 0.13 | 0.13 | 0.16 |
| Scallops | 1 | 0.61 | 0.61 | 0.13 | 0.13 | ND | ND | 0.01 | 0.01 | 0.01 | 0.01 |
| Sea snail | 1 | 3.31 | 3.31 | 1.47 | 1.47 | 0.03 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 |
| Shrimp | 1 | 4.02 | 4.02 | 0.02 | 0.02 | 0.15 | 0.15 | 0.04 | 0.04 | 0.05 | 0.05 |
| Snow crab | 2 | 6.78 | 7.90 | 0.03 | 0.04 | 0.02 | 0.02 | 0.08 | 0.12 | 0.10 | 0.17 |
| Soft clams | 1 | 3.30 | 3.30 | 0.05 | 0.05 | 0.13 | 0.13 | 0.01 | 0.01 | 0.01 | 0.01 |
| **Land Mammals** | | | | | | | | | | | |
| Beaver intestine | 1 | ND | ND | 0.19 | 0.19 | 0.04 | 0.04 | ND | ND | NM | NM |
| Beaver tail | 7 | 0.001 | 0.01 | 0.01 | 0.01 | 0.01 | 0.05 | 0.0002 | 0.001 | ND | ND |
| Black bear meat | 5 | 0.001 | 0.01 | 0.01 | 0.03 | 2.75 | 13.60 | 0.004 | 0.01 | 0.003 | 0.003 |
| Bear fat | 4 | ND | ND | 0.001 | 0.003 | 0.003 | 0.01 | ND | ND | NM | NM |
| Caribou bone marrow | 1 | ND | ND | 0.002 | 0.002 | 0.01 | 0.01 | 0.001 | 0.001 | NM | NM |
| Caribou heart | 2 | 0.01 | 0.01 | 0.01 | 0.02 | 2.74 | 5.48 | 0.01 | 0.01 | NM | NM |
| Caribou kidney | 1 | 0.01 | 0.01 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | NM | NM |
| Caribou meat | 4 | 0.02 | 0.03 | 0.01 | 0.02 | 0.13 | 0.50 | 0.01 | 0.02 | NM | NM |
| Deer kidney | 1 | 0.004 | 0.004 | 6.22 | 6.22 | 0.04 | 0.04 | 0.04 | 0.04 | NM | NM |
| Deer liver | 1 | ND | ND | 0.14 | 0.14 | 0.02 | 0.02 | 0.001 | 0.001 | NM | NM |
| Deer meat | 4 | ND | ND | 0.01 | 0.04 | 0.01 | 0.03 | 0.001 | 0.002 | NM | NM |
| Moose heart | 1 | ND | ND | 0.02 | 0.02 | 0.01 | 0.01 | ND | ND | NM | NM |
| Moose kidney | 2 | ND | ND | 24.25 | 29.80 | 0.02 | 0.03 | 0.01 | 0.01 | ND | ND |
| Moose liver | 4 | 0.002 | 0.01 | 3.86 | 6.80 | 0.11 | 0.37 | 0.002 | 0.004 | 0.001 | 0.001 |
| Moose meat | 10 | 0.001 | 0.01 | 0.01 | 0.04 | 0.03 | 0.10 | 0.001 | 0.002 | NM | NM |
| Moose nose | 1 | ND | ND | 0.03 | 0.03 | 0.01 | 0.01 | ND | ND | NM | NM |
| Moose tongue | 1 | ND | ND | 0.02 | 0.02 | 0.05 | 0.05 | ND | ND | NM | NM |
| Muskrat meat | 1 | ND | ND | 0.001 | 0.001 | 0.01 | 0.01 | ND | ND | NM | NM |
| Porcupine meat | 2 | 0.004 | 0.004 | 0.11 | 0.19 | 0.01 | 0.02 | 0.001 | 0.001 | NM | NM |
| Rabbit intestines | 1 | 0.004 | 0.004 | 0.02 | 0.02 | 0.03 | 0.03 | 0.01 | 0.01 | NM | NM |
| Rabbit liver | 1 | ND | ND | 0.08 | 0.08 | 0.03 | 0.03 | 0.01 | 0.01 | NM | NM |
| Rabbit meat | 7 | 0.003 | 0.01 | 0.31 | 1.79 | 0.03 | 0.15 | 0.003 | 0.01 | NM | NM |
| Squirrel meat | 1 | 0.005 | 0.005 | 0.03 | 0.03 | 0.02 | 0.02 | 0.002 | 0.002 | NM | NM |

## Table 27. Mean and maximum levels of toxic trace metals in traditional food samples from Quebec (µg/g fresh weight)

| Traditional food sample | n* | Arsenic (ug/g) | | Cadmium (ug/g) | | Lead (ug/g) | | Mercury (ug/g) | | Methyl Mercury (ug/g) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Max | Mean | Max | Mean | Max | Mean | Max | Mean | Max |
| **Birds** | | | | | | | | | | | |
| Arctic tern/stern egg | 1 | 0.06 | 0.06 | ND | ND | ND | ND | 0.05 | 0.05 | 0.04 | 0.04 |
| Black guillemot | 1 | 0.36 | 0.36 | 0.003 | 0.003 | 0.01 | 0.01 | 0.10 | 0.10 | 0.10 | 0.10 |
| Canada goose liver | 1 | 0.004 | 0.004 | 0.31 | 0.31 | 0.04 | 0.04 | 0.02 | 0.02 | 0.01 | 0.01 |
| Canada goose meat | 7 | 0.002 | 0.01 | 0.004 | 0.01 | 0.09 | 0.53 | 0.001 | 0.002 | 0.001 | 0.002 |
| Eider duck liver | 1 | 0.41 | 0.41 | 0.46 | 0.46 | 0.01 | 0.01 | 0.12 | 0.12 | 0.14 | 0.14 |
| Eider duck meat | 1 | 0.29 | 0.29 | 0.01 | 0.01 | 2.63 | 2.63 | 0.06 | 0.06 | 0.05 | 0.05 |
| Golden eye duck meat | 1 | 0.03 | 0.03 | 0.05 | 0.05 | ND | ND | 0.43 | 0.43 | 0.42 | 0.42 |
| Goose grease/fat | 1 | ND | ND | ND | ND | ND | ND | ND | ND | NM | NM |
| Grouse/partridge meat | 9 | 0.01 | 0.01 | 0.02 | 0.04 | 4.34 | 23.10 | 0.0005 | 0.002 | NM | NM |
| Mallard duck meat | 5 | 0.04 | 0.13 | 0.02 | 0.04 | 20.91 | 104 | 0.06 | 0.14 | 0.05 | 0.13 |
| Ptarmigan meat | 2 | 0.003 | 0.01 | 0.20 | 0.36 | 0.14 | 0.27 | 0.001 | 0.002 | NM | NM |
| Scoter duck meat | 1 | 0.25 | 0.25 | 0.02 | 0.02 | 0.01 | 0.01 | 0.08 | 0.08 | 0.06 | 0.06 |
| Snow goose meat | 2 | 0.01 | 0.02 | 0.004 | 0.01 | 0.01 | 0.02 | 0.002 | 0.003 | 0.002 | 0.003 |
| Wood duck meat | 1 | ND | ND | 0.01 | 0.01 | 0.05 | 0.05 | 0.01 | 0.01 | NM | NM |
| **Berries/Fruit** | | | | | | | | | | | |
| Blackberries | 1 | ND | ND | 0.005 | 0.005 | ND | ND | ND | ND | NM | NM |
| Blueberries | 8 | 0.001 | 0.005 | 0.00 | 0.03 | 0.01 | 0.03 | ND | ND | NM | NM |
| Chokecherries | 1 | ND | ND | ND | ND | ND | ND | ND | ND | NM | NM |
| Cloudberries/bakeapples | 2 | ND | ND | 0.04 | 0.05 | ND | ND | ND | ND | NM | NM |
| Cranberries, bog | 2 | ND | ND | 0.002 | 0.003 | ND | ND | ND | ND | NM | NM |
| Cranberries, highbush | 3 | ND | ND | 0.004 | 0.01 | 0.01 | 0.01 | ND | ND | NM | NM |
| Cranberries, low bush | 1 | ND | ND | 0.001 | 0.001 | ND | ND | ND | ND | NM | NM |
| Raspberries | 3 | 0.002 | 0.01 | 0.003 | 0.01 | 0.01 | 0.02 | ND | ND | NM | NM |
| Strawberries | 1 | ND | ND | 0.002 | 0.002 | ND | ND | ND | ND | NM | NM |
| Teaberry | 1 | 0.04 | 0.04 | 0.005 | 0.005 | 0.10 | 0.10 | 0.01 | 0.01 | NM | NM |

**Table 27. Mean and maximum levels of toxic trace metals in traditional food samples from Quebec (µg/g fresh weight)**

| Traditional food sample | n* | Arsenic (ug/g) | | Cadmium (ug/g) | | Lead (ug/g) | | Mercury (ug/g) | | Methyl Mercury (ug/g) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Max | Mean | Max | Mean | Max | Mean | Max | Mean | Max |
| **Greens/Roots/Tree Foods** | | | | | | | | | | | |
| Apples | 2 | ND | ND | ND | ND | 0.01 | 0.01 | ND | ND | NM | NM |
| Bear root tea brewed | 1 | 0.02 | 0.02 | ND | ND | ND | ND | ND | ND | NM | NM |
| Butternut squash | 1 | ND | ND | ND | ND | 0.004 | 0.004 | ND | ND | NM | NM |
| Canada yew brewed | 1 | 0.0002 | 0.0002 | 0.0003 | 0.0003 | ND | ND | ND | ND | NM | NM |
| Cedar tea brewed | 3 | 0.001 | 0.001 | ND | 0.0001 | 0.0003 | 0.001 | ND | ND | NM | NM |
| Chaga tea brewed | 1 | NM | NM | 0.0001 | 0.0001 | ND | ND | ND | ND | NM | NM |
| Chanterelle mushrooms | 1 | 0.01 | 0.01 | 0.03 | 0.03 | 0.02 | 0.02 | 0.002 | 0.002 | NM | NM |
| Clover tea brewed | 1 | 0.001 | 0.001 | ND | ND | ND | ND | ND | ND | NM | NM |
| Crab apples | 2 | ND | ND | 0.003 | 0.01 | 0.51 | 0.66 | ND | ND | NM | NM |
| Dandelion leaves | 1 | 0.03 | 0.03 | 0.07 | 0.07 | 0.49 | 0.49 | 0.005 | 0.005 | NM | NM |
| Fiddleheads | 4 | ND | ND | 0.22 | 0.76 | 0.01 | 0.02 | ND | ND | NM | NM |
| Honey | 2 | ND | ND | 0.001 | 0.001 | 0.01 | 0.02 | ND | ND | NM | NM |
| Jerusalem artichoke | 1 | 0.02 | 0.02 | 0.01 | 0.01 | 0.03 | 0.03 | ND | ND | NM | NM |
| Labrador tea brewed | 3 | 0.0002 | 0.0003 | ND | 0.0001 | 0.0003 | 0.001 | 0.0001 | 0.0002 | NM | NM |
| Maple syrup | 2 | 0.06 | 0.13 | 0.004 | 0.004 | 0.02 | 0.02 | ND | ND | NM | NM |
| Muskrat root tea brewed | 1 | 0.0003 | 0.0003 | ND | ND | ND | ND | ND | ND | NM | NM |
| Pine tea brewed | 1 | 0.0003 | 0.0003 | ND | ND | ND | ND | ND | ND | NM | NM |
| Raspberry leaf tea | 1 | 0.001 | 0.001 | ND | ND | ND | ND | ND | ND | NM | NM |
| Stinging nettle leaves | 2 | 0.07 | 0.10 | 0.01 | 0.02 | 0.72 | 1.27 | 0.003 | 0.004 | NM | NM |
| Sweetgrass tea brew | 1 | 0.001 | 0.001 | ND | ND | 0.001 | 0.001 | ND | ND | NM | NM |
| Tamarack tea brewed | 1 | 0.0002 | 0.0002 | ND | ND | ND | ND | ND | ND | NM | NM |
| **Garden Plants** | | | | | | | | | | | |
| Chicken eggs | 1 | ND | ND | ND | ND | ND | ND | ND | ND | NM | NM |
| Pole beans | 1 | ND | ND | ND | ND | ND | ND | ND | ND | NM | NM |
| Potatoes | 1 | 0.10 | 0.10 | 0.02 | 0.02 | 0.16 | 0.16 | 0.001 | 0.001 | NM | NM |
| White corn flour | 1 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | ND | ND | NM | NM |
| White washed corn | 1 | 0.01 | 0.01 | 0.002 | 0.002 | 0.02 | 0.02 | ND | ND | NM | NM |

n*=number of communities; ND= not detected; NM= not measured

**Table 28a. Top 10 traditional food sources of arsenic intake among First Nations adults in Quebec, by ecozone and total region**

| Taiga Shield | | Boreal Shield | | Mixedwood Plains | | Atlantic Maritime | | Quebec | |
|---|---|---|---|---|---|---|---|---|---|
| Traditional Food | % | Traditional Food | % | Traditional Food | % | Traditional Food | % | Traditional Food | % |
| Cisco | 25.6 | Lobster | 34.0 | Rainbow trout | 20.6 | Shrimp | 26.7 | Lobster | 22.8 |
| Lobster | 20.4 | Sturgeon | 26.4 | Maple syrup | 12.1 | Lobster | 22.6 | Shrimp | 13.7 |
| Shrimp | 13.2 | Scoter duck meat | 10.8 | Sturgeon | 12.0 | Snow crab | 20.9 | Snow crab | 9.9 |
| Caribou meat | 7.4 | Lake trout | 8.5 | Cod | 11.1 | Cod | 12.7 | Sturgeon | 9.4 |
| Rainbow trout | 6.1 | Walleye (yellow pickerel) | 3.8 | Shrimp | 10.9 | Atlantic salmon | 5.5 | Cod | 7.2 |
| Cod | 4.3 | Rainbow smelt | 2.8 | Soft clam | 7.2 | Soft clam | 4.2 | Cisco | 6.4 |
| Brown trout | 4.3 | Rainbow trout | 2 | Lobster | 5.8 | Rainbow trout | 1.6 | Scoter duck meat | 3.5 |
| Lake trout | 3.9 | Caribou meat | 1.6 | Atlantic salmon | 5.0 | Scallops | 1.5 | Atlantic salmon | 3.4 |
| White perch/bass | 3.4 | Brook/speckled trout | 1.5 | Yellow perch | 2.4 | Sole/American plaice | 1.4 | Rainbow trout | 3.3 |
| Atlantic salmon | 3.3 | Scallops | 1.5 | Northern pike/jackfish | 2.1 | Smelt | 1.2 | Lake trout | 3.2 |

**Table 28b. Top 10 traditional food sources of cadmium intake among First Nations adults in Quebec, by ecozone and total region**

| Taiga Shield | | Boreal Shield | | Mixedwood Plains | | Atlantic Maritime | | Quebec | |
|---|---|---|---|---|---|---|---|---|---|
| Traditional Food | % | Traditional Food | % | Traditional Food | % | Traditional Food | % | Traditional Food | % |
| Ptarmigan meat | 87.4 | Moose kidney | 75.1 | Deer meat | 39.1 | Moose kidney | 22.3 | Moose kidney | 73.0 |
| Caribou meat | 2.8 | Moose liver | 18.9 | Deer kidney | 21.4 | Fiddleheads | 18.6 | Moose liver | 18.1 |
| Blueberries | 2.5 | Rabbit/hare meat | 3.5 | Fiddleheads | 14.2 | Lobster | 16.4 | Rabbit/hare meat | 3.4 |
| Goose, Canada | 2.2 | Ptarmigan | 1.3 | Deer liver | 4.0 | Deer kidney | 15.3 | Ptarmigan meat | 3.2 |
| Porcupine meat | 1.2 | Moose nose | 0.8 | Moose meat | 3.0 | Scallops | 8.8 | Moose nose | 0.8 |
| Cloudberries/ bakeapples | 1.1 | Scoter duck meat | 0.06 | Dandelions | 2.8 | Moose meat | 3.5 | Deer meat | 0.2 |
| Grouse meat | 0.9 | Beaver meat | 0.05 | Moose liver | 2.5 | Shrimp | 2.6 | Deer kidney | 0.2 |
| Rabbit/hare meat | 0.6 | Sturgeon | 0.05 | Rabbit/hare meat | 2.2 | Snow crab | 2.6 | Fiddleheads | 0.13 |
| Black bear meat | 0.3 | Grouse meat | 0.05 | White washed corn | 1.8 | Soft clams | 1.8 | Caribou meat | 0.10 |
| Lobster | 0.2 | Caribou meat | 0.04 | Raspberries | 1.3 | Moose liver | 1.8 | Lobster | 0.09 |

**Table 28c. Top 10 traditional food sources of lead intake among First Nations adults in Quebec, by ecozone and total region**

| Taiga Shield | | Boreal Shield | | Mixedwood Plains | | Atlantic Maritime | | Quebec | |
|---|---|---|---|---|---|---|---|---|---|
| Traditional Food | % | Traditional Food | % | Traditional Food | % | Traditional Food | % | Traditional Food | % |
| Ptarmigan meat | 54.2 | Mallard duck meat | 65.3 | Dandelions | 18.3 | Stinging nettle | 30.6 | Mallard duck meat | 63.4 |
| Grouse meat | 38.4 | Grouse meat | 29.5 | Deer meat | 18.1 | Grouse/partridge | 18.1 | Grouse meat | 29.5 |
| Caribou meat | 4.2 | Moose nose | 2.2 | White washed corn | 10.1 | Moose meat | 17.0 | Moose meat | 2.3 |
| Goose, Canada | 1.1 | Ptarmigan | 0.7 | Stinging nettle leaves | 6.6 | Shrimp | 14.6 | Ptarmigan meat | 1.7 |
| Porcupine meat | 0.7 | Caribou meat | 0.6 | Maple syrup | 6.6 | Dandelions | 3.2 | Caribou meat | 0.7 |
| Brown trout | 0.26 | Black bear meat | 0.5 | Caribou meat | 5.6 | Fiddleheads | 2.8 | Black bear meat | 0.5 |
| Eider duck meat | 0.26 | Rabbit/hare meat | 0.2 | Mallard duck meat | 5.2 | Blueberries | 2.5 | Goose, Canada | 0.3 |
| Blueberries | 0.25 | Goose, Canada | 0.2 | Crabapple | 5.2 | Soft clams | 2.4 | Rabbit/hare meat | 0.24 |
| Moose meat | 0.24 | Beaver meat | 0.2 | Raspberries | 4.8 | Corn/hominy | 1.4 | Beaver tail | 0.20 |
| Shrimp | 0.22 | Eider duck meat | 0.2 | Moose meat | 4.7 | Snow crab | 1.0 | Eider duck meat | 0.17 |

**Table 28d. Top 10 traditional food sources of mercury intake among First Nations adults in Quebec, by ecozone and total region**

| Taiga Shield | | Boreal Shield | | Mixedwood Plains | | Atlantic Maritime | | Quebec | |
|---|---|---|---|---|---|---|---|---|---|
| Traditional Food | % | Traditional Food | % | Traditional Food | % | Traditional Food | % | Traditional Food | % |
| Lake trout | 63.6 | Walleye (yellow pickerel) | 57.2 | Walleye (yellow pickerel) | 53.7 | Lobster | 25.3 | Walleye (yellow pickerel) | 49.8 |
| Brook/speckled trout | 13.9 | Lake trout | 22.8 | Yellow perch | 9.8 | Atlantic salmon | 19.4 | Lake trout | 25.7 |
| Whitefish (lake, round) | 9.6 | Northern pike/jackfish | 7.3 | Channel catfish | 7.3 | Cod | 14.0 | Northern pike/jackfish | 6.8 |
| Caribou meat | 5.5 | Sturgeon | 6.1 | Smallmouth/ | 6.6 | Shrimp | 14.6 | Ptarmigan meat | 1.7 |
| largemouth bass | 6.2 | Brook/speckled trout | 11.2 | Sturgeon | 5.3 | Dandelions | 3.2 | Caribou meat | 0.7 |
| Northern pike/jackfish | 2.0 | Brook/speckled trout | 2.9 | Lake trout | 6.0 | Shrimp | 8.0 | Brook/speckled trout | 4.1 |
| Brown trout | 1.1 | Scoter duck meat | 1.3 | Sturgeon | 5.1 | Rainbow trout | 7.2 | Whitefish (lake, round) | 1.3 |
| White perch/bass | 1.0 | Mallard duck meat | 0.5 | Rainbow trout | 3.6 | Snow crab | 6.4 | Scoter duck meat | 1.1 |
| Mallard duck meat | 0.7 | Goldeneye | 0.4 | Northern pike/jackfish | 2.7 | Striped bass | 2.2 | Caribou meat | 0.9 |
| Goose, Canada | 0.47 | Caribou meat | 0.3 | Brook/speckled trout | 1.5 | Lake trout | 1.8 | Lobster | 0.58 |
| Rainbow trout | 0.46 | Whitefish (lake, round) | 0.3 | White perch/bass | 0.9 | Scallops | 0.9 | Yellow perch | 0.56 |

**Table 29. Exposure estimates (µg/kg body weight/day) for metals from traditional food for First Nations adults in Quebec, using mean and maximum concentrations (n=573)**

| Contaminant | PTDI (µg/kg/day) | Level of concentration | n> PTDI | Mean | Median | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|---|---|
| Arsenic | 1 | mean | 9 | 0.03 | 0 | 0.17 | 0.03 | 0.17 |
| | | maximum | 10 | 0.04 | 0 | 0.17 | 0.04 | 0.17 |
| Cadmium | 1 | mean | 6 | 0.18 | 0.01 | 0.69 | 0.18 | 0.69 |
| | | maximum | 6 | 0.19 | 0.01 | 0.69 | 0.19 | 0.69 |
| Lead | 3.6 | mean | 2 | 0.21 | 0.01 | 1.42 | 0.06 | 0.39 |
| | | maximum | 2 | 0.22 | 0.01 | 1.43 | 0.06 | 0.40 |
| Mercury* | 0.5 | mean | 0 | 0.04 | 0.01 | 0.14 | 0.08 | 0.27 |
| | | maximum | 0 | 0.04 | 0.01 | 0.15 | 0.20 | 0.75 |

**Table 30. Exposure estimates (µg/kg body weight/day) for mercury from traditional food (using mean and maximum concentrations) among First Nations women of child-bearing age (WCBA) in Quebec (n=269)**

| Level of mercury concentration | PTDI (µg/kg/day) | n>PTDI | Mean | Median | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|---|
| Mean | 0.2 | 1 | 0.03 | 0.01 | 0.11 | 0.13 | 0.55 |
| Maximum | 0.2 | 1 | 0.03 | 0.01 | 0.11 | 0.14 | 0.55 |

**Table 31a. Toxic metal exposure estimates (µg/kg body weight/day) from traditional food for First Nations adults in Quebec, using mean and maximum concentrations, consumers only (n=536)**

| Contaminant | PTDI (µg/kg/day) | Level of concentration | n> PTDI | Mean | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|---|
| Arsenic | 1 | mean | 12 | 0.04 | 0.17 | 0.04 | 0.17 |
| | | maximum | 16 | 0.07 | 0.25 | 0.07 | 0.25 |
| Cadmium | 1 | mean | 4 | 0.15 | 0.69 | 0.15 | 0.69 |
| | | maximum | 8 | 0.21 | 0.94 | 0.21 | 0.94 |
| Lead | 3.6 | mean | 0 | 0.12 | 0.55 | 0.03 | 0.15 |
| | | maximum | 11 | 0.61 | 2.95 | 0.17 | 0.82 |
| Mercury* | 0.5 | mean | 0 | 0.03 | 0.13 | 0.06 | 0.26 |
| | | maximum | 0 | 0.05 | 0.24 | 0.11 | 0.47 |

*analyses restricted to women aged 51+ and all men only (n=280)

**Table 31b. Toxic metal exposure estimates (µg/kg body weight/day) from traditional food for First Nations adults in the Taiga Shield, using ecozone-specific mean and maximum concentrations, consumers only (n=62)**

| Contaminant | PTDI (µg/kg/day) | Level of concentration | n> PTDI | Mean | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|---|
| Arsenic | 1 | mean | 0 | 0.003 | 0.01 | 0.003 | 0.01 |
| | | maximum | 0 | 0.004 | 0.01 | 0.004 | 0.01 |
| Cadmium | 1 | mean | 0 | 0.02 | 0.07 | 0.02 | 0.07 |
| | | maximum | 0 | 0.02 | 0.07 | 0.02 | 0.07 |
| Lead | 3.6 | mean | 0 | 0.03 | 0.11 | 0.01 | 0.03 |
| | | maximum | 0 | 0.03 | 0.12 | 0.01 | 0.03 |
| Mercury* | 0.5 | mean | 0 | 0.03 | 0.10 | 0.06 | 0.20 |
| | | maximum | 0 | 0.04 | 0.13 | 0.07 | 0.26 |

*analyses restricted to women aged 51+ and all men only (n=33)

**Table 31c. Toxic metal exposure estimates (µg/kg body weight/day) from traditional food for First Nations adults in the Boreal Shield, using ecozone-specific mean and maximum concentrations, consumers only (n=117)**

| Contaminant | PTDI (µg/kg/day) | Level of concentration | n> PTDI | Mean | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|---|
| Arsenic | 1 | mean | 0 | 0.01 | 0.05 | 0.01 | 0.05 |
| | | maximum | 0 | 0.02 | 0.07 | 0.02 | 0.07 |
| Cadmium | 1 | mean | 4 | 0.33 | 1.21 | 0.33 | **1.21** |
| | | maximum | 5 | 0.35 | 1.22 | 0.35 | **1.22** |
| Lead | 3.6 | mean | 2 | 0.39 | 1.76 | 0.11 | 0.49 |
| | | maximum | 2 | 0.59 | 2.28 | 0.16 | 0.63 |
| Mercury* | 0.5 | mean | 0 | 0.05 | 0.25 | 0.10 | 0.51 |
| | | maximum | 0 | 0.06 | 0.32 | 0.13 | 0.63 |

*analyses restricted to women aged 51+ and all men only (n=52)

**Table 31d. Toxic metal exposure estimates (µg/kg body weight/day) from traditional food for First Nations adults in the Mixedwood Plains, using ecozone-specific mean and maximum concentrations, consumers only (n=188)**

| Contaminant | PTDI (µg/kg/day) | Level of concentration | n> PTDI | Mean | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|---|
| Arsenic | 1 | mean | 0 | 0.005 | 0.02 | 0.005 | 0.02 |
| | | maximum | 0 | 0.01 | 0.03 | 0.01 | 0.03 |
| Cadmium | 1 | mean | 0 | 0.01 | 0.03 | 0.01 | 0.03 |
| | | maximum | 0 | 0.01 | 0.05 | 0.01 | 0.05 |
| Lead | 3.6 | mean | 0 | 0.01 | 0.02 | 0.002 | 0.01 |
| | | maximum | 0 | 0.01 | 0.03 | 0.002 | 0.01 |
| Mercury* | 0.5 | mean | 0 | 0.01 | 0.05 | 0.02 | 0.10 |
| | | maximum | 0 | 0.01 | 0.06 | 0.02 | 0.11 |

*analyses restricted to women aged 51+ and all men only (n=110)

**Table 31e. Toxic metal exposure estimates (µg/kg body weight/day) from traditional food for First Nations adults in the Atlantic Maritime, using ecozone-specific mean and maximum concentrations, consumers only (n=113)**

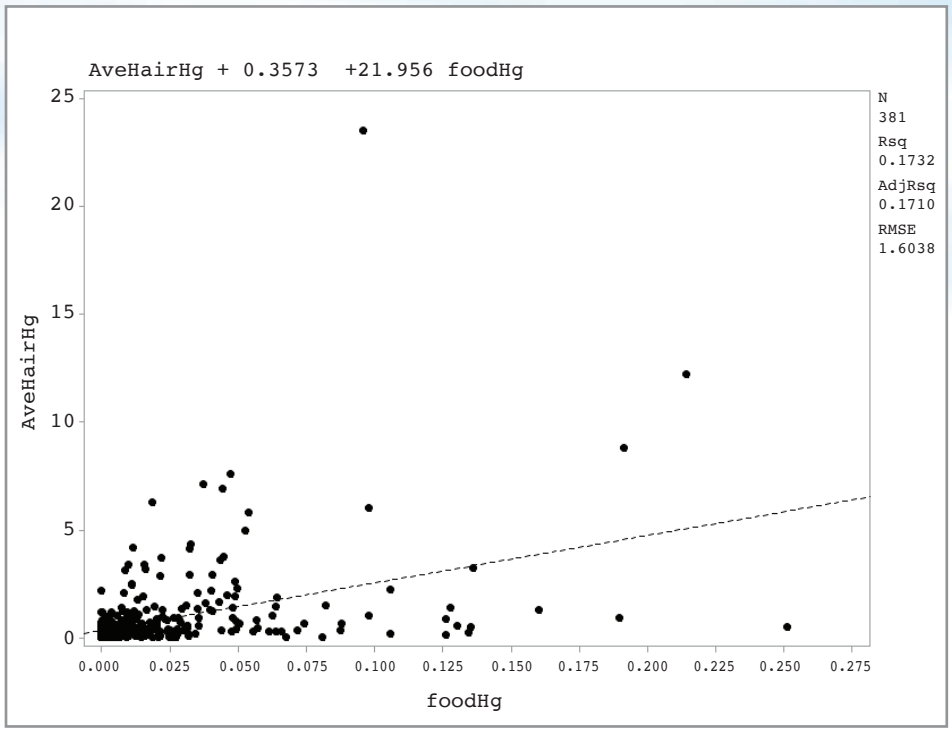
| Contaminant | PTDI (µg/kg/day) | Level of concentration | n> PTDI | Mean | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|---|
| Arsenic | 1 | mean | 8 | 0.29 | 1.07 | 0.29 | **1.07** |
| | | maximum | 11 | 0.31 | 1.23 | 0.31 | **1.23** |
| Cadmium | 1 | mean | 0 | 0.01 | 0.02 | 0.01 | 0.02 |
| | | maximum | 0 | 0.01 | 0.02 | 0.01 | 0.02 |
| Lead | 3.6 | mean | 0 | 0.02 | 0.06 | 0.005 | 0.02 |
| | | maximum | 0 | 0.03 | 0.12 | 0.01 | 0.03 |
| Mercury* | 0.5 | mean | 0 | 0.01 | 0.03 | 0.02 | 0.06 |
| | | maximum | 0 | 0.01 | 0.03 | 0.02 | 0.07 |

*analyses restricted to women aged 51+ and all men only (n=62)

**Table 32. Mercury exposure estimates (µg/kg body weight/day) from traditional food (using mean and maximum concentrations) among First Nations women of child-bearing age in Quebec, consumers only**

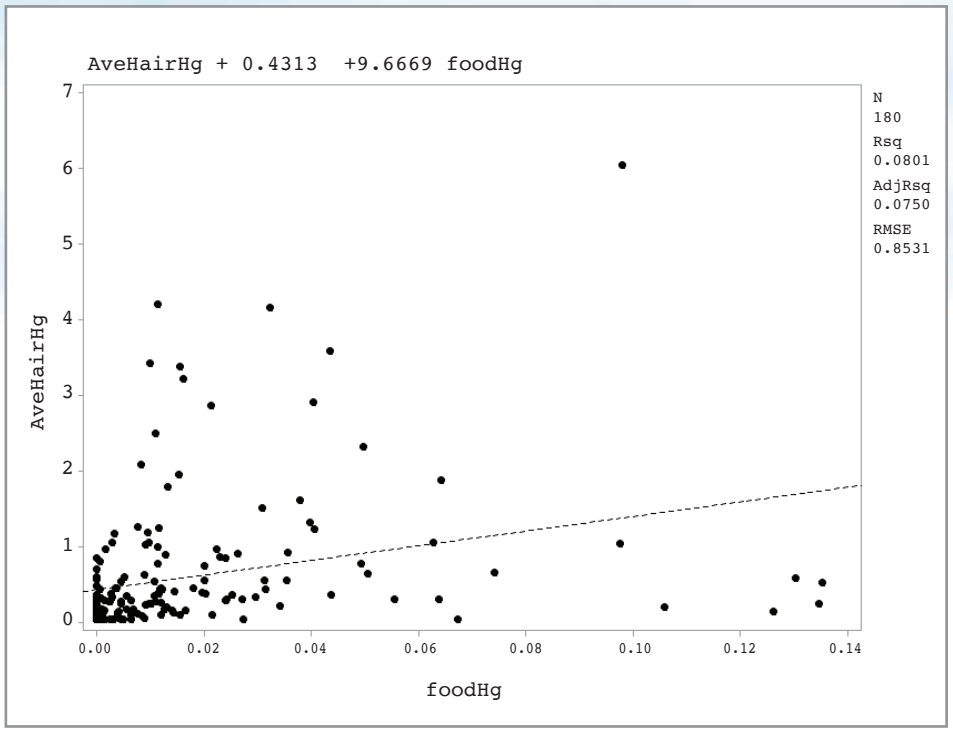
| Region or ecozone | Level of mercury concentration | PTDI (µg/kg/day) | n>PTDI | Mean | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|---|
| First Nations in Quebec (n=256) | Mean | 0.2 | 0 | 0.02 | 0.10 | 0.10 | 0.49 |
| | Maximum | 0.2 | 4 | 0.04 | 0.17 | 0.18 | 0.86 |
| Taiga Shield (n=29) | Mean | 0.2 | 0 | 0.02 | 0.06 | 0.08 | 0.30 |
| | Maximum | 0.2 | 0 | 0.02 | 0.07 | 0.09 | 0.34 |
| Boreal Shield (n=65) | Mean | 0.2 | 0 | 0.03 | 0.13 | 0.16 | 0.65 |
| | Maximum | 0.2 | 1 | 0.04 | 0.16 | 0.21 | 0.82 |
| Mixedwood Plains (n=78) | Mean | 0.2 | 0 | 0.01 | 0.06 | 0.04 | 0.29 |
| | Maximum | 0.2 | 0 | 0.01 | 0.08 | 0.05 | 0.38 |
| Atlantic Maritime (n=51) | Mean | 0.2 | 0 | 0.01 | 0.02 | 0.04 | 0.12 |
| | Maximum | 0.2 | 0 | 0.01 | 0.03 | 0.04 | 0.14 |

**Figure 44. Correlation between mercury exposure from traditional food and hair mercury levels, total population (n=381)**




r =0.42

**Figure 45. Correlation between mercury exposure from traditional food and hair mercury levels, women of child-bearing age (n=180)**




r=0.28

**Table 33. Mean and maximum levels of Polycyclic Aromatic Hydrocarbons (PAHs) in Quebec traditional food samples (ng TEQ/g fresh weight)**

| Traditional food species | n* | Total PAHs ng TEQ/g | |
|---|---|---|---|
| | | Mean | Max |
| **Fish** | | | |
| Atlantic salmon | 4 | 0.0003 | 0.001 |
| Bass | 1 | 0.001 | 0.001 |
| Brook/speckled trout | 4 | 0.0001 | 0.0004 |
| Brown trout | 1 | 0.0003 | 0.0003 |
| Catfish (brown bullhead, channel) | 2 | 0.0003 | 0.001 |
| Cisco meat | 1 | 0.001 | 0.001 |
| Cod | 1 | 0.0004 | 0.0004 |
| Eel | 2 | 0.0003 | 0.001 |
| Lake trout eggs | 1 | ND | ND |
| Lake trout meat | 5 | 0.05 | 0.25 |
| Lake trout smoked | 1 | 21.27 | 21.27 |
| Lake whitefish | 4 | 0.53 | 1.26 |
| Mackerel | 1 | 0.001 | 0.001 |
| Northern pike meat | 3 | 0.01 | 0.04 |
| Pike eggs | 1 | 0.001 | 0.001 |
| Rainbow trout | 1 | 0.0004 | 0.0004 |
| Smallmouth bass | 1 | 0.001 | 0.001 |
| Smelt | 2 | 0.0003 | 0.001 |
| Sole | 1 | 0.001 | 0.001 |
| Striped bass | 1 | ND | ND |
| Sturgeon | 2 | 0.001 | 0.001 |
| Sucker eggs | 1 | 0.04 | 0.04 |
| Walleye | 5 | 0.03 | 0.16 |
| White bass | 1 | 0.001 | 0.001 |
| Yellow perch | 1 | 0.0003 | 0.0003 |

| Traditional food species | n* | Total PAHs ng TEQ/g | |
|---|---|---|---|
| | | Mean | Max |
| **Seafood** | | | |
| Lobster | 3 | 0.03 | 0.09 |
| Scallops | 1 | 0.001 | 0.001 |
| Sea snail | 1 | 0.0004 | 0.0004 |
| Shrimp | 1 | 0.0004 | 0.0004 |
| Snow crab | 2 | 0.0002 | 0.0004 |
| Soft clams | 1 | 0.04 | 0.04 |
| **Land Mammals** | | | |
| Beaver tail | 7 | ND | ND |
| Black bear meat | 5 | 0.61 | 1.34 |
| Bear fat | 4 | 2.27 | 8.32 |
| Caribou meat | 4 | 0.13 | 0.26 |
| Deer meat | 4 | ND | ND |
| Moose kidney | 2 | 0.24 | 0.24 |
| Moose liver | 4 | 0.0004 | 0.0004 |
| Moose meat | 10 | 0.03 | 0.16 |
| Rabbit meat | 7 | ND | ND |
| **Birds** | | | |
| Black guillemot | 1 | 0.0004 | 0.0004 |
| Canada goose liver | 1 | ND | ND |
| Canada goose meat | 7 | 0.11 | 0.45 |
| Eider duck liver | 1 | 0.001 | 0.001 |
| Mallard duck meat | 5 | 2.81 | 11.23 |
| Scoter duck meat | 1 | 0.0004 | 0.0004 |
| Snow goose meat | 2 | 0.02 | 0.03 |

n*=number of communities.

**Table 34. Mean and maximum levels of organochlorines in Quebec traditional food samples (ng/g fresh weight)**

| Traditional food sample | n* | Hexachlorobenzene | | *p,p*-DDE | | *trans*-Nonachlor | | Toxaphene | | Total PCBs | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Max | Mean | Max | Mean | Max | Mean | Max | Mean | Max |
| **Fish** | | | | | | | | | | | |
| Atlantic salmon | 4 | 2.36 | 3.75 | 5.36 | 7.70 | 1.49 | 2.31 | 3.61 | 4.92 | 7.83 | 12.7 |
| Bass | 1 | 0.29 | 0.29 | 2.43 | 2.43 | 0.33 | 0.33 | ND | ND | 2.73 | 2.73 |
| Brook/speckled trout | 4 | 0.36 | 0.60 | 2.76 | 5.22 | 0.42 | 1.03 | 0.42 | 1.06 | 3.34 | 9.44 |
| Brown trout | 1 | 0.22 | 0.22 | 0.33 | 0.33 | 0.04 | 0.04 | ND | ND | ND | ND |
| Catfish | 2 | 0.20 | 0.32 | 4.23 | 8.21 | 0.50 | 0.99 | ND | ND | 26.5 | 50.4 |
| Cisco meat | 1 | 0.58 | 0.58 | 0.29 | 0.29 | 0.18 | 0.18 | ND | ND | ND | ND |
| Cod | 1 | 0.70 | 0.70 | 1.94 | 1.94 | 1.10 | 1.10 | ND | ND | 5.68 | 5.68 |
| Eel | 2 | 0.35 | 0.44 | 10.7 | 12 | 0.31 | 0.51 | 0.02 | 0.04 | 2.97 | 4.11 |
| Lake trout eggs | 1 | 1.33 | 1.33 | 1.09 | 1.09 | 0.33 | 0.33 | ND | ND | 1.33 | 1.33 |
| Lake trout meat | 5 | 0.53 | 1.06 | 5.80 | 10.4 | 0.83 | 2.62 | 0.11 | 0.29 | 10.6 | 39.3 |
| Lake trout smoked | 1 | 5.62 | 5.62 | 14.4 | 14.4 | 8.45 | 8.45 | 8.55 | 8.55 | 67.2 | 67.2 |
| Lake whitefish | 4 | 0.30 | 0.65 | 1.27 | 4.03 | 0.09 | 0.16 | ND | ND | 0.75 | 2.10 |
| Mackerel | 1 | 1.56 | 1.56 | 2.86 | 2.86 | 0.78 | 0.78 | 1.13 | 1.13 | 10.9 | 10.9 |
| Northern pike meat | 3 | 0.27 | 0.59 | 0.75 | 1.28 | 0.16 | 0.47 | 0.14 | 0.42 | 1.08 | 2.25 |
| Pike eggs | 1 | 1.72 | 1.72 | 1.62 | 1.62 | 0.60 | 0.60 | 0.46 | 0.46 | 4.76 | 4.76 |
| Rainbow trout | 1 | 0.18 | 0.18 | 0.28 | 0.28 | 0.17 | 0.17 | 0.10 | 0.10 | 0.39 | 0.39 |
| Smallmouth bass | 1 | 0.10 | 0.10 | 1.79 | 1.79 | 0.26 | 0.26 | ND | ND | 10.7 | 10.7 |
| Smelt | 2 | 0.43 | 0.46 | 4.01 | 4.21 | 0.48 | 0.66 | 0.04 | 0.08 | 4.05 | 4.71 |
| Sole | 1 | 0.09 | 0.09 | 0.51 | 0.51 | 0.04 | 0.04 | ND | ND | ND | ND |
| Striped bass | 1 | 0.16 | 0.16 | 3.37 | 3.37 | 0.06 | 0.06 | ND | ND | 3.02 | 3.02 |
| Sturgeon | 2 | 0.90 | 1.31 | 10.4 | 18.4 | 1.60 | 2.90 | 0.24 | 0.24 | 149 | 296 |
| Sucker eggs | 1 | 0.53 | 0.53 | 1.87 | 1.87 | ND | ND | ND | ND | 1.18 | 1.18 |
| Walleye | 5 | 0.12 | 0.17 | 0.59 | 1.07 | 0.12 | 0.17 | ND | ND | 0.49 | 0.73 |
| White bass | 1 | 0.57 | 0.57 | 3.42 | 3.42 | 0.75 | 0.75 | ND | ND | 30.6 | 30.6 |
| Yellow perch | 1 | 0.13 | 0.13 | 1.04 | 1.04 | 0.15 | 0.15 | ND | ND | 7.59 | 7.59 |

**Table 34. Mean and maximum levels of organochlorines in Quebec traditional food samples (ng/g fresh weight)**

| Traditional food sample | n* | Hexachlorobenzene | | *p,p*-DDE | | *trans*-Nonachlor | | Toxaphene | | Total PCBs | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Max | Mean | Max | Mean | Max | Mean | Max | Mean | Max |
| **Seafood** | | | | | | | | | | | |
| Lobster | 3 | 0.15 | 0.17 | 1.17 | 2.02 | 0.02 | 0.04 | ND | ND | 1.15 | 2.03 |
| Scallops | 1 | 0.02 | 0.02 | 0.01 | 0.01 | ND | ND | ND | ND | ND | ND |
| Sea snail | 1 | 0.18 | 0.18 | 0.12 | 0.12 | 0.04 | 0.04 | ND | ND | ND | ND |
| Shrimp | 1 | 0.12 | 0.12 | 0.02 | 0.02 | 0.40 | 0.40 | 0.05 | 0.05 | 1.79 | 1.79 |
| Snow crab | 2 | 0.25 | 0.29 | 0.80 | 1.04 | 0.26 | 0.40 | ND | ND | 1.82 | 2.77 |
| Soft clams | 1 | 0.08 | 0.08 | 0.13 | 0.13 | ND | ND | ND | ND | ND | ND |
| **Land Mammals** | | | | | | | | | | | |
| Beaver tail | 7 | 0.39 | 0.39 | 0.17 | 0.17 | ND | ND | ND | ND | ND | ND |
| Black bear meat | 5 | 0.10 | 0.10 | ND | ND | ND | ND | ND | ND | ND | ND |
| Bear fat | 4 | 0.93 | 1.47 | 1.11 | 3.39 | 0.12 | 0.28 | ND | ND | 28.9 | 78.1 |
| Moose kidney | 2 | 0.07 | 0.07 | ND | ND | ND | ND | ND | ND | ND | ND |
| Moose liver | 4 | 0.32 | 0.32 | 0.01 | 0.01 | ND | ND | ND | ND | ND | ND |
| Beaver tail | 7 | 0.39 | 0.39 | 0.17 | 0.17 | ND | ND | ND | ND | ND | ND |
| Black bear meat | 5 | 0.10 | 0.10 | ND | ND | ND | ND | ND | ND | ND | ND |
| **Birds** | | | | | | | | | | | |
| Black guillemot | 1 | 3.32 | 3.32 | 4.04 | 4.04 | 0.24 | 0.24 | 0.18 | 0.18 | 10.4 | 10.4 |
| Canada goose liver | 1 | 0.42 | 0.42 | 0.31 | 0.31 | 1.02 | 1.02 | ND | ND | ND | ND |
| Canada goose meat | 7 | 0.49 | 1.47 | 7.10 | 12 | 0.16 | 0.72 | ND | ND | 1.44 | 4.79 |
| Eider duck liver | 1 | 1.19 | 1.19 | 2.26 | 2.26 | 0.43 | 0.43 | 0.21 | 0.21 | 5.65 | 5.65 |
| Mallard duck meat | 5 | 1.54 | 5.61 | 24 | 81 | 0.35 | 1.23 | 0.02 | 0.06 | 149 | 582 |
| Scoter duck meat | 1 | 1.34 | 1.34 | 6.67 | 6.67 | 0.07 | 0.07 | 0.02 | 0.02 | 44.4 | 44.4 |
| Snow goose meat | 2 | 0.28 | 0.38 | 0.90 | 1.66 | 0.32 | 0.44 | 0.05 | 0.10 | 0.09 | 0.18 |

n*=number of communities; ND= not detected; NM= not measured

## Table 35. Mean and maximum levels of Polybrominated Diphenyl Ethers (PBDEs) in Quebec traditional food samples (ng/g fresh weight)

| Traditional Food Sample | n* | Total PBDEs | |
|---|---|---|---|
| | | Mean | Max |
| **Fish** | | | |
| Atlantic salmon | 4 | 0.62 | 0.86 |
| Bass | 1 | 0.66 | 0.66 |
| Brook/speckled trout | 4 | 1.98 | 6.13 |
| Brown trout | 1 | 0.21 | 0.21 |
| Catfish (brown bullhead, channel) | 2 | 14.3 | 28.5 |
| Cisco meat | 1 | 0.12 | 0.12 |
| Cod | 1 | 0.75 | 0.75 |
| Eel | 2 | 0.83 | 1.32 |
| Lake trout eggs | 1 | 1.54 | 1.54 |
| Lake trout meat | 5 | 5.5 | 23.8 |
| Lake trout smoked | 1 | 48.1 | 48.1 |
| Lake whitefish | 4 | 0.28 | 0.54 |
| Mackerel | 1 | 1.59 | 1.59 |
| Northern pike meat | 3 | 0.44 | 0.86 |
| Pike eggs | 1 | 0.89 | 0.89 |
| Rainbow trout | 1 | 0.14 | 0.14 |
| Smallmouth bass | 1 | 6.65 | 6.65 |
| Smelt | 2 | 0.68 | 0.85 |
| Sole | 1 | 0.05 | 0.05 |
| Striped bass | 1 | 0.56 | 0.56 |
| Sturgeon | 2 | 18.8 | 37.1 |
| Sucker eggs | 1 | 0.87 | 0.87 |
| Walleye | 5 | 1.18 | 3.80 |
| White bass | 1 | 14.6 | 14.6 |
| Yellow perch | 1 | 2.57 | 2.57 |

| Traditional Food Sample | n* | Total PBDEs | |
|---|---|---|---|
| | | Mean | Max |
| **Seafood** | | | |
| Lobster | 3 | 0.05 | 0.12 |
| Scallops | 1 | 0.01 | 0.01 |
| Sea snail | 1 | 0.02 | 0.02 |
| Shrimp | 1 | 0.17 | 0.17 |
| Snow crab | 2 | 0.07 | 0.09 |
| Soft clams | 1 | 0.01 | 0.01 |
| **Land Mammals** | | | |
| Beaver tail | 7 | 0.03 | 0.03 |
| Black bear meat | 5 | 0.83 | 0.83 |
| Bear fat | 4 | 1.99 | 5.26 |
| Moose kidney | 2 | 0.04 | 0.04 |
| Moose liver | 4 | ND | ND |
| **Birds** | | | |
| Black guillemot | 1 | 1.05 | 1.05 |
| Canada goose liver | 1 | 0.51 | 0.51 |
| Canada goose meat | 7 | 156 | 780 |
| Eider duck liver | 1 | 0.56 | 0.56 |
| Mallard duck meat | 5 | 3.04 | 7.44 |
| Scoter duck meat | 1 | 0.79 | 0.79 |
| Snow goose meat | 2 | 0.25 | 0.49 |

n*=number of communities

## Table 36. Mean and Max total levels of Perfluorinated Compounds (PFCs) in Quebec traditional food samples (ng/g fresh weight)

| Traditional Food Sample | n* | Total PFCs | |
|---|---|---|---|
| | | Mean | Max |
| **Fish** | | | |
| Atlantic salmon | 4 | 1.12 | 1.36 |
| Bass | 1 | 1.19 | 1.19 |
| Brook/speckled trout | 4 | 6.00 | 19.46 |
| Brown trout | 1 | 2.55 | 2.55 |
| Catfish (brown bullhead, channel) | 2 | 2.31 | 2.35 |
| Cisco meat | 1 | 0.16 | 0.16 |
| Cod | 1 | 0.48 | 0.48 |
| Eel | 2 | 3.53 | 6.10 |
| Lake trout eggs | 1 | 6.24 | 6.24 |
| Lake trout meat | 5 | 2.23 | 6.51 |
| Lake trout smoked | 1 | 1.50 | 1.50 |
| Lake whitefish | 4 | 3.78 | 11.89 |
| Mackerel | 1 | 2.14 | 2.14 |
| Northern pike meat | 3 | 2.38 | 2.67 |
| Pike eggs | 1 | 5.38 | 5.38 |
| Rainbow trout | 1 | 0.73 | 0.73 |
| Smallmouth bass | 1 | 4.93 | 4.93 |
| Smelt | 2 | 3.93 | 5.57 |
| Sole | 1 | 0.37 | 0.37 |
| Striped bass | 1 | 2.63 | 2.63 |
| Sturgeon | 2 | 1.31 | 1.69 |
| Sucker eggs | 1 | 30.42 | 30.42 |
| Walleye | 5 | 4.17 | 12.64 |
| White bass | 1 | 5.16 | 5.16 |
| Yellow perch | 1 | 3.42 | 3.42 |
| **Seafood** | | | |
| Lobster | 3 | 2.32 | 3.13 |
| Scallops | 1 | 0.22 | 0.22 |
| Sea snail | 1 | 0.71 | 0.71 |
| Shrimp | 1 | 4.25 | 4.25 |
| Snow crab | 2 | 14.64 | 21.27 |
| Soft clams | 1 | 0.55 | 0.55 |

| Traditional Food Sample | n* | Total PFCs | |
|---|---|---|---|
| | | Mean | Max |
| **Land Mammals** | | | |
| Beaver tail | 7 | 2.18 | 9.13 |
| Black bear meat | 5 | 1.21 | 3.85 |
| Bear fat | 4 | 1.23 | 3.25 |
| Caribou bone marrow | 1 | 0.29 | 0.29 |
| Caribou heart | 2 | 1.01 | 1.01 |
| Caribou kidney | 1 | 0.31 | 0.31 |
| Caribou meat | 4 | 1.29 | 3.44 |
| Deer kidney | 1 | 1.21 | 1.21 |
| Deer liver | 1 | 1.13 | 1.13 |
| Deer meat | 4 | 0.41 | 0.76 |
| Moose heart | 1 | 0.55 | 0.55 |
| Moose kidney | 2 | 0.20 | 0.22 |
| Moose liver | 4 | 2.50 | 4.51 |
| Moose meat | 10 | 0.82 | 5.52 |
| Moose nose | 1 | 0.23 | 0.23 |
| Moose tongue | 1 | 0.29 | 0.29 |
| Porcupine meat | 2 | 0.31 | 0.50 |
| Rabbit intestines | 1 | 10.64 | 10.64 |
| Rabbit liver | 1 | 1.19 | 1.19 |
| Rabbit meat | 7 | 1.37 | 7.18 |
| Squirrel meat | 1 | 0.41 | 0.41 |
| **Birds** | | | |
| Black guillemot | 1 | 9.08 | 9.08 |
| Canada goose liver | 1 | 6.28 | 6.28 |
| Canada goose meat | 7 | 1.97 | 3.88 |
| Eider duck liver | 1 | 4.00 | 4.00 |
| Mallard duck meat | 5 | 12.83 | 33.40 |
| Scoter duck meat | 1 | 3.70 | 3.70 |
| Snow goose meat | 2 | 0.60 | 0.64 |
| **Plants** | | | |
| Fiddleheads | 4 | ND | ND |

n*=number of communities

## Table 37. Levels of Dioxins and Furans in Quebec traditional food samples (ng TEQ/kg fresh weight)

| Traditional Food Sample | n* | Dioxins and Furans | |
|---|---|---|---|
| | | Mean | Max |
| **Fish** | | | |
| Atlantic salmon | 4 | 0.06 | 0.12 |
| Bass | 1 | ND | ND |
| Brook/speckled trout | 4 | 0.13 | 0.26 |
| Brown trout | 1 | 0.002 | 0.002 |
| Catfish (brown bullhead, channel) | 2 | 0.17 | 0.35 |
| Cisco meat | 1 | ND | ND |
| Cod | 1 | 0.03 | 0.03 |
| Eel | 2 | 0.01 | 0.02 |
| Lake trout eggs | 1 | 0.01 | 0.01 |
| Lake trout meat | 5 | 0.12 | 0.59 |
| Lake trout smoked | 1 | 2.57 | 2.57 |
| Lake whitefish | 4 | 0.001 | 0.004 |
| Mackerel | 1 | 0.07 | 0.07 |
| Northern pike meat | 3 | 0.06 | 0.18 |
| Pike eggs | 1 | 0.05 | 0.05 |
| Rainbow trout | 1 | 0.04 | 0.04 |
| Smallmouth bass | 1 | 0.26 | 0.26 |
| Smelt | 2 | 0.03 | 0.04 |
| Sole | 1 | ND | ND |
| Striped bass | 1 | 0.01 | 0.01 |
| Sturgeon | 2 | 0.58 | 1.15 |
| Sucker eggs | 1 | 0.004 | 0.004 |
| Walleye | 5 | 0.01 | 0.02 |
| White bass | 1 | 0.17 | 0.17 |
| Yellow perch | 1 | 0.004 | 0.004 |

| Traditional Food Sample | n* | Dioxins and Furans | |
|---|---|---|---|
| | | Mean | Max |
| **Seafood** | | | |
| Lobster | 3 | 0.01 | 0.03 |
| Scallops | 1 | 0.0001 | 0.0001 |
| Sea snail | 1 | 0.002 | 0.002 |
| Shrimp | 1 | 0.04 | 0.04 |
| Snow crab | 2 | 0.04 | 0.08 |
| Soft clams | 1 | 0.01 | 0.01 |
| **Land Mammals** | | | |
| Bear fat | 4 | 0.01 | 0.02 |
| Beaver tail | 7 | 0.004 | 0.004 |
| Black bear meat | 5 | 0.20 | 0.20 |
| Moose kidney | 2 | 0.02 | 0.02 |
| Moose liver | 4 | 0.01 | 0.01 |
| **Birds** | | | |
| Black guillemot | 1 | ND | ND |
| Canada goose liver | 1 | 0.01 | 0.01 |
| Canada goose meat | 7 | 0.06 | 0.19 |
| Eider duck liver | 1 | 0.01 | 0.01 |
| Mallard duck meat | 5 | 0.24 | 0.71 |
| Scoter duck meat | 1 | 0.33 | 0.33 |
| Snow goose meat | 2 | 0.12 | 0.24 |

n*=number of communities

**Table 38. Exposure estimates (µg/kg body weight/day) for organics from traditional food for First Nations adults in Quebec using mean concentrations (n=573)**

| Organics | PTDI (µg/kg/day) | n>PTDI | Mean | Median | 95th percentile | Mean/ PTDI | 95th/ PTDI |
|---|---|---|---|---|---|---|---|
| HCBs | 0.27 | 0 | 0.0001 | 0.00003 | 0.0004 | 0.0004 | 0.002 |
| DDE | 20 | 0 | 0.001 | 0.0002 | 0.002 | 0.00003 | 0.0001 |
| PCB | 1 | 0 | 0.003 | 0.0002 | 0.011 | 0.003 | 0.01 |
| Chlordane | 0.05 | 0 | 0.0001 | 0.00001 | 0.0003 | 0.001 | 0.005 |
| Toxaphene | 0.2 | 0 | 0.00004 | 0 | 0.0002 | 0.0002 | 0.001 |
| PAH | 40 | 0 | 0.0001 | 0 | 0.001 | 0 | 0.00001 |
| PFCs | 0.08 | 0 | 0.001 | 0.0002 | 0.004 | 0.01 | 0.05 |
| PBDE | 0.1 | 0 | 0.002 | 0.0001 | 0.012 | 0.02 | 0.12 |
| Dioxin and Furan | 2.3 pg/kg/day | 0 | 0.021 | 0.002 | 0.122 | 0.01 | 0.05 |

**Table 39. Exposure estimates (µg/kg body weight/day) for PCBs from traditional food for FirstNations adults in Quebec using mean and maximum concentrations, by ecozone, consumers only**

| Ecozone | Level of concentration | n> PTDI | Mean | 95th percentile | HQ Mean/PTDI | HQ 95th/PTDI |
|---|---|---|---|---|---|---|
| Total First Nations in Quebec (n=536) | mean | 0 | 0.002 | 0.01 | 0.002 | 0.01 |
| | maximum | 0 | 0.005 | 0.02 | 0.005 | 0.02 |
| Taiga Shield (n=62) | mean | 0 | 0.0004 | 0.001 | 0.0004 | 0.001 |
| | maximum | 0 | 0.001 | 0.001 | 0.001 | 0.001 |
| Boreal Shield (n=117) | mean | 0 | 0.003 | 0.01 | 0.003 | 0.01 |
| | maximum | 0 | 0.003 | 0.01 | 0.003 | 0.01 |
| Mixedwood Plains (n=188) | mean | 0 | 0.001 | 0.01 | 0.001 | 0.01 |
| | maximum | 0 | 0.001 | 0.01 | 0.001 | 0.01 |
| Atlantic Maritime (n=113) | mean | 0 | 0.0004 | 0.001 | 0.0004 | 0.001 |
| | maximum | 0 | 0.001 | 0.002 | 0.001 | 0.002 |

# Appendices

## Appendix A. Chemical fact sheets

Better Information for Better Health

First Nations Food, Nutrition and Environment Study (FNFNES)

**Chemical Factsheets**

Since the early 1900s the chemical industry developed thousands of substances resulting in more than 78,000 substances being used in commerce today. We are exposed to chemicals every day, from household cleaning compounds to cosmetics to additives in the food we eat. If not handled properly, some of these chemicals can be hazardous to human health and the environment when at elevated level of exposure.

In order to protect public health it is important to control the release of these chemicals and monitor their levels in the environment and certain foods

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### UNDERSTANDING CHEMICAL POLLUTANTS

**What chemicals in the environment are we worried about?**

We often hear that we are unknowingly being exposed to chemicals in the air we breathe, food we eat and water we drink. What are they and what do they do? The following is a list of chemicals that are commonly found in the Canadian environment. The First Nations Food, Nutrition and Environment Study (FNFNES) collected traditional food and drinking water samples from First Nations communities and measured the concentrations of these chemicals to assess the risk of exposure. The results of testing are presented in the Regional Reports. These factsheets are included to provide background information to the general reader on these chemicals. As the focus of FNFNES is on long-term low-level exposure from food and water, the acute effects of high doses such as those from occupational exposure are not presented.

Based on the evidence gathered from animal experiments and human populations accidentally exposed to these chemicals, threshold levels of many of these chemicals have been established. For public health protection, national and international guidelines have been established. When the daily intake is below these threshold values, no adverse health effects are expected among the studied population.

**Included are Chemical Factsheets on the following substances:**

**Benefit of Traditional Foods vs Risk:** Traditional foods offer many nutritional and cultural benefits. These must be weighed against the store-bought food alternatives and levels of contamination.

**Persistent Organic Pollutants:** Toxic organic chemical substances that do not break down or dissipate in the environment. They can stay in your body for a very long time.

**Pesticides and Herbicides:** These kill insects, weeds and fungus which harm agricultural crops. They can affect the nervous system and immune functions.

**Polychlorinated biphenyls (PCBs):** These industrial chemicals, while banned have been used in transformers, capacitors and as coolants and persist in the environment. They can affect the development of children.

**Polybrominated Diphenyl Ethers (PBDEs):** These compounds are used as flame retardants and are often found in building materials and consumer goods such as electronics and furniture. They can affect immune functions.

**Dioxins and Furans:** There are 210 different types of dioxins and furans, all of which are persistent organic pollutants and some of which can cause cancer.

**Polycyclic Aromatic Hydrocarbons (PAHs):** These are produced through burning and some PAHs can cause cancer.

**Perfluorinated Compounds (PFCs):** Toxic and carcinogenic in animals, PFCs lasts indefinitely in the environment. It is used in the manufacture of non-stick surfaces such as on cookware. They can affect thyroid functions.

**Cadmium:** A metallic chemical element used to make alloys and batteries that can damage the kidney.

**Lead:** A heavy blue-grey metal which affects the brain development of children.

**Mercury:** A silver metal that is liquid at room temperature, mercury can take a variety of forms, some of which are more easily absorbed by the human body and can affect child development.

**Arsenic:** A silvery-white poisonous metal that is used to make insecticides and poisons for rodents. It is toxic to animals and humans and can cause cancer.

More factsheets are available at the First Nations Environmental Health Innovation Network (FNEHIN) website: www.fnehin.ca

**Benefit of Traditional Foods vs Risk**

Traditional foods should not be avoided because of suspected contamination as they are an excellent source of nutrients. The test results of contaminants found in traditional foods collected in your area are reported in the regional reports and any that are high in contaminants have been highlighted. This will provide you with local information that can be used to choose the best food to maximize the nutrient intake and lower your exposure to environmental contaminants.

Wild game has been found, on average, to be higher in protein and lower in both fat and cholesterol than domesticated meats. First Nations have long relied upon traditional foods for a healthy, balanced and nutritious diet. Traditional foods are an optimal food choice that can be found locally and acquired with traditional knowledge. Studies, such as this one, show that those who consume traditional foods have a more nutritious and healthier diet than those that don't and that traditional foods can make important contributions to the intake of several important nutrients.

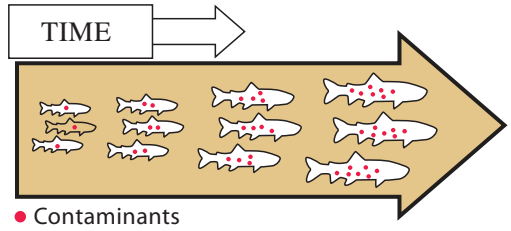
**Persistent Organic Pollutants (POPs)**

Persistent organic pollutants are organic compounds that are resistant to environmental degradation through chemical, biological, and photolytic (broken down by sunlight) processes. As they are not easily broken down, they can persist in the environment, sometimes for decades. They can be transported far from their sources by air and ocean current (e.g. from the industrialized south to the Canadian Arctic). They can bioaccumulate in plants, animals and humans (absorbed into the body at a rate greater than is removed), and biomagnified (increase in concentrations) along the food chain. At high enough concentrations POPs can have harmful effects on human health and the environment.

POPs include some of the most well-known and toxic environmental contaminants, such as polychlorinated biphenyls (PCBs), dioxins and furans. POPs commonly found in traditional foods and discussed in the FNFNES reports include hexachlorobenzene (HCB), 1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane (DDT) and its metabolite, 1,1-dichloro-2,2-bis(4-chlorophenyl) ethylene (DDE), PCBs, dioxins and furans. Although the levels of many of these contaminants have declined since most developed countries have restricted their use decades ago, they are persistent and remain in the environment and our bodies for long periods of time.

POPs can affect neural development and the immune system and can also disrupt hormonal balance and regulation. The developing fetus and infants are at higher risk of POPs exposure as POPs can pass through the placenta to the fetus or be ingested by babies through breast milk. It is important to note that the benefits of breast feeding have always out-weighed the risk of contaminants in breast milk in all cases studied worldwide.

Illustration of how POPs accumulate in animals and people faster than the body can excrete the substance[iii]




**Pesticides:**

**What are they?** Pesticides are chemicals used to eliminate or control a variety of domestic or agricultural pests that can damage crops and livestock and reduce farm productivity. The most commonly applied pesticides are insecticides (to kill insects), herbicides (to kill weeds), rodenticides (to kill rodents), and fungicides (to control fungi, mold, and mildew). Of these pesticide classes, herbicides (weed killers) are the most widely used. Two classes of pesticides have established exposures: organochlorine pesticides (some of which are being measured in FNFNES) and organophosphate pesticides (not being measured in this study). Organochlorine pesticides (OCPs) such as DDT are POPs.

**Where are they found?** Pesticide residues are common food contaminants. Older organochlorine pesticides (like DDT) can be found in fatty tissues such as meat, fish and milk products, while modern pesticides such as organophosphates are mainly found on the surface of fruits and vegetables. Since organophosphates are water soluble, they can be easily washed away. Therefore, always wash fruits and vegetables thoroughly with water before eating. Due to surface runoff, pesticides can also be found in surface water, if there has been heavy use in the area. This may be a concern as it could contaminate drinking water from surface supplies.

**What are the major health effects?** Some pesticides are toxic to the nervous and immune system, and some are endocrine (hormone) disruptors. Endocrine disruptors are substances that can interfere with the endocrine system of animals, including humans by mimicking certain hormones. Endocrine disruption is important because hormones play a critical role in controlling how the body develops. A number of environmental contaminants (as well as other substances, such as some pharmaceuticals) are endocrine disruptors. Some pesticides, such as pentachlorophenol are contaminated with dioxins, which may play a role in their toxicity[iv]. For example, daily ingestion of low doses of diquat, an extensively used herbicide, induces intestinal inflammation in rats. It has been suggested that repeated ingestion of small amounts of pesticides, as could be found in food, may have consequences for human health and may be involved in the development of gastrointestinal disorders[v]. Exposure to pesticides during the fetal stage and in childhood can cause long-term damage.

**What are the guideline levels in water and food and daily intake?** The tolerable daily intake (TDI) established by Health Canada for DDT, a classic organochlorine pesticide, is 0.01 mg/Kg BW/day. There is no drinking water guideline for DDT as it does not dissolve in water easily.

### Polychlorinated biphenyls (PCBs):

**What are they?** PCBs are a class of compounds that are mixtures of up to 209 different chlorinated hydrocarbons, or congeners. Different congeners sometimes act differently from one another, and some are more resistant to break down than others in the environment. Some congeners can act like dioxins ('dioxin-like congeners') and others act in other ways ('non dioxin-like congeners'). PCBs were used in paints, lubricants and electrical equipment.

**Where are they found?** PCBs are generally found in higher concentrations in fatty foods of animal origin, such as some fish, meats and dairy products. Everyone living in developed countries have PCBs in their bodies and long-range transport of PCBs by global air currents have caused PCBs to be distributed globally.[vi] Most PCBs enter the environment from landfill sites and leaks from old equipment. Food is the largest source of exposure but air, water and soil can play a part as well.[vii]

**What are the major health effects?** Since people are never exposed to only one of these groups, people exposed to PCBs are at risk of the same health effects caused by dioxins, as well as those caused by non-dioxin-like PCB congeners. People eating large amounts of certain sports fish, wild game and marine mammals are at increased risk for higher exposures and possible adverse health effects. Long-term, high level exposure may also cause liver and kidney cancer.[viii] Fetal exposure to PCBs can cause developmental deficits such as lowering IQ among children.

**What are the guideline levels in water and food and daily intake?** The tolerable daily intake (TDI) established by Health Canada is 0.0001 3mg/kg bw/day.[ix]

### Flame Retardants - Polybrominated Diphenyl Ethers (PBDEs):

**What are they?** Flame retardants are chemicals that prevent the spread of fire and are persistent organic pollutants. PBDE flame retardants are added to some plastics, electrical and electronic equipment, upholstered furniture, non-clothing textiles and foam products. Because PBDEs are added to the products rather than chemically bound into them, they can be slowly and continuously released from the products during their manufacture, while in use, or after their disposal. As of 2008 the EU has banned several types of brominated flame retardants following evidence beginning in 1998 that the chemicals were accumulating in human breast milk.

**Where are they found?** PBDEs have been found both in the environment and in humans, including in human breast milk in Canada, the United States and Europe. PBDEs are generally found in higher concentrations in fatty foods of animal origin, such as some fish, meats and dairy products. Exposure to PBDEs is nearly impossible to avoid due to their presence in the air, indoor dust, water, food, animal fats, and breast milk. Nearly all Americans tested have trace amounts of flame retardants in their body. While the levels in humans are very low, they have been increasing with time, and are higher in North Americans than in Europeans.

**What are the major health effects?** Many are considered harmful, as they are linked to adverse health effects in laboratory animal research. Concerns are being raised because of their persistence, bioaccumulation, and potential for toxicity, both in animals and in humans. Research in laboratory animals has linked PBDE exposure to an array of adverse health effects including thyroid hormone disruption, neurobehavioural effects and possibly, cancer.[x]

**What are the guideline levels in water and food and daily intake?** There is no guideline level for PBDE from Health Canada.

### Dioxins and Furans:

**What are they?** There are over 200 types of polychlorinated dibenzodioxins (PCDDs), or dioxins. Polychlorinated dibenzofurans (PCDFs) are related chemicals. Some other persistent organic pollutants can act like dioxins and are called 'dioxin-like compounds'.

**Where are they found?** The largest source of dioxins and furans entering the environment is through large-scale waste incinerators. Emissions are also made from small-scale burning of plastics, diesel, treated wood and cigarette smoke. The primary source of exposure to dioxins and dioxin-like compounds in developed countries is via food, especially meat, milk, dairy, eggs, and fish, which together make up 93% of total exposure. Inhalation, consumption of water, vegetable oils, grains, fruits and vegetables only constitute a small percentage of overall exposure.[xi]

**What are the major health effects?** Dioxins are known to suppress the immune system of animals and humans,[xii] and are likely to cause cancer.[xiii] Changes to animals' hormone and reproduction systems and development have also been observed due to high exposure to dioxins and furans.[xiv] The question of whether dioxins can influence the body's immune system to attack its own cells causing disease, like type 1 diabetes, is still being investigated.

**What are the guideline levels in water and food and daily intake?** Health Canada has set a tolerable daily intake (TDI) for PCDDs and PCDFs at 2.3 pg/Kg BW/day (Health Canada, 2005 and WHO 2010).

### Polycyclic Aromatic Hydrocarbons (PAHs):

**What are they?** PAHs are a group encompassing over 100 different chemicals and are usually found as two or more of these compounds in a mixture. They are created through incomplete burning of many substances.

**Where are they found?** Exposure can be through inhalation, drinking contaminated water, or eating contaminated foods including grilled or charred meats. Air can become contaminated with PAHs by wild fires, vehicle exhaust, trash incinerators, cigarette smoke or coal tar, and water and foods can be contaminated from the soil and ground water. Waste sites where construction materials or ash are buried can also contaminate ground water. Breathing smoke which contains PAHs is the most common way people are exposed to PAHs. Eating food grown in contaminated soil can expose people to PAHs. Charring or grilling food can increase the amount of PAHs that the food contains.

**What are the major health effects?** Some PAHs are expected to be carcinogens and have caused cancer and reproductive problems in laboratory animals, but there is a lack of data on the effect of PAHs on humans.[xvi] PAHs can damage lungs, liver, kidneys and skin.[xvii] According to the US Environmental Protection Agency, PAHs also can damage red blood cells and weaken the immune system. PAHs are a large class of chemicals which range from nontoxic to extremely toxic. Their toxicity, and therefore the amount of the PAH needed to cause a health effect, is dependent upon the type of PAH. Seven types of PAHs have been deemed probable human carcinogens by the U.S. Environmental Protection Agency.

**What are the guideline levels in water and food and daily intake?** Health Canada recommended a maximum acceptable concentration of 0.01 µg/L Benzo[α]pyrene (a PAH) in drinking water. Health Canada has no guideline level for non-carcinogenic endpoints of PAHs. The oral slope factor for Benzo[α]pyrene is 2.3 mg/Kg BW/day..

### Perfluorinated Compounds (PFCs):

**What are they?** Perfluorinated compounds (PFCs) are a family of fluorine-containing chemicals with unique properties to make materials stain and stick resistant. PFCs are incredibly resistant to breakdown and are turning up in unexpected places around the world. Although these chemicals have been used since the 1950s in countless familiar products, they've been subjected to little government testing. There are many forms of PFCs, but the two getting attention recently are: PFOA or perfluorooctanoic acid, used to make Teflon products and PFOS or perfluorooctane sulfonate, a breakdown product of chemicals formerly used to make Scotch Gard products.

**Where are they found?** PFCs are used in a wide array of consumer products and food packaging. Grease-resistant food packaging and paper products, such as microwave popcorn bags and pizza boxes, contain PFCs. PFOS was used until 2002 in the manufacture of 3M's Scotch Gard treatment and used on carpet, furniture, and clothing. PFOA is used to make DuPont's Teflon product, famous for its use in non-stick cookware. If Teflon-coated pans are overheated, PFOA is released. PFCs are in cleaning and personal-care products like shampoo, dental floss, and denture cleaners. Even Gore-Tex clothing, beloved in the Northwest for its ability to shed water, contains PFCs.

**What are the major health effects?** In recent studies there have been indications that PFOAs interfere with normal reproduction by adversely affecting fertility, and has caused developmental toxicity in offspring resulting in birth defects.[xviii]

**What are the guideline levels in water and food and daily intake?** There is no guideline level for PFCs from Health Canada.

### Metals:

Metals include elements like arsenic, mercury, lead and cadmium, all of which are toxic. Metals occur naturally in the environment with large variations in concentration. In modern times, economic activity has resulted in several sources of metals that are introduced to the environment via pollution. Waste-derived fuels and coal are especially prone to containing metals, so they should be a central concern in a consideration of their use. Living organisms require trace amounts of some metals, such as iron, cobalt, copper, manganese, molybdenum, and zinc which are beneficial. However, excessive levels can be detrimental to health. Other metals such as cadmium, lead, mercury, and arsenic are considered to be toxic and have no known vital or beneficial effects and over time their accumulation in the bodies of animals can cause serious illness.

### Cadmium:

**What is it?** Cadmium is a natural element that is found in all soils and rocks. It is a metal that resists corrosion and is used in many applications such as batteries, some plastics such as PVC, and metal coatings.

**Where is it found?** It can enter the environment from mining, industry, coal and household waste burning and hazardous waste sites and can travel great distances before entering the local environment through ground or water. Cadmium does not break down, can travel great distances in the environment and can change in form. Cigarette smoke is a major source of exposure to cadmium and can effectively double the average daily intake. Other sources of exposure include from foods (cadmium is often found to be highest in shellfish and the liver and kidneys of large mammals like moose and deer) drinking water, and breathing air near a waste incinerator.

**What are the major health effects?** Long-term exposure to lower levels can cause kidney and lung damage, fragile bones and an increase in cancers.

**What are the guideline levels in water and food and daily intake?** The drinking water guideline for Cd is 0.005 mg/L. The tolerable daily intake (TDI) established by Health Canada is 0.008 mg/Kg BW/day.

### Lead:

**What is it?** Lead is found naturally in the environment and has many industrial uses.

**Where is it found?** Lead was once commonly used in gasoline, paint, and pipes, although its use has now been restricted in these areas. It can currently be found in lead-acid car batteries, toys, solder, stained glass, crystal vessels, lead ammunition, jewelry and PVC plastic. Some of the most common ways to be exposed to lead include improper disposal of old lead-based paint, leaded gasoline, some ceramics or other lead-containing products. Lead from these sources can find its way into drinking water in homes with old pipes containing lead solder, inhaling paint dust or ingesting broken or peeling lead paint, and through animals that have been killed with lead shot. Fragments can be too small to detect and washing can merely spread them. Detectable fragments contain even more lead and should be avoided when eating for everyone. Canada continues to permit the use of lead in hunting, except for hunting migratory birds and in wetlands[xix]).

**What are the major health effects?** Lead is well known to be a serious toxin for humans and has contributed to nervous system, kidney and reproductive system problems. Long term exposure can also cause anemia. Recent studies in children in other parts of the world are beginning to suggest that amounts of lead much lower than previously thought can contribute to impaired intelligence. This is especially true for very young children.

**What are the guideline levels in water and food and daily intake?** The drinking water guideline for lead is 0.01 mg/L. There is no known level of lead exposure that is considered safe and no established tolerable daily intake (TDI).

## Mercury:

**What is it?** Mercury is the only metal that is liquid at normal air temperature and pressure. Mercury occurs in deposits throughout the world mostly as cinnabar (mercuric sulfide). Mercury can exist in different forms in the environment. It can be found in either elemental form such as liquid or vapour, dissolved inorganic form or organic form. Mercury can change forms through natural processes.

**Where is it found?** Mercury can be released naturally from rocks, soil and volcanoes. It is found in certain dental fillings (dental amalgam), thermometers, and compact fluorescent lights (CFLs) and its use in other applications is being phased out.

Mercury is released from waste incineration, coal and fossil fuel burning, cement production, mining and smelting. Much of the airborne mercury that settles in Canada actually originates from outside Canada. Mercury can also be released into the environment through flooding. For example, a new reservoir is created, the mercury naturally present in soils and vegetation is converted in water by bacterial action to methylmercury, a more toxic form of mercury where it enters the food chain and bioaccumulates in fish. Mercury accumulates within living organisms so that when one animal eats other animals, much of that mercury stays within the animal which has eaten the other. This process of bioaccumulation applies to humans who eat animals which contain mercury so that those higher in the food chain (predatory fish and carnivorous mammals) often have higher mercury levels. Methylmercury is most often found in large predatory and bottom feeding fish (such as mackerel, orange roughy, walleye, trout) and shellfish.

**What are the major health effects?** Long-term exposure to mercury can affect brain functions, weaken the immune system, and cause neurological disorders and damage. High-level exposure can also permanently damage the brain, kidneys, and developing fetus and produce tremors, changes in vision or hearing and memory problems. Children are more sensitive to mercury than adults and mercury can be passed from a mother's body to the fetus.

**What are the guideline levels in water and food and daily intake?** The drinking water guideline for mercury is 0.001 mg/L. The provisional tolerable weekly intake (pTWI) for methylmercury established by the WHO is 1.6 ug/Kg BW and 4 ug/Kg BW for inorganic mercury.[xx] Health Canada has set guideline levels for methylmercury at 0.47 ug/Kg BW/day for adults and 0.2 ug/Kg BW/day for women of child-bearing age, pregnant women and children.[xxi]

## Arsenic:

**What is it?** Arsenic is a natural element found widely throughout the earth. It can be found in some drinking water, such as from deep wells, and is produced as a by-product from certain mining operations. The main use of metallic arsenic is for strengthening copper and lead alloys (for example, in automotive batteries). Arsenic is commonly found in semiconductor electronic devices. Arsenic and its compounds, especially the trioxide, are used in the production of pesticides, herbicides, insecticides and treated wood products.

**Where is it found?** Arsenic is found everywhere in low levels; including in air, food and water. It can even result in arsenic poisoning in certain areas of the world when ingested in drinking water. It can take on various different forms, some of which are more toxic than others, and is most often used as a preservative in pressure treated wood, and as an active ingredient in some pesticides (such as those used in orchards). Sources of contamination include cigarette smoke and coal burning facilities. Arsenic can travel great distances when in the air and water. Exposure to arsenic is most often from arsenic treated wood, small amounts from food, water and air and living within an area with high natural levels of arsenic in rock.

**What are the major health effects?** Arsenic can irritate the throat and lungs, cause numbness in hands and feet, nausea and vomiting, decreased production of blood cells, skin irritation on contact, loss of movement and in very high levels can cause death. Studies have shown that ingesting certain types of arsenic can increase the risk of skin, liver, bladder and lung cancer.[xxii] Long-term exposure of children may also affect development. Arsenic is considered to cause cancer.

**What are the guideline levels in water and food and daily intake?** Health Canada recommended a maximum acceptable concentration of 0.01 mg/L arsenic in drinking water. Health Canada has no guideline level for non-carcinogenic endpoints. The oral slope factor for arsenic is 1.5 mg/Kg BW/day.

## References for Chemical Fact Sheets


i Health Canada. Canadian Nutrient File, version 2010. http://www.hc-sc.gc.ca/fn-an/nutrition/fiche-nutri-data/index-eng.php

ii Shen H MK, Virtanen HE, Damggard IN, Haavisto AM, Kaleva M, Boisen KA, Schmidt IM, Chellakooty M, Skakkebaek NE, Toppari J, Schramm KW. From mother to child: investigation of prenatal and postnatal exposure to persistent bioaccumulating toxicants using breast milk and placenta biomonitoring. Chemosphere 2007; 67:S256-S62.

iii Aboriginal Affairs and Northern Development Canada. Fish. Northwest Territories Contaminants Fact Sheets. 2004, Available Online: https://www.aadnc-aandc.gc.ca/eng/1100100023393/1100100023401

iv Saldana T, Basso O, Hoppin J, Baird D, Knott C, Blair A, et al. Pesticide exposure and self-reported gestational diabetes mellitus in the Agricultural Health Study. Diabetes Care 2007;30:529-34.

v Anton P, Theodorou V, Bertrand V, Eutamene H, Aussenac T, Feyt N, et al. Chronic ingestion of a potential food contaminant induces gastrointestinal inflammation in rats: role of nitric oxide and mast cells. Dig Dis Sci 2000; 45:1842-49.

vi Health Canada. It's Your Health: PCBs. 2005. Available Online: http://www.hc-sc.gc.ca/hl-vs/alt_formats/pacrb-dgapcr/pdf/iyh-vsv/environ/pcb-bpc-eng.pdf .

vii Carpenter, David. Polychlorinated Biphenyls (PCBs): Routes of Exposure and Effects on Human Health. Reviews on Environmental Health, 2006. 21(1): 1-23

viii Health Canada. It's Your Health: PCBs. 2005. Available Online: http://www.hc-sc.gc.ca/hl-vs/alt_formats/pacrb-dgapcr/pdf/iyh-vsv/environ/pcb-bpc-eng.pdf

ix Health Canada. Federal Contaminated Site Risk Assessment in Canada Part II: Health Canada Toxicological Reference Values (TRVS) and Chemical-Specific Factors, Version 2.0. 2010. Available Online: http://www.hc-sc.gc.ca/ewh-semt/pubs/contamsite/part-partie_ii/index-eng.php

x Agency for Toxic Substances and Disease Registry. Toxic Substances Portal. Polybrominated Biphenyls (PBBs) & Polybrominated Diphenyl Ethers (PBDEs). Available from: http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=900&tid=94.

xi Lorber M, Patterson D, Huwe J, Kahn H. Evaluation of background exposures of Americans to dioxin-like compounds in the 1990s and the 2000s. Chemosphere 2009;77:640-51.

xii Baccarelli A, Mocarelli P, Patterson D, Jr, Bonzini M, Pesatori A, Caporaso N, et al. Immunologic effects of dioxin: new results from Seveso and comparison with other studies. Environ Health Perspective 2002;110:1169-73.

xiii United States Environmental Protection Agency, 2010. Dioxins and Furans Fact Sheet, Available from:http://www.epa.gov/osw/hazard/wastemin/minimize/factshts/dioxfura.pdf

xiv United States Environmental Protection Agency, 2010. Dioxins and Furans Fact Sheet, Available from:http://www.epa.gov/osw/hazard/wastemin/minimize/factshts/dioxfura.pdf

xv Agency for Toxic Substances and Disease Registry ToxFAQs. Polycyclic Aromatic Hydrocarbons. U.S. Department of Health and Human Services. Sep 1996.

xvi Ibid. 1996.

Wisconsin Department of Health Services. 2000. Chemical Fact Sheets: Polycyclic Aromatic Hydrocarbons (PAHs). Available Online: http://www.dhs.wisconsin.gov/eh/chemfs/fs/pah.htm. Accessed 19 Oct, 2010.

xvii United States Environmental Protection Agency (USEPA) Chemical Safety and Pollution Prevention: Perfluorooctanoic Acid (PFOA) and Fluorinated Telomeres, 2010. Available Online: http://www.epa.gov/opptintr/pfoa

xviii Health Canada. Risk Management Strategy for Lead. February 2013.http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/contaminants/prms_lead-psgr_plomb/prms_lead-psgr_plomb-eng.pdf

xx World Health Organization. Safety evaluation of certain contaminants in food. WHO Food Additives Series: 63, FAO JECFA Monographs 8. Geneva, 2011.

xxi Health Canada. 2007. Mercury, Your Health and the Environment. Available Online: http://www.hc-sc.gc.ca/ewh-semt/pubs/contaminants/mercur/index-eng.php

xxii Agency for Toxic Substances & Disease Registry. Arsenic August 2007. Updated Sep 1, 2010. Available Online: http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=19&tid=3. Accessed Nov 2, 2010


# Appendix B. Statistical tools used to obtain weighted estimates at the regional level

1: Non-Response adjustment factor:

For each stratum $h$=1,…,$H$, and each community $i$=1,…,$n_h$, if $r_h$ communities participated in the study out of the $n_h$ selected, then the non-response adjustment factor is given by:

$$WADJ1_{hi} = \begin{cases} \frac{n_h}{r_h}, & \text{for participating communities} \\ 0, & \text{for non-participating communities} \end{cases}$$

2. Bootstrap method for Standard Error

i) Draw a simple random sample of $m_h$=$n_h$-1 communities with replacement from the $n_h$ sampled communities, independently for each stratum $h$=1,…$H$.

ii) Let $m^*_{hi}$ be the number of times the ($hi$)-th sample community is selected ($\sum_i m^*_{hi} = m_h$).

iii) Define the bootstrap weights as

$$w^*_{hijk} = \frac{n_h}{n_h - 1} \times m^*_{hi} \times WFINAL3_{hijk}$$

If the ($hi$)-th community is not selected in the bootstrap sample, $m^*_{hi} = 0$ and then $w^*_{hijk} = 0$.

iv) Do steps i) to iii) $B$=500 times.

For estimating the sampling error, let $\theta$ be the population parameter of interest. Let $\hat{\theta}$ be the full-sample estimate for $\theta$ obtained by using the final weight and let $\hat{\theta}^*_b$, $b$ = 1, ..., 500, be the Bootstrap replicate estimates of the same parameter of interest obtained by using the Bootstrap weights. Then, setting $B$ = 500, the Bootstrap estimate of the sampling error of $\hat{\theta}$ is given by:

$$se_{BOOT}(\hat{\theta}) = \sqrt{\hat{V}_{BOOT}(\hat{\theta})},$$

where $\hat{V}_{BOOT}(\hat{\theta}) = \frac{1}{B}\sum_{b=1}^{B}\left(\hat{\theta}^*_b - \hat{\theta}\right)^2 = 0.002\sum_{b=1}^{500}\left(\hat{\theta}^*_b - \hat{\theta}\right)^2$.

with a CV: $cv(\hat{\theta}) = \frac{se_{BOOT}(\hat{\theta})}{\hat{\theta}} \times 100\%$

# Appendix C. Detection limit tables



## Table C.1 Organochlorine Pesticides

| PARAMETER | DL (ug/g) | PARAMETER | DLs (ug/g) |
|---|---|---|---|
| Chlordane, α- | 0.001 | Chlordane, g- | 0.001 |
| Chlorpyrifos | 0.001 | DDE, p,p'- | 0.0005 |
| DDT, o,p'- | 0.005 | DDT, p,p'- | 0.005 |
| Dicofol | 0.010 | Dieldrin | 0.005 |
| Endosulfan I | 0.010 | Endosulfan II | 0.030 |
| Endosulfan sulfate | 0.010 | Endrin | 0.010 |
| HCB | 0.0003 | HCH, α- | 0.002 |
| HCH, β- | 0.010 | HCH, g- | 0.001 |
| Heptachlor | 0.001 | Heptachlor epoxide (exo) | 0.001 |
| Heptachlor epoxide (endo) | 0.010 | Methoxychlor | 0.020 |
| Oxychlordane | 0.005 | Nonachlor, trans- | 0.001 |
| TDE, p,p'- | 0.0005 | TDE, o,p'- | 0.0005 |
| Mirex | 0.002 | Aldrin | 0.001 |
| Toxaphene parlar 50 | 0.0003 | Toxaphene parlar 26 | 0.0005 |
| Heptachlor epoxide (exo) | 0.001 | DDE, p,p'- | 0.001 |

## Table C.2 Organophosphate Pesticides

| PARAMETER | DLs (ug/g) | PARAMETER | DLs (ug/g) |
|---|---|---|---|
| Azinphos-methyl | 0.020 | Chlorfenvinphos 1 | 0.01 |
| Coumaphos | 0.010 | Diazinon | 0.005 |
| Dimethoate | 0.010 | Disulfoton | 0.005 |
| Ethion | 0.010 | Fensulfothion | 0.030 |
| Fenthion | 0.010 | Fonofos | 0.005 |
| Malathion | 0.010 | Methidathion | 0.030 |
| Methyl parathion | 0.020 | Parathion | 0.020 |
| Phorate | 0.010 | Phorate sulfone | 0.010 |
| Phosalone | 0.010 | Phosmet | 0.010 |
| Terbuphos | 0.010 | Tetrachlorvinphos | 0.005 |
| Chlorfenvinphos 2 | 0.003 | | |

## Table C.3 PCB Congeners

| Congener | DLs | Congener | DLs | Congener | DLs | Congener | DLs | Congener | DLs |
|---|---|---|---|---|---|---|---|---|---|
| 28 | 0.001 | 60 | 0.001 | 118 | 0.0005 | 153 | 0.0003 | 189 | 0.001 |
| 33 | 0.001 | 66 | 0.001 | 128 | 0.0005 | 156 | 0.0005 | 191 | 0.0005 |
| 37 | 0.001 | 74 | 0.001 | 129 | 0.0005 | 157 | 0.0005 | 193 | 0.0005 |
| 40 | 0.001 | 87 | 0.001 | 136 | 0.0005 | 170 | 0.001 | 194 | 0.001 |
| 41 | 0.001 | 90 | 0.001 | 137 | 0.0005 | 180 | 0.0005 | 201 | 0.0005 |
| 44 | 0.001 | 99 | 0.001 | 138 | 0.0005 | 183 | 0.0005 | 203 | 0.0005 |
| 49 | 0.001 | 105 | 0.0005 | 141 | 0.0005 | 185 | 0.0005 | 206 | 0.001 |
| | | | | | | | | 209 | 0.0003 |

## Table C.4a Methylmercury in Food

| ELEMENT | SYMBOL | RLs (ng/g) |
|---|---|---|
| Methylmercury | Me-Hg | 4.0 |

## Table C.4b Metals in Food

| ELEMENT | SYMBOL | DLs (ppm) Based on Dry Weight | DLs (ppm) Based on Wet Weight |
|---|---|---|---|
| Aluminum | Al | 0.5 | 0.1 |
| Arsenic | As | 0.1 | 0.02 |
| Barium | Ba | 0.1 | 0.02 |
| Beryllium | Be | 0.1 | 0.02 |
| Bismuth | Bi | 0.1 | 0.02 |
| Cadmium | Cd | 0.02 | 0.004 |
| Calcium | Ca | 5 | 1 |
| Chromium | Cr | 0.1 | 0.02 |
| Cobalt | Co | 0.1 | 0.02 |
| Copper | Cu | 0.1 | 0.02 |
| Iron | Fe | 5 | 1 |
| Lead | Pb | 0.1 | 0.02 |
| Lanthanum | La | 0.5 | 0.1 |
| Magnesium | Mg | 5 | 1 |

| ELEMENT | SYMBOL | DLs (ppm) Based on Dry Weight | DLs (ppm) Based on Wet Weight |
|---|---|---|---|
| Manganese | Mn | 0.1 | 0.02 |
| Mercury | Hg | 0.01 | 0.002 |
| Molybdenum | Mo | 0.1 | 0.02 |
| Nickel | Ni | 0.1 | 0.02 |
| Phosphorous | P | 15 | 3 |
| Potassium | K | 10 | 2 |
| Selenium | Se | 0.1 | 0.02 |
| Silver | Ag | 0.025 | 0.005 |
| Sodium | Na | 5 | 1 |
| Strontium | Sr | 0.1 | 0.02 |
| Thallium | Tl | 0.01 | 0.002 |
| Tin | Sn | 0.1 | 0.02 |
| Vanadium | V | 0.1 | 0.02 |
| Zinc | Zn | 0.5 | 0.1 |

## Table C.5 Metals in Tap Water

| Element | Symbol | DLs (ppm) |
|---|---|---|
| Aluminum | Al | 0.01 |
| Antimony | Sb | 0.0001 |
| Arsenic | As | 0.0001 |
| Barium | Ba | 0.0002 |
| Boron | B | 0.01 |
| Cadmium | Cd | 0.00001 |
| Calcium | Ca | 0.5 |
| Chromium | Cr | 0.0005 |
| Copper | Cu | 0.001 |
| Iron | Fe | 0.05 |
| Lead | Pb | 0.0001 |
| Magnesium | Mg | 0.05 |
| Manganese | Mn | 0.0005 |
| Mercury (by CVASF) | Hg | 0.00001 |
| Potassium | K | 0.05 |
| Selenium | Se | 0.00005 |
| Sodium | Na | 0.5 |
| Uranium | U | 0.0001 |
| Zinc | Zn | 0.003 |

## Table C.6 PCDDs and PCDFs

| PCDDs | DLs (ng/kg) | PCDDs | DLs (ng/kg) |
|---|---|---|---|
| 1,2,3,7,8-PentaCDD | 0.05 | 1,2,3,4,7,8-HexaCDD | 0.1 |
| 1,2,3,6,7,8-HexaCDD | 0.1 | 1,2,3,7,8,9-HexaCDD | 0.1 |
| 1,2,3,4,6,7,8-HeptaCDD | 0.1 | OctaCDD | 0.3 |
| TCDD | 0.03 | | |

| PCDFs | DLs (ng/kg) | PCDFs | DLs (ng/kg) |
|---|---|---|---|
| 2,3,7,8-TetraCDF | 0.03 | 1,2,3,7,8-PentaCDF | 0.05 |
| 2,3,4,7,8-PentaCDF | 0.05 | 1,2,3,4,7,8-HexaCDF | 0.08 |
| 1,2,3,6,7,8-HexaCDF | 0.08 | 1,2,3,7,8,9-HexaCDF | 0.08 |
| 2,3,4,6,7,8-HexaCDF | 0.08 | 1,2,3,4,6,7,8-HeptaCDF | 0.10 |
| 1,2,3,4,7,8,9-HeptaCDF | 0.10 | OctaCDF | 0.20 |

## Table C.7 PBDEs

| BDE congener | X No of Br. | Structure | DL(ng/kg) |
|---|---|---|---|
| 47 | 4 | 2,2',4,4' | 5 |
| 85 | 5 | 2,2',3,4,4' | 2 |
| 99 | 5 | 2,2',4,4',5 | 5 |
| 100 | 5 | 2,2',4,4',6 | 5 |
| 153 | 6 | 2,2',4,4',5,5' | 2 |
| 154 | 6 | 2,2',4,4',5,6' | 2 |
| 183 | 7 | 2,2',3,4,4',5',6 | 2 |
| 209 | 10 | 2,2',3,3',4,4',5,5',6,6' | 25 |

## Table C.8 PFCs

| PFC | Common Name | DLs (ug/g) |
|---|---|---|
| PFC | Common Name | DLs (ug/g) |
| PFPeA | perfluoropentanoic acid | 0.001 |
| PFHxA | perfluorohexanoic acid | 0.0005 |
| PFHpA | perfluoroheptanoic acid | 0.0005 |
| PFOA | perfluorooctanoic acid | 0.0005 |
| PFNA | perfluorononanoic acid | 0.0005 |
| PFDA | perfluorodecanoic acid | 0.0005 |
| PFUnA | perfluoroundecanoic acid | 0.0005 |
| PFDoA | perfluorododecanoic acid | 0.0005 |
| PFTA | perfluorotridecanoic acid | 0.0005 |
| PFBS | perfluorobutane sulfonate | 0.0005 |
| PFHxS | perfluorohexane sulfonate | 0.0005 |
| PFOS | perfluorooctane sulfonate | 0.0005 |
| PFOSA | perfluorooctane sulfonamide | 0.001 |

## Table C.9 Polycyclic aromatic hydrocarbons (PAHs)

| Polycyclic Aromatic Hydrocarbons | DLs (ug/g) | Polycyclic Aromatic Hydrocarbons | DLs (ug/g) |
|---|---|---|---|
| Naphthalene | 0.001 | Acenaphthylene | 0.001 |
| Acenaphthene | 0.001 | Fluorene | 0.001 |
| Phenanthrene | 0.001 | Anthracene | 0.001 |
| Flouranthene | 0.001 | Pyrene | 0.001 |
| Benz[α]anthracene | 0.001 | Chrysene | 0.001 |
| Benzo[β]fluoranthene | 0.001 | Benzo[k]fluoranthene | 0.001 |
| Benzo[α]pyrene | 0.001 | Benzo[ghi]perylene | 0.001 |
| Dibenz[α,h]anthracene | 0.001 | Indeno[1,2,3-cd] pyrene | 0.001 |

## Table C.10 Pharmaceuticals in Water

| Parameter | DLs (ng/litre) | Parameter | DLs (ng/litre) |
|---|---|---|---|
| Acetaminophen | 10 | Atenolol | 5 |
| Atorvastatin | 5 | Bezafibrate | 1.0 |
| Caffeine | 5 | Carbamazepine | 0.5 |
| Chlortetracycline | 10 | Cimetidine | 2 |
| Ciprofloxacin | 20 | Clarithromycin | 2 |
| Codeine | 5 | Cotinine | 5 |
| Clofibric acid | 1 | Dehydonifedipine | 2 |
| Diclofenac | 15 | Diltiazem | 5 |
| Diphenhydramine | 10 | 17 α-Ethinylestradiol | 0.2 |
| Erythromycin | 10 | Fluoxetine | 5 |
| Furosemide | 5 | Gemfibrozil | 1 |
| Hydrochlorothiazide | 5 | Ibuprofen | 20 |
| Iso-Chlortetracycline | 10 | Indomethacin | 15 |
| Ketoprofen | 2 | Lincomycin | 10 |
| Metformin | 10 | Metoprolol | 5 |
| Monensin | 10 | Naproxen | 5 |
| Oxytetracycline | 10 | Pentoxyfylline | 2 |
| Ranitidine | 10 | Roxithromycin | 5 |
| Sulfamethazine | 5 | Sulfamethoxazole | 2 |
| Tetracycline | 10 | Alpha-Trenbolone | 2 |
| Beta-Trenbolone | 2 | Trimethoprim | 2 |
| Warfarin | 0.5 | | |

# Appendix D. Framework for mixed dishes categorization into food groupings

| Mixed Foods | Grain Products | Vegetables & Fruits | Milk Products | Meat & Alternatives | Serving Size | Examples of mixed foods |
|---|---|---|---|---|---|---|
| 1. Grains and Meat | 1 | | | 1 | 100g | Rice fried with meat, bannock with eggs, plain hamburger |
| 2. Grains and Milk Products | 1 | | 0.5 | | 150g | Cheese pizza, macaroni and cheese, yogurt coated granola bar |
| 3. Grains and Vegetables | 2 | 1 | | | 150g | Raisin bread, pasta salad with vegetables, granola bar with blueberries |
| 4. Grains, Vegetables and Meat | 1 | 1 | | 0.5 | 150g | Egg roll with meat, cabbage rolls, chicken with rice and carrots |
| 5. Grains, Vegetables and Milk Products | 1 | 1 | 0.5 | | 200g | Meatless lasagna, cheese pizza with vegetables, cannelloni with cheese and spinach |
| 6. Grains, Meat and Milk Products | 1 | | 0.5 | 0.5 | 200g | French toast, pepperoni pizza, croissant with egg, cheese, and sausage |
| 7. Vegetables and Meat | | 1 | | 1 | 150g | Baked beans with pork, chili con carne, meat and vegetable stew |
| 8. Vegetables and Milk Products | | 1 | 1 | | 150g | Tzatziki, poutine, mashed potatoes with milk |
| 9. Grains, Vegetables, Meat and Milk Products | 1 | 0.25 | 0.5 | 0.5 | 200g | Spinach quiche, all dressed pizza, lasagna with meat |
| 10. Meat and milk products | | | 1 | 1 | 150g | Eggnog, cheese sausage, cream of chicken soup |
| 11. Vegetables, meat and milk products | | 0.5 | 1 | 0.5 | 200 | Clam chowder, chicken stuffed with vegetables and cheese, salad with egg and cheese |

# Appendix E. Body Mass Index (BMI)

The Body Mass Index (BMI) uses a person's weight (in kilograms) and height (in metres) to calculate his or her risk of developing health problems.

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height (m) x height (m)}}$$

## Categories of BMI and Health Risk

| BMI | Classification | Risk of developing health problems |
|---|---|---|
| < 18.5 | Underweight | Increased |
| 18.5 - 24.9 | Normal Weight | Least |
| 25.0 - 29.9 | Overweight | Increased |
| 30.0 - 34.9 | Obese class I | High |
| 35.0 - 39.9 | Obese class II | Very high |
| >= 40.0 | Obese class III | Extremely high |

Notes: The BMI is not used for pregnant or lactating women. These BMI categories are not used for children less than 18 years of age. For people aged 65 and over, the 'normal weight' classification may range from a BMI of 18.5 to 29.9. Other factors such as lifestyle habits, fitness level and the presence or absence of other health risk conditions need to be taken into consideration to determine an individual's risk. Source: Health Canada. Canadian Guidelines for Body Weight Classification in Adults. Ottawa: Minister of Public Works and Government Services Canada; 2003.

Available from :
http://www.hc-sc.gc.ca/fn-an/nutrition/weights-poids/guide-ld-adult/bmi_chart_java-graph_imc_java-eng.php

### How to calculate your BMI:

**Step 1:** Determine your weight in kilograms.

To convert weight from pounds to kilograms, divide by **2.2**:

$$\frac{\text{weight (pounds)}}{\text{height (m) x height (m)}} = \text{weight (kg)}$$

**Step 2:** Determine your height in metres.

To convert height from feet and inches to metres:

a) Multiply height in feet times **12** to get height in **inches**

b) Add any **additional height** in inches to the value obtained in a)

c) Multiply value in b) times **0.0254** to get height in **metres**

**Step 3:** Take your weight in kilograms (value from Step 1) and divide by your height in metres (value from Step 2) squared.

$$\frac{\text{weight (kg)}}{\text{height (m) x height (m)}} = \text{BMI}$$

**Step 4:** Compare your BMI to the classification chart to determine your health risk.

**Example:** *Let's calculate the BMI of someone who weighs 160 pounds and is 5'8" tall:*

***Step 1:***

To convert from pounds to kilograms, divide by 2.2:

$$\frac{160 \text{ pounds}}{2.2} = 72.7 \text{ kg}$$

***Step 2:***

To convert height from 5'8" to metres:
a) multiply 5 feet x 12 inches per foot= 60 inches
b) 60 + 8 inches= 68 inches
c) 68 x 0.0254= 1.73 metres

So 5 feet 8 inches = 1.73 metres

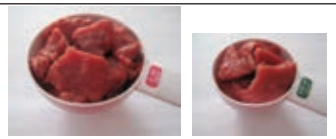
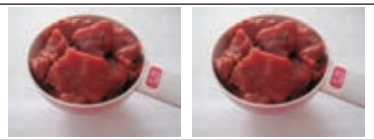
***Step 3:***

$$\frac{72.7 \text{ kg}}{(1.73\text{m} \times 1.73\text{m})} = 24.3$$

***Step 4:***

According to the chart, a BMI of 24.3 falls within 18.5 - 24.9, the normal weight range that has the least risk to developing health problems.

# Appendix F. Conversion of Grams to Usual Household Measures

| Grams | Usual Household Measures | |
|---|---|---|
| 5 grams | 1 teaspoon |  |
| 10 grams | 2 teaspoons |  |
| 15 grams | 1 tablespoon |  |
| 30 grams | 2 tablespoons |  |
| 60 grams | ¼ cup |  |
| 75 grams | ⅓ cup |  |
| 125 grams | ½ cup |  |
| 180 grams | ¾ cup |  |
| 250 grams | 1 cup |  |
| 375 grams | 1 ½ cup |  |
| 500 grams | 2 cups |  |

# Appendix G. Traditional Food Intake by species in grams per day

## a) Estimated average (mean) intake of traditional foods (g/person/day), consumers and non-consumers, based on traditional food frequency results

| Food | Mean grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| All traditional food | 31.49 | 33.56 | 57.55 | 35.43 | 36.85 |
| Moose meat | 7.96 | 6.22 | 15.86 | 6.78 | 8.87 |
| Canada goose | 2.74 | 1.90 | 4.31 | 1.11 | 2.70 |
| Caribou meat | 2.61 | 1.61 | 1.34 | 1.72 | 2.10 |
| Ptarmigan (willow, white-tailed, rock) | 1.60 | 0.82 | 4.40 | 1.21 | 1.89 |
| Blueberry | 1.38 | 2.02 | 2.93 | 1.65 | 1.81 |
| Walleye (yellow pickerel) | 1.40 | 0.83 | 2.29 | 2.19 | 1.50 |
| Lake trout | 1.07 | 0.79 | 1.24 | 3.04 | 1.21 |
| Beaver meat | 1.04 | 0.51 | 2.19 | 1.07 | 1.13 |
| Grouse (spruce, ruffed, partridge) | 0.77 | 0.58 | 2.13 | 1.64 | 1.04 |
| Deer meat | 0.51 | 0.85 | 1.75 | 3.19 | 1.03 |
| Hare or rabbit meat | 0.71 | 0.46 | 1.87 | 1.19 | 0.9 |
| Squash | 0.72 | 1.58 | 0.45 | 0.20 | 0.81 |
| Beans | 0.62 | 1.08 | 0.43 | 0.76 | 0.70 |
| Sturgeon | 0.23 | 0.94 | 1.83 | 0.21 | 0.66 |
| Black bear meat | 0.54 | 0.35 | 1.59 | 0.14 | 0.65 |
| Corn/hominy | 0.55 | 1.09 | 0.57 | 0.35 | 0.65 |
| Black bear fat | 0.46 | 0.30 | 1.15 | 0.01 | 0.50 |
| Brook trout | 0.20 | 0.47 | 0.54 | 1.34 | 0.42 |
| Moose liver | 0.66 | 0.15 | 0.23 | 0.03 | 0.42 |

| Food | Mean grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| Scoter | 0.02 | 0.02 | 2.32 | 0.02 | 0.42 |
| Moose kidney | 0.67 | 0.08 | 0.12 | 0.02 | 0.39 |
| Raspberry | 0.38 | 0.56 | 0.11 | 0.42 | 0.38 |
| Goose grease | 0.27 | 0.16 | 1.14 | 0 | 0.38 |
| Maple syrup | 0.27 | 0.60 | 0.33 | 0.34 | 0.36 |
| Chicken egg | 0.43 | 0.31 | 0.10 | 0 | 0.31 |
| Wild strawberry | 0.21 | 0.56 | 0.10 | 0.09 | 0.26 |
| Whitefish (lake, round) | 0.11 | 0.71 | 0.11 | 0.21 | 0.25 |
| Fiddleheads | 0.13 | 0.68 | 0.12 | 0.15 | 0.25 |
| Long-tailed duck | 0.03 | 0 | 1.28 | 0 | 0.24 |
| Northern pike/ jackfish | 0.09 | 0.32 | 0.34 | 0.40 | 0.21 |
| Sauger | 0.12 | 0.18 | 0.40 | 0.16 | 0.19 |
| Atlantic salmon | 0.12 | 0.30 | 0.28 | 0.11 | 0.18 |
| Mallard | 0.07 | 0.10 | 0.69 | 0.02 | 0.18 |
| Other berries, fruit (wild apples, wild pears, bunchberry) | 0.28 | 0.02 | 0.06 | 0.21 | 0.18 |
| Porcupine meat | 0.14 | 0.16 | 0.17 | 0.21 | 0.16 |
| Labrador tea | 0.17 | 0.18 | 0.18 | 0.06 | 0.16 |
| Lobster | 0.12 | 0.22 | 0.13 | 0.19 | 0.15 |
| Blackberry, large | 0.12 | 0.29 | 0.01 | 0.19 | 0.14 |
| Other cultivated traditional food (pole bean, beet, turnip) | 0.09 | 0.28 | 0.05 | 0.07 | 0.12 |

## a) Estimated average (mean) intake of traditional foods (g/person/day), consumers and non-consumers, based on traditional food frequency results

| Food | Mean grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| Wild leeks | 0.03 | 0.41 | 0.01 | 0.09 | 0.11 |
| Rainbow trout | 0.09 | 0.17 | 0.04 | 0.11 | 0.10 |
| Cisco | 0.13 | 0.12 | 0.01 | 0.07 | 0.10 |
| Shrimp | 0.11 | 0.17 | 0.03 | 0.06 | 0.10 |
| Other wild bird (black guillemot/sea pigeon, quail, chicken, seagull, swan) | 0.01 | 0.43 | 0.02 | 0.03 | 0.10 |
| Mint | 0.10 | 0.21 | 0.02 | 0 | 0.10 |
| Cloudberries (bakeapple) | 0.05 | 0.10 | 0.20 | 0.08 | 0.09 |
| Yellow perch | 0.03 | 0.14 | 0.03 | 0.19 | 0.07 |
| Snow goose (blue goose) | 0.09 | 0.06 | 0.06 | 0.01 | 0.07 |
| Cranberry, mountain | 0.03 | 0.10 | 0.05 | 0.34 | 0.07 |
| Stinging nettle | 0 | 0.18 | 0 | 0.35 | 0.07 |
| Other mushrooms (chaga, puffball) | 0.06 | 0.19 | 0 | 0 | 0.07 |
| Cod | 0.02 | 0.08 | 0.13 | 0.14 | 0.06 |
| Scallops | 0.06 | 0.07 | 0.02 | 0.1 | 0.06 |
| Black raspberry | 0.01 | 0.19 | 0.09 | 0.02 | 0.06 |
| Bullhead (catfish) | 0.02 | 0.04 | 0.02 | 0.28 | 0.05 |
| Haddock | 0.04 | 0.06 | 0.12 | 0.01 | 0.05 |
| Crab | 0.05 | 0.05 | 0.03 | 0.04 | 0.05 |

| Food | Mean grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| American black duck | 0.01 | 0.02 | 0.17 | 0.16 | 0.05 |
| Elderberry | 0.08 | 0.04 | 0 | 0 | 0.05 |
| Wild grapes | 0.01 | 0.18 | 0 | 0.02 | 0.05 |
| Wild ginger root | 0.01 | 0.20 | 0 | 0 | 0.05 |
| Cedar tea | 0.09 | 0.02 | 0.01 | 0.01 | 0.05 |
| Brown trout | 0 | 0.15 | 0.04 | 0 | 0.04 |
| Arctic char | 0.05 | 0.05 | 0.01 | 0 | 0.04 |
| Rainbow smelt | 0.02 | 0.07 | 0.02 | 0.09 | 0.04 |
| Sucker | 0 | 0.08 | 0.01 | 0.26 | 0.04 |
| Mussels | 0.04 | 0.06 | 0.01 | 0.03 | 0.04 |
| Caribou liver | 0.05 | 0 | 0 | 0.12 | 0.04 |
| Dandelions | 0.02 | 0.09 | 0.02 | 0.06 | 0.04 |
| Yarrow | 0 | 0.17 | 0 | 0 | 0.04 |
| Herring | 0.01 | 0.02 | 0.01 | 0.23 | 0.03 |
| Smallmouth bass | 0.02 | 0.01 | 0.03 | 0.17 | 0.03 |
| Channel catfish | 0.01 | 0.03 | 0.02 | 0.18 | 0.03 |
| Atlantic halibut | 0.01 | 0.03 | 0.12 | 0.01 | 0.03 |
| Caribou kidney | 0 | 0 | 0.10 | 0.14 | 0.03 |
| Northern pintail | 0.01 | 0.10 | 0.04 | 0 | 0.03 |
| Golden eye | 0.02 | 0 | 0.07 | 0 | 0.03 |
| Cranberry, bog | 0.02 | 0.07 | 0 | 0.01 | 0.03 |
| Thimbleberries | 0.01 | 0.03 | 0.11 | 0 | 0.03 |

### a) Estimated average (mean) intake of traditional foods (g/person/day), consumers and non-consumers, based on traditional food frequency results

| Food | Mean grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| Other wild plants (rhubarb, bear root tea, cow vetch and sweet clover, fennel, horsetail tea, lavender, red clover, wild carrot, red willow) | 0.03 | 0.02 | 0 | 0.16 | 0.03 |
| Hazelnuts | 0.02 | 0.04 | 0.02 | 0.06 | 0.03 |
| Land-locked Atlantic salmon | 0 | 0.04 | 0.04 | 0 | 0.02 |
| Mooneye | 0 | 0 | 0 | 0.22 | 0.02 |
| White perch/bass | 0.02 | 0.03 | 0 | 0.01 | 0.02 |
| Striped bass | 0.01 | 0 | 0 | 0.19 | 0.02 |
| Bluefin tuna | 0.02 | 0.07 | 0 | 0 | 0.02 |
| Soft clam | 0.02 | 0.04 | 0.01 | 0 | 0.02 |
| Deer liver | 0.04 | 0 | 0.01 | 0.01 | 0.02 |
| Muskrat meat | 0.01 | 0.05 | 0.01 | 0.01 | 0.02 |
| Canvasback | 0 | 0 | 0.08 | 0 | 0.02 |
| American wigeon | 0.01 | 0.01 | 0.11 | 0 | 0.02 |
| Northern shoveler | 0.01 | 0.06 | 0 | 0 | 0.02 |
| Merganser | 0 | 0 | 0.06 | 0.15 | 0.02 |
| Crowberry | 0.02 | 0.03 | 0 | 0 | 0.02 |
| Wild rice | 0 | 0.04 | 0.04 | 0.07 | 0.02 |
| Wild onion/chives | 0.01 | 0.05 | 0 | 0.01 | 0.02 |
| Acorns | 0 | 0.09 | 0 | 0 | 0.02 |
| Largemouth bass | 0.01 | 0 | 0.01 | 0.01 | 0.01 |
| Pickerel (chain) | 0.01 | 0.01 | 0 | 0 | 0.01 |

| Food | Mean grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| Sole/American plaice | 0.01 | 0.03 | 0 | 0 | 0.01 |
| Quahog clam | 0.01 | 0 | 0 | 0.02 | 0.01 |
| Oysters | 0.01 | 0.01 | 0 | 0 | 0.01 |
| Seal meat | 0.01 | 0 | 0 | 0 | 0.01 |
| Wood duck | 0 | 0.01 | 0.01 | 0 | 0.01 |
| Ruddy duck | 0 | 0.01 | 0.04 | 0 | 0.01 |
| Teal | 0.01 | 0.02 | 0.01 | 0.01 | 0.01 |
| Eider | 0 | 0.02 | 0.01 | 0.07 | 0.01 |
| Loon | 0 | 0 | 0.02 | 0 | 0.01 |
| Wild turkey | 0.01 | 0 | 0.01 | 0.01 | 0.01 |
| Black huckleberry | 0.01 | 0 | 0 | 0 | 0.01 |
| Highbush cranberry | 0.01 | 0.01 | 0 | 0 | 0.01 |
| Trailing raspberry | 0 | 0.01 | 0 | 0.01 | 0.01 |
| Rosehips | 0 | 0.06 | 0 | 0 | 0.01 |
| Plum | 0.01 | 0.01 | 0 | 0.03 | 0.01 |
| Crabapple | 0.01 | 0.01 | 0.01 | 0 | 0.01 |
| Sumac | 0.02 | 0 | 0 | 0 | 0.01 |
| Lamb's quarters | 0.01 | 0 | 0 | 0 | 0.01 |
| Sunflower seeds | 0.01 | 0.03 | 0.01 | 0 | 0.01 |
| Wintergreen leaves (teaberry) | 0 | 0.01 | 0.01 | 0 | 0.01 |
| Rat root (wihkes, sweet flag) | 0 | 0.04 | 0 | 0 | 0.01 |
| Pitcher plant (turtle socks) | 0.01 | 0.02 | 0.01 | 0 | 0.01 |

## a) Estimated average (mean) intake of traditional foods (g/person/day), consumers and non-consumers, based on traditional food frequency results

| Food | Mean grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| Tamarack bark tea | 0 | 0 | 0.04 | 0 | 0.01 |
| Other tree foods (fir needle tea, maple sap, willow sap, maple water, raw hemlock leaves) | 0 | 0.02 | 0 | 0.06 | 0.01 |
| Other bird egg (duck, goose) | 0.01 | 0.01 | 0.01 | 0 | 0.01 |
| Cherry | 0 | 0 | 0 | 0.04 | 0 |
| Other land mammals (caribou heart) | 0 | 0 | 0 | 0.03 | 0 |
| Harlequin Duck | 0 | 0 | 0.02 | 0 | 0 |
| Black walnut | 0 | 0.02 | 0 | 0 | 0 |
| Squid | 0 | 0.02 | 0 | 0 | 0 |
| Scaup | 0 | 0 | 0.02 | 0 | 0 |
| Eider egg | 0 | 0 | 0 | 0.02 | 0 |
| Herring gull egg | 0 | 0 | 0 | 0.02 | 0 |
| Seagull egg | 0 | 0.01 | 0 | 0.02 | 0 |
| Arctic tern egg | 0 | 0 | 0 | 0.02 | 0 |
| Coho salmon | 0 | 0 | 0.01 | 0 | 0 |
| Capelin | 0 | 0 | 0 | 0.01 | 0 |

| Food | Mean grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| Burbot (ling) | 0 | 0.01 | 0 | 0 | 0 |
| Carp | 0 | 0.01 | 0 | 0 | 0 |
| Mackerel | 0 | 0.01 | 0 | 0 | 0 |
| Seal fat | 0.01 | 0 | 0 | 0 | 0 |
| Other seafood (bar clams, beluga whale, crayfish, frogs) | 0.01 | 0 | 0 | 0 | 0 |
| Deer kidney | 0 | 0.01 | 0 | 0 | 0 |
| Squirrel meat | 0 | 0 | 0 | 0.01 | 0 |
| Bufflehead | 0.01 | 0 | 0 | 0 | 0 |
| Pheasant (ring-necked) | 0 | 0 | 0.01 | 0 | 0 |
| Kinnickinnick (bearberry) | 0 | 0.01 | 0 | 0 | 0 |
| Groundnut | 0 | 0.01 | 0 | 0 | 0 |
| Jerusalem artichoke | 0 | 0 | 0.01 | 0 | 0 |
| Ginseng | 0 | 0 | 0.01 | 0 | 0 |
| Birch twig tea | 0 | 0 | 0.01 | 0 | 0 |
| Alder tea | 0 | 0 | 0.01 | 0 | 0 |

## b) Estimated high consumption (95th percentile rate) of traditional foods (g/person/day), consumers and non-consumers, based on traditional food frequency results

| Food | 95th percentile grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| All traditional food | 106.53 | 132.17 | 138.57 | 120.68 | 112.82 |
| Moose meat | 24.9 | 17.92 | 54.9 | 36.33 | 36.6 |
| Caribou meat | 16.34 | 6.31 | 8.69 | 7.45 | 14.01 |
| Canada goose | 11.99 | 8.22 | 13.7 | 6.16 | 12.33 |
| Lake trout | 11.62 | 3.78 | 8.71 | 15.97 | 11.62 |
| Ptarmigan (willow, white-tailed, rock) | 6.85 | 4.79 | 15.75 | 4.79 | 10.27 |
| Grouse (spruce, ruffed, partridge) | 4.11 | 3.77 | 7.53 | 12.33 | 7.53 |
| Walleye (yellow pickerel) | 6.1 | 3.48 | 8.71 | 14.52 | 6.39 |
| Blueberry | 5.75 | 6.9 | 7.86 | 5.75 | 5.75 |
| Beaver meat | 3.89 | 2.1 | 5.49 | 4.66 | 4.67 |
| Moose liver | 4.08 | 0.34 | 1.02 | 0.17 | 4.08 |
| Beans | 2.63 | 7.01 | 0.88 | 4.38 | 3.95 |
| Hare or rabbit meat | 2.72 | 2.99 | 6.86 | 7.45 | 3.89 |
| Goose grease | 0.94 | 0.59 | 4.71 | 0 | 3.77 |
| Sturgeon | 1.74 | 5.23 | 9.0 | 1.45 | 3.48 |
| Black bear fat | 2.95 | 1.41 | 3.53 | 0.12 | 3.3 |
| Black bear meat | 2.33 | 2.09 | 7.32 | 0.47 | 3.2 |
| Brook trout | 0.87 | 1.74 | 2.32 | 5.52 | 2.9 |
| Corn/hominy | 1.32 | 10.52 | 1.75 | 1.75 | 2.63 |
| Deer meat | 1.17 | 5.38 | 4.58 | 6.52 | 2.33 |
| Squash | 0.88 | 5.26 | 0.88 | 1.75 | 2.19 |
| Sauger | 0.58 | 1.74 | 1.74 | 0 | 1.74 |

| Food | 95th percentile grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| Maple syrup | 1.58 | 6.31 | 0.53 | 2.63 | 1.58 |
| Raspberry | 2.3 | 2.49 | 0.77 | 1.15 | 1.53 |
| Northern pike/ jackfish | 0.29 | 1.74 | 1.16 | 2.9 | 1.45 |
| Scoter | 0 | 0 | 16.1 | 0 | 1.03 |
| Mallard | 0.68 | 0.34 | 3.42 | 0.34 | 1.03 |
| Moose kidney | 4.08 | 0.51 | 0.34 | 0.17 | 1.02 |
| Fiddleheads | 0.44 | 1.75 | 0 | 1.32 | 0.88 |
| Atlantic salmon | 0.58 | 1.16 | 0.29 | 0.87 | 0.87 |
| Whitefish (lake, round) | 0.87 | 2.9 | 0 | 1.45 | 0.87 |
| Wild strawberry | 0.58 | 1.92 | 0.38 | 0.77 | 0.77 |
| Lobster | 0.58 | 0.87 | 0.29 | 1.16 | 0.58 |
| Labrador tea | 0.55 | 0.99 | 0.55 | 0.41 | 0.55 |
| Porcupine meat | 0.39 | 0.6 | 0.46 | 1.4 | 0.47 |
| Cranberry, mountain | 0 | 0.77 | 0 | 1.92 | 0.38 |
| Long-tailed duck | 0 | 0 | 10.27 | 0 | 0.34 |
| Rainbow trout | 0 | 1.74 | 0 | 0.29 | 0.29 |
| Blackberry, large | 0.38 | 1.15 | 0 | 0.19 | 0.19 |
| Cloudberries (bakeapple) | 0.19 | 0.77 | 0 | 0.58 | 0.19 |
| Cedar tea | 0.33 | 0.16 | 0.08 | 0.03 | 0.16 |
| Striped bass | 0 | 0 | 0 | 3.48 | 0 |
| Caribou kidney | 0 | 0 | 0.68 | 2.04 | 0 |
| Caribou liver | 0 | 0 | 0 | 2.04 | 0 |
| Northern pintail | 0 | 1.37 | 0.34 | 0 | 0 |
| Canvasback | 0 | 0 | 0.68 | 0 | 0 |

## b) Estimated high consumption (95th percentile rate) of traditional foods (g/person/day), consumers and non-consumers, based on traditional food frequency results

| Food | 95th percentile grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| American wigeon | 0 | 0 | 0.68 | 0 | 0 |
| American black duck | 0 | 0 | 0.68 | 0 | 0 |
| Scallops | 0 | 0 | 0 | 0.58 | 0 |
| Thimbleberries | 0 | 0 | 0.58 | 0 | 0 |
| Other land mammals (caribou heart) | 0 | 0 | 0 | 0.47 | 0 |
| Ruddy duck | 0 | 0 | 0.34 | 0 | 0 |
| Golden eye | 0 | 0 | 0.34 | 0 | 0 |
| Merganser | 0 | 0 | 0.34 | 0 | 0 |
| Snow goose (blue goose) | 0 | 0 | 0.34 | 0 | 0 |
| Tamarack bark tea | 0 | 0 | 0.22 | 0 | 0.05 |

| Food | 95th percentile grams/ person/ day | | | | |
|---|---|---|---|---|---|
| | Women | | Men | | First Nations in Quebec (n=573) |
| | Age 19-50 (n=269) | Age 51+ (n=151) | Age 19-50 (n=87) | Age 51+ (n=66) | |
| Brown trout | 0 | 0 | 0.29 | 0 | 0 |
| Arctic char | 0 | 0.29 | 0 | 0 | 0 |
| Yellow perch | 0 | 0 | 0 | 0.29 | 0 |
| Sucker | 0 | 0.29 | 0 | 0 | 0 |
| Cod | 0 | 0.29 | 0 | 0 | 0 |
| Crab | 0 | 0 | 0 | 0.29 | 0 |
| Shrimp | 0 | 0.29 | 0 | 0 | 0 |
| Black raspberry | 0 | 0.19 | 0 | 0 | 0 |
| Birch twig tea | 0 | 0 | 0.05 | 0 | 0 |
| Alder tea | 0 | 0 | 0.05 | 0 | 0 |

# Appendix H. Types of fruits and vegetables consumed from personal or community gardens in First Nations communities in Quebec

| Types of fruits and vegetables eaten from gardens | Percent of all fruits and vegetables reported (n=1050 responses) |
|---|---|
| Tomatoes | 16.67 |
| Cucumbers | 13.05 |
| Beans (snap/string/bush/runner/pole) | 8.76 |
| Peppers (sweet/hot) | 8.48 |
| Carrots | 5.33 |
| Zucchini/Summer Squash | 5.33 |
| Lettuce | 4.76 |
| Onions (green, yellow, spanish, red, shallots) | 4.38 |
| Potatoes | 4.19 |
| Winter Squash (pumpkin, butternut, spaghetti) | 4.00 |
| Berries (raspberries, strawberries, blueberries, blackberries, currants) | 3.14 |
| Peas (sweet, snap, snow peas) | 1.62 |
| Radish | 1.52 |
| Corn | 1.43 |
| Turnips | 1.43 |
| Apples | 1.14 |
| Garlic | 1.14 |
| Cabbage | 1.05 |
| Rhubarb | 1.05 |
| Melons (cantaloupe, watermelon) | 0.96 |
| Beets | 0.86 |
| Basil | 0.76 |
| Broccoli | 0.76 |
| Cherries (black cherries, Chinese cherry, ground cherries) | 0.76 |
| Eggplant | 0.76 |

| Types of fruits and vegetables eaten from gardens | Percent of all fruits and vegetables reported (n=1050 responses) |
|---|---|
| Celery | 0.57 |
| Kale | 0.57 |
| Parsley | 0.48 |
| Oregano | 0.38 |
| Spinach | 0.38 |
| Swiss Chard | 0.38 |
| Thyme | 0.38 |
| Mint | 0.29 |
| Plums | 0.29 |
| Rosemary | 0.29 |
| Asparagus | 0.19 |
| Cauliflower | 0.19 |
| Cilantro | 0.19 |
| Kidney Beans | 0.19 |
| Lavender | 0.19 |
| Leek | 0.19 |
| Sage | 0.19 |
| Tobacco | 0.19 |
| Brussel Sprouts | 0.1 |
| Camomile | 0.1 |
| Fennel | 0.1 |
| Grapes | 0.1 |
| Lemon Balm | 0.1 |
| Parsnips | 0.1 |
| Pears | 0.1 |
| Rutabaga | 0.1 |
| Sorrel | 0.1 |

# Appendix I.

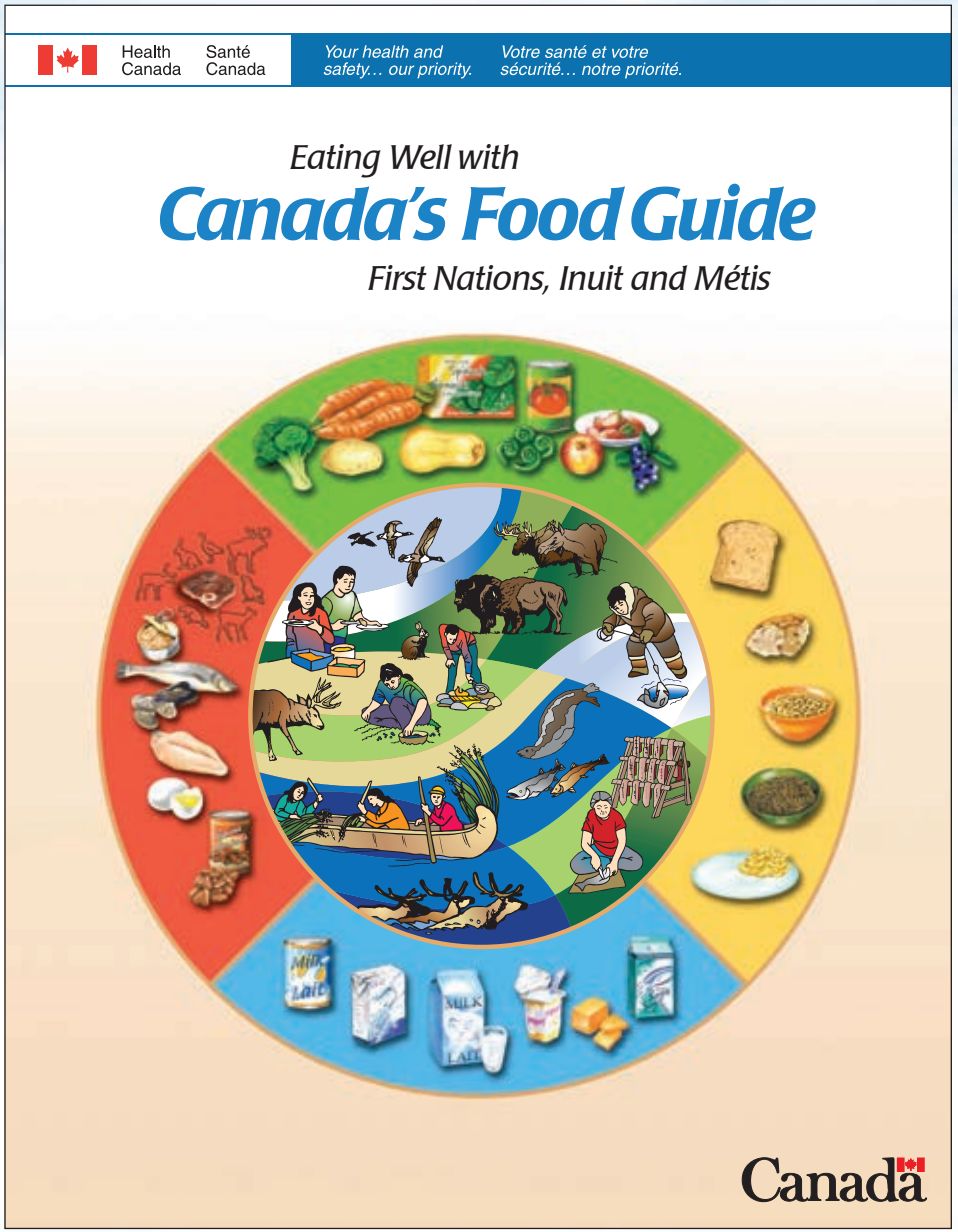
## Eating Well with Canada's Food Guide First Nations, Inuit and Métis

VEGETABLES AND FRUIT

GRAIN PRODUCTS

MILK AND ALTERNATIVES

MEAT AND ALTERNATIVES



## How to use Canada's Food Guide

The Food Guide shows how many servings to choose from each food group every day and how much food makes a serving.

1. Find your age and sex group in the chart below.
2. Follow down the column to the number of servings you need for each of the four food groups every day.
3. Look at the examples of the amount of food that counts as one serving. For instance, 125 mL (1/2 cup) of carrots is one serving in the Vegetables and Fruit food group.

## What is one Food Guide Serving?

Look at the examples below.

## Eating Well Every Day

Canada's Food Guide describes healthy eating for Canadians two years of age or older.

Choosing the amount and type of food recommended in Canada's Food Guide will help:

- children and teens grow and thrive
- meet your needs for vitamins, minerals and other nutrients
- lower your risk of obesity, type 2 diabetes, heart disease, certain types of cancer and osteoporosis (weak and brittle bones).

| | Recommended Number of Food Guide Servings per day | | | |
|---|---|---|---|---|
| | Children 2–3 years old | Children 4–13 years old | Teens and Adults (Females) | Teens and Adults (Males) |
| **Vegetables and Fruit** Fresh, frozen and canned. | 4 | 5–6 | 7–8 | 7–10 |
| **Grain Products** | 3 | 4–6 | 6–7 | 7–8 |
| **Milk and Alternatives** | 2 | 2–4 | Teens 3–4<br>Adults (19–50 years) 2<br>Adults (51+ years) 3 | Teens 3–4<br>Adults (19–50 years) 2<br>Adults (51+ years) 3 |
| **Meat and Alternatives** | 1 | 1–2 | 2 | 3 |

**Eat at least one dark green and one orange vegetable each day. Choose vegetables and fruit prepared with little or no added fat, sugar or salt. Have vegetables and fruit more often than juice.**

Dark green and orange vegetables 125 mL (1/2 cup) · Other vegetables 125 mL (1/2 cup) · Leafy vegetables and wild plants cooked 125 mL (1/2 cup) raw 250 mL (1 cup) · Berries 125 mL (1/2 cup) · Fruit 1 fruit or 125 mL (1/2 cup) · 100% Juice 125 mL (1/2 cup)

**Make at least half of your grain products whole grain each day. Choose grain products that are lower in fat, sugar or salt.**

Bread 1 slice (35 g) · Bannock 35 g (2" x 2" x 1") · Cold cereal 30 g (see food package) · Hot cereal 175 mL (3/4 cup) · Cooked pasta 125 mL (1/2 cup) · Cooked rice White, brown, wild 125 mL (1/2 cup)

**Drink 500 mL (2 cups) of skim, 1% or 2% milk each day. Select lower fat milk alternatives. Drink fortified soy beverages if you do not drink milk.**

Milk Powdered milk, mixed 250 mL (1 cup) · Fortified soy beverage 250 mL (1 cup) · Canned milk (evaporated) 125 mL (1/2 cup) · Yogurt 175 g (3/4 cup) · Cheese 50 g (1 1/2 oz.)

**Have meat alternatives such as beans, lentils and tofu often. Eat at least two Food Guide Servings of fish each week.* Select lean meat and alternatives prepared with little or no added fat or salt.**

Traditional meats and wild game 75 g cooked (2 1/2 oz)/125 mL (1/2 cup) · Fish and shellfish 75 g cooked (2 1/2 oz)/125 mL (1/2 cup) · Lean meat and poultry 75 g cooked (2 1/2 oz)/125 mL (1/2 cup) · Eggs 2 eggs · Beans – cooked 175 mL (3/4 cup) · Peanut butter 30 mL (2 Tbsp)

### When cooking or adding fat to food:

- Most of the time, use vegetable oils with unsaturated fats. These include canola, olive and soybean oils.
- Aim for a small amount (2 to 3 tablespoons or about 30-45 mL) each day. This amount includes oil used for cooking, salad dressings, margarine and mayonnaise.
- Traditional fats that are liquid at room temperature, such as seal and whale oil, or ooligan grease, also contain unsaturated fats. They can be used as all or part of the 2-3 tablespoons of unsaturated fats recommended per day.
- Choose soft margarines that are low in saturated and trans fats.
- Limit butter, hard margarine, lard, shortening and bacon fat.

*Health Canada provides advice for limiting exposure to mercury from certain types of fish. Refer to www.healthcanada.gc.ca for the latest information. Consult local, provincial or territorial governments for information about eating locally caught fish.

## Respect your body... Your choices matter

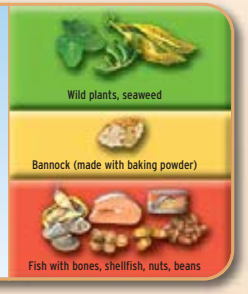
Following Canada's Food Guide and limiting foods and drinks which contain a lot of calories, fat, sugar or salt are important ways to respect your body. Examples of foods and drinks to limit are:

- pop
- fruit flavoured drinks
- sweet drinks made from crystals
- sports and energy drinks
- candy and chocolate
- cakes, pastries, doughnuts and muffins
- granola bars and cookies
- ice cream and frozen desserts
- potato chips
- nachos and other salty snacks
- french fries
- alcohol

## People who do not eat or drink milk products must plan carefully to make sure they get enough nutrients.

The traditional foods pictured here are examples of how people got, and continue to get, nutrients found in milk products. Since traditional foods are not eaten as much as in the past, people may not get these nutrients in the amounts needed for health.

People who do not eat or drink milk products need more individual advice from a health care provider.




## Women of childbearing age

All women who could become pregnant, and pregnant and breastfeeding women, need a multivitamin with **folic acid** every day. Pregnant women should make sure that their multivitamin also contains **iron**. A health care provider can help you find the multivitamin that is right for you.

When pregnant and breastfeeding, women need to eat a little more. They should include an extra 2 to 3 Food Guide Servings from any of the food groups each day.

For example:

- have dry meat or fish and a small piece of bannock for a snack, or
- have an extra slice of toast at breakfast and an extra piece of cheese at lunch.

## Women and men over the age of 50

The need for **vitamin D** increases after the age of 50.

In addition to following Canada's Food Guide, men and women over the age of 50 should take a daily vitamin D supplement of 10 µg (400 IU).

## For strong body, mind and spirit, be active every day.

This guide is based on *Eating Well with Canada's Food Guide*.

For more information, interactive tools or additional copies visit Canada's Food Guide at: **www.healthcanada.gc.ca/foodguide**

or contact: Publications • Health Canada • Ottawa, Ontario K1A 0K9 • E-Mail: publications@hc-sc.gc.ca • Tel.: 1-866-225-0709 • TTY: 1-800-267-1245 • Fax: (613) 941-5366

Également disponible en français sous le titre : Bien manger avec le Guide alimentaire canadien – Premières Nations, Inuit et Métis

This publication can be made available on request on diskette, large print, audio-cassette and braille.

 HC Pub.: 3426 Cat.: H34-159/2007E ISBN: 0662-44562-7

# Appendix J. List of common foods and beverages avoided because of intolerance

| Foods avoided | Percentage calculated from 249 food intolerances reported by 171 adults | As a percentage of all adults (n=573) |
|---|---|---|
| Milk and dairy products | 27.3 | 7.9 |
| Vegetables (includes onion, pepper, broccoli, cabbage, cauliflower, garlic, corn, lettuce, red pepper, potato, salad, turnip) | 8.0 | 2.3 |
| Spices and spicy foods | 7.6 | 2.2 |
| Greasy/fried food | 7.2 | 2.1 |
| Fruits (includes avocado, applesauce, banana, kiwi, orange, pineapple, raisin, raspberry) | 6.8 | 2.0 |
| Caffeine (coffee/tea) | 4.0 | 1.2 |
| Fish/shellfish | 4.0 | 1.2 |
| Gluten/wheat | 4.0 | 1.2 |
| Meat | 3.6 | 1.0 |
| Fast food/junk food | 3.2 | 0.9 |
| Oil/fat | 2.8 | 0.8 |
| Processed meat | 2.8 | 0.8 |
| Chocolate | 2.4 | 0.7 |

| Foods avoided | Percentage calculated from 249 food intolerances reported by 171 adults | As a percentage of all adults (n=573) |
|---|---|---|
| Tomatoes/ tomato sauce | 2.4 | 0.7 |
| Beans/nuts | 2.0 | 0.6 |
| Soft drinks | 2.0 | 0.6 |
| Sugar/sweets | 1.6 | 0.5 |
| Eggs | 1.2 | 0.3 |
| Tap water/ well water | 1.2 | 0.3 |
| Italian food | 0.8 | 0.2 |
| Acidic foods | 0.8 | 0.2 |
| Canned foods | 0.8 | 0.2 |
| Gravy | 0.8 | 0.2 |
| Oats/oatmeal | 0.8 | 0.2 |
| Bannock | 0.4 | 0.1 |
| Bee products | 0.4 | 0.1 |
| High fibre foods | 0.4 | 0.1 |
| Sodium | 0.4 | 0.1 |

# Appendix K. Store-bought food intake (g/person/day)

| Total Diet Study food code* | Food Description | First Nations in Quebec (n=573) Grams/person/day |
|---|---|---|
| PP10 | Water, natural, spring, bottled | 563.4 |
| K03 | Coffee | 417.3 |
| PP08 | Tap Water, Kitchen | 247.2 |
| K04 | Soft drinks | 228.3 |
| K05 | Tea | 166.8 |
| KFNFNES08 | Fruit flavoured drinks | 100.8 |
| A02 | Milk, 2% | 55.2 |
| N02 | French fries | 54.0 |
| F01 | Bread, white | 52.9 |
| C01 | Eggs | 50.6 |
| F16 | Pasta, plain | 42.7 |
| C02 | Poultry, chicken and turkey | 34.5 |
| N01 | Pizza | 31.7 |
| G19 | Potatoes, boiled without skins | 29.9 |
| F19 | Rice | 28.9 |
| FNFNES2 | Mixed meat dishes | 28.1 |
| F07 | Cereals, oatmeal | 26.7 |
| E01 | Soups, meats, canned | 26.2 |
| EFNFNES06 | Soups, homemade | 24.9 |
| E04 | Soups, dehydrated | 24.7 |
| KFNFNES10 | Energy/sports drinks | 20.3 |
| H08 | Citrus juice, frozen | 19.6 |
| FNFNES9 | Other beverages (smoothies, sweetened vitamin water, iced tea) | 19.5 |
| H09 | Citrus juice, canned | 17.0 |
| F15 | Pasta, mixed dishes | 17.0 |
| A06 | Cream | 16.4 |
| E03 | Soups, tomato, canned | 15.7 |
| B03 | Beef, ground | 15.7 |

| Total Diet Study food code* | Food Description | First Nations in Quebec (n=573) Grams/person/day |
|---|---|---|
| FFNFNES22 | Bannock | 15.4 |
| N05 | Chicken burger | 15.3 |
| G24 | Tomatoes, canned and sauce | 13.9 |
| F02 | Bread, whole wheat | 13.9 |
| H07 | Citrus fruits | 13.5 |
| FNFNES12 | Mixed vegetarian dishes | 13.2 |
| EFNFNES05 | Soups, vegetable, canned, not creamed | 12.6 |
| H04 | Bananas | 12.2 |
| A08 | Yogourt | 11.4 |
| H03 | Apple, raw | 11.4 |
| G06 | Carrots | 11.0 |
| IFNFNES05 | Gravy | 10.6 |
| J08 | Sugar, white/brown | 10.3 |
| B11 | Wiener, sausage | 9.8 |
| H01 | Apple juice, canned/frozen | 9.3 |
| B04 | Pork, fresh | 9.3 |
| F04 | Cake | 9.0 |
| A07 | Ice cream | 9.0 |
| A09 | Cheese | 8.6 |
| NFNFNES10 | Sandwich/subs | 8.5 |
| G20 | Potatoes, chips (plain, salted) | 8.3 |
| N03 | Hamburger | 7.7 |
| G17 | Potatoes, baked with skin | 7.3 |
| F14 | Pancakes | 6.5 |
| N08 | Egg breakfast on a bun, bagel, muffin or croissant | 6.5 |
| A11 | Cheese, processed | 6.4 |
| PP11 | Water, natural, mineral | 6.4 |

| Total Diet Study food code* | Food Description | First Nations in Quebec (n=573) Grams/person/day |
|---|---|---|
| F13 | Muffins | 6.2 |
| G01 | Baked beans, canned | 6.0 |
| F20 | Buns and rolls | 6.0 |
| A01 | Milk, whole | 5.8 |
| G11 | Lettuce | 5.6 |
| G23 | Tomatoes (raw and broiled) | 5.6 |
| FNFNES11 | Mixed poultry dishes | 5.3 |
| I02 | Margarine | 5.1 |
| G04 | Broccoli | 5.1 |
| B05 | Pork, cured | 5.1 |
| FNFNES6 | Other fruits (blackberry, fruit salad, lemon, pomegranate, raw pinapple, olives) | 5.0 |
| PP01 | Condiments | 4.7 |
| B08 | Cold cuts and luncheon meats | 4.7 |
| G09 | Corn | 4.6 |
| G08 | Celery | 4.6 |
| J01 | Chocolate bar | 4.5 |
| F09 | Cookies | 4.4 |
| A03 | Milk, 1% | 4.1 |
| F17 | Pie, apple | 4.1 |
| F11 | Danish and donuts | 3.9 |
| F08 | Cereals, wheat and bran | 3.9 |
| G13 | Onions | 3.9 |
| FNFNES13 | Protein supplement (powders and drinks) | 3.8 |
| H12 | Melons | 3.5 |
| FFNFNES26 | Bagels | 3.5 |
| HHFNFNES23 | Other fruit juice (lemon, pomegranate, grape, cranberry, mixed fruit) | 3.4 |
| FNFNES4 | Other vegetables (bean sprouts, chives, cilantro, eggplant, mixed frozen vegetables, fennel, garlic) | 3.3 |
| IFNFNES06 | Dairy substitutes (non-dairy creamer, coffee whitener and dessert toppings) | 3.2 |
| SFNFNES01 | Corn/tortilla chips | 3.2 |
| B01 | Beef, steak | 3.1 |
| G15 | Peppers | 3.0 |
| H10 | Grape juice, bottled | 2.8 |
| F06 | Cereals, corn | 2.7 |
| H11 | Grapes | 2.6 |
| I01 | Cooking fats and salad oils | 2.5 |
| J06 | Peanut butter and peanuts | 2.5 |
| F10 | Crackers | 2.5 |
| H02 | Apple sauce | 2.4 |
| H14 | Pears | 2.1 |
| A12 | Butter | 2.1 |
| J03 | Gelatin dessert | 1.9 |
| B02 | Beef, roast | 1.8 |
| G10 | Cucumbers and dill pickles | 1.8 |
| H19 | Strawberries | 1.8 |
| J09 | Syrup | 1.6 |
| B09 | Lunch meat, canned | 1.5 |
| G22 | Tomato juice, canned | 1.4 |
| D04 | Shellfish, fresh or frozen | 1.4 |
| FFNFNES29 | Tortilla/taco | 1.3 |
| M01 | Popcorn | 1.3 |
| II04 | Mayonnaise | 1.3 |

| Total Diet Study food code* | Food Description | First Nations in Quebec (n=573) Grams/person/day |
|---|---|---|
| FNFNES3 | Other cereal products (plain dumplings, arrowroot flour, hominy, wheat germ, lemon square, puff pastry, rice krispie squares, tempura batter) | 1.3 |
| D03 | Fish, canned (tuna, salmon) | 1.3 |
| H05 | Blueberries | 1.2 |
| G02 | Beans, string | 1.2 |
| G12 | Mushrooms | 1.2 |
| J05 | Jams | 1.2 |
| A04 | Milk, skim | 1.1 |
| GFNFNES29 | Squash, winter | 1.1 |
| AFNFNES18 | Milkshake | 1.1 |
| AFNFNES13 | Cream sauce | 1.1 |
| D01 | Fish, marine (sole, salmon, haddock, cod) | 1.1 |
| F18 | Pie, other | 1.0 |
| G07 | Cauliflower | 0.9 |
| AFNFNES16 | Cream cheese | 0.9 |
| G21 | Rutabagas or turnip | 0.8 |
| J04 | Honey | 0.8 |
| AFNFNES14 | Almond milk beverage | 0.8 |
| JJ12 | Nuts | 0.8 |
| FFNFNES25 | Granola bars (includes protein bars) | 0.8 |
| HHFNFNES24 | Clementine | 0.8 |
| KFNFNES11 | Hot chocolate | 0.7 |
| FF21 | Bread, other | 0.7 |
| J02 | Candy | 0.6 |
| G05 | Cabbage | 0.6 |
| HH20 | Kiwi | 0.6 |
| H18 | Raspberries | 0.6 |
| H13 | Peaches | 0.6 |

| Total Diet Study food code* | Food Description | First Nations in Quebec (n=573) Grams/person/day |
|---|---|---|
| M05 | Frozen Entrees (oven/microwave) | 0.5 |
| A05 | Evaporated milk | 0.5 |
| A10 | Cheese, cottage | 0.5 |
| FFNFNES24 | Cereals, rice | 0.5 |
| JFNFNES19 | Popsicles | 0.5 |
| HHFNFNES22 | Avocado | 0.5 |
| HHFNFNES26 | Mango | 0.5 |
| G14 | Peas | 0.5 |
| H15 | Pineapple, canned | 0.5 |
| NFNFNES11 | Onion rings | 0.4 |
| N04 | Fish burger | 0.4 |
| J07 | Puddings | 0.4 |
| FFNFNES23 | Pita bread | 0.3 |
| GG22 | Spinach | 0.3 |
| N06 | Hot dog | 0.3 |
| JFNFNES16 | Artificial sweetener | 0.3 |
| J10 | Seeds, shelled | 0.2 |
| G18 | Potatoes, boiled with skins | 0.2 |
| FNFNES1 | Mixed dairy products | 0.2 |
| PP07 | Soya sauce | 0.2 |
| F05 | Cereals, cooked, wheat | 0.2 |
| GG24 | Brussel sprouts | 0.2 |
| GFNFNES30 | Sweet potato | 0.2 |
| JFNFNES15 | Frosting | 0.2 |
| EE03 | Soups, broth, canned | 0.2 |
| E02 | Soups, creamed vegetable, canned | 0.2 |
| FNFNES10 | Other fast foods (burritos, nachos, tacos) | 0.1 |
| NFNFNES09 | Sausage breakfast on a bun, bagel, muffin or croissant | 0.1 |
| B06 | Veal | 0.1 |

| Total Diet Study food code* | Food Description | First Nations in Quebec (n=573) Grams/person/day |
|---|---|---|
| F03 | Bread, rye | 0.1 |
| H16 | Plums, prunes | 0.1 |
| G03 | Beets | 0.1 |
| JFNFNES17 | Molasses | 0.1 |
| FFNFNES27 | Couscous | 0.1 |
| PP02 | Salt | 0.1 |
| GG23 | Asparagus | 0.1 |
| JFNFNES18 | Sweet toppings | 0.1 |
| GFNFNES25 | Kale | 0.1 |
| CC03 | Poultry, liver/paté | 0.05 |
| F12 | Flour, wheat | 0.04 |
| AFNFNES19 | Milk, condensed | 0.03 |
| PP06 | Herbs and spices | 0.03 |
| FNFNES5 | Other salty snacks (crackers and cheese, pretzels, trail mix, vegetable chips) | 0.03 |
| GFNFNES28 | Zucchini | 0.02 |
| GFNFNES27 | Radish | 0.02 |
| B07 | Lamb | 0.01 |
| H06 | Cherries | 0.01 |
| H17 | Raisins | 0.01 |
| B10 | Organ Meats | 0.001 |
| PPFNFNES | Baking soda | 0.001 |

* foods that did not fall into the Total Diet Study codes (Dabeka and Cao 2013) were assigned FNFNES codes in order to group them for the purpose of these analyses.

[1] Mixed meat dishes = meat plus vegetables, grains, or dairy products

[2] Mixed poultry dishes= poultry plus vegetables, grains, or dairy products

[3] Mixed vegetarian dishes= salads, vegetarian dishes

[4] Mixed dairy products= dairy plus fruits or grains

Note: alcohol was excluded from these analyses

# Appendix L. List of supplements taken by First Nations in Quebec

| Types of supplements reported to be taken | % of all types of supplements reported (n=249) |
|---|---|
| Multivitamin/mineral supplement | 17.12 |
| Vitamin D | 14.89 |
| Prenatal supplement | 13.99 |
| Vitamin B (6, 12, complex) | 8.62 |
| Omega/fish oil | 7.64 |
| Vitamin C | 7.44 |
| Calcium | 6.68 |
| Protein supplement | 3.5 |
| Iron | 3.25 |
| Magnesium | 2.52 |
| Calcium plus vit D +/or Mg | 1.62 |
| Probiotic supplement | 1.58 |
| Weight loss supplement | 1.37 |
| Cranberry supplement | 1.36 |
| Amino acid supplement | 1.34 |
| Kelp | 1.11 |

| Types of supplements reported to be taken | % of all types of supplements reported (n=249) |
|---|---|
| Vitamin A | 0.82 |
| Echinacea | 0.68 |
| Folic acid | 0.61 |
| Glucosamine | 0.57 |
| Vitamin E | 0.45 |
| Eye vitamin/mineral supplement | 0.44 |
| Garlic | 0.36 |
| Amberen (menopause) | 0.34 |
| Anti-anxiety supplement | 0.34 |
| Coenzyme Q10 | 0.27 |
| Fibre | 0.27 |
| Zinc | 0.27 |
| Ginseng | 0.19 |
| Turmeric | 0.19 |
| Veggie green | 0.1 |
| Melatonin | 0.06 |

# Appendix M. Average costs of nutritious food basket items in grocery stores near participating First Nations communities and in Montreal

| Food Item | Purchase Unit | Across Quebec (n=10 stores) | Taiga Shield (n=2 stores) | Hudson Plains (n=1 store) | Boreal Shield (n=3 stores) | Mixedwood Plains (n=2 stores) | Atlantic Maritime (n=2 stores) | Montreal (n=2 stores) |
|---|---|---|---|---|---|---|---|---|
| | Price per purchase unit in CDN dollars | | | | | | | |
| **Milk & Milk Alternatives** | | | | | | | | |
| Milk, partly skimmed, 2% M.F. | 4 L | 7.67 | 9.34 | 8.99 | 7.99 | 6.33 | 6.19 | 6.20 |
| Cheese, processed food, cheddar, slices | 500 GM | 6.25 | 8.54 | 9.21 | 6.18 | 4.43 | 4.39 | 3.96 |
| Cheese, mozzarella, partially skim (16.5% M.F.) | 200 GM | 4.17 | 5.91 | 4.66 | 4.24 | 2.83 | 3.40 | 2.33 |
| Cheese, cheddar | 200 GM | 3.92 | 5.65 | 4.66 | 3.54 | 2.93 | 3.40 | 2.33 |
| Yogourt, fruit bottom, 1% to 2% M.F. | 750 GM | 4.77 | 5.53 | 6.29 | 5.77 | 3.53 | 2.99 | 3.26 |
| **Eggs** | | | | | | | | |
| Grade A large eggs | dozen | 3.22 | 4.44 | 3.29 | 3.42 | 2.91 | 1.97 | 2.98 |
| **Meat, Poultry And Legumes** | | | | | | | | |
| Chicken, legs | 1 KG | 7.17 | 5.99 | 9.10 | 8.45 | 7.12 | 5.50 | 6.94 |
| Ham, sliced, regular (approximately 11% fat) | 175 GM | 4.61 | 6.55 | 4.32 | 3.22 | 5.64 | 3.89 | 4.49 |
| Beef, hip, inside (top) round roast | 1 KG | 16.41 | 15.79 | 19.99 | 16.89 | 18.96 | 11.99 | 16.19 |
| Beef, hip, inside (top) round steak | 1 KG | 24.17 | 43.72 | 22.39 | 15.16 | 20.29 | 22.94 | 22.68 |
| Beef, ground, lean | 1 KG | 13.76 | 16.71 | 14.61 | 14.06 | 10.51 | 13.21 | 12.72 |
| Beans, baked, canned in tomato sauce | 398 ML | 1.55 | 2.23 | 2.59 | 1.56 | 0.89 | 1.00 | 0.79 |
| Peanuts, dry roasted | 700 GM | 6.24 | 6.54 | 3.00 | 7.37 | 7.30 | 4.79 | 6.81 |
| Lentils, dry | 454 GM | 1.84 | 1.80 | 1.80 | 2.03 | 2.05 | 1.40 | 1.92 |
| Peanut butter, smooth type, fat, sugar and salt added | 500 GM | 4.24 | 4.45 | 4.79 | 4.08 | 4.24 | 4.00 | 3.49 |
| Pork, loin, centre chop, bone-in | 1 KG | 12.72 | 16.40 | 11.49 | 12.06 | 12.72 | 10.67 | 10.46 |
| **Fish** | | | | | | | | |
| Tuna, light, canned in water | 170 GM | 1.90 | 2.61 | 2.69 | 2.04 | 1.16 | 1.32 | 1.14 |
| Fish (sole, haddock, pollock, halibut), frozen | 400 GM | 6.50 | 5.66 | 9.24 | 8.26 | 5.70 | 4.11 | 3.67 |
| Salmon, chum (keta), canned | 213 GM | 2.81 | 3.05 | 4.25 | 2.88 | 2.49 | 2.10 | 2.00 |

| Food Item | Purchase Unit | Across Quebec (n=10 stores) | Taiga Shield (n=2 stores) | Hudson Plains (n=1 store) | Boreal Shield (n=3 stores) | Mixedwood Plains (n=2 stores) | Atlantic Maritime (n=2 stores) | Montreal (n=2 stores) |
|---|---|---|---|---|---|---|---|---|
| | Price per purchase unit in CDN dollars | | | | | | | |
| **Orange Vegetables & Fruit** | | | | | | | | |
| Peach, canned halves or slices, juice pack | 398 ML | 2.64 | 3.25 | 4.69 | 2.46 | 2.17 | 1.75 | 1.52 |
| Melon, cantaloupe, raw | 1 KG | 3.45 | 4.79 | 6.87 | 2.48 | 2.01 | 3.28 | 2.34 |
| Sweet potato, raw | 1 KG | 6.10 | 13.55 | 6.45 | 4.26 | 3.51 | 3.84 | 3.26 |
| Carrot, raw | 1 KG | 1.45 | 1.38 | 2.20 | 1.45 | 1.32 | 1.28 | 1.20 |
| **Dark Green Vegetables** | | | | | | | | |
| Beans, snap (Italian, green or yellow), frozen | 1 KG | 4.68 | 5.17 | 4.66 | 4.43 | 4.85 | 4.41 | 3.06 |
| Lettuce, cos or romaine | 1 KG | 3.51 | 3.23 | 5.10 | 3.61 | 2.63 | 3.71 | 2.96 |
| Vegetables, mixed, frozen | 1 KG | 3.96 | 4.30 | 6.39 | 3.98 | 3.23 | 3.11 | 2.51 |
| Broccoli, raw | 1 KG | 4.00 | 4.67 | 4.92 | 4.25 | 2.85 | 3.63 | 3.62 |
| Peas, green, frozen | 1 KG | 4.06 | 4.67 | 6.39 | 3.98 | 3.04 | 3.45 | 2.51 |
| Pepper, sweet, green, raw | 1 KG | 4.71 | 7.00 | 6.59 | 4.47 | 3.29 | 3.29 | 3.84 |
| **Other Vegetables & Fruit** | | | | | | | | |
| Apple, raw | 1 KG | 3.45 | 2.88 | 5.00 | 3.67 | 2.74 | 3.64 | 2.19 |
| Banana, raw | 1 KG | 2.11 | 3.05 | 2.15 | 2.04 | 1.63 | 1.72 | 1.50 |
| Grape, red or green, raw | 1 KG | 7.77 | 7.65 | 8.80 | 8.70 | 6.04 | 7.70 | 4.37 |
| Oranges, all commercial varieties, raw | 1 KG | 4.83 | 4.11 | 4.40 | 7.23 | 3.21 | 3.81 | 2.44 |
| Orange juice, frozen concentrate | 355 ML | 2.72 | 4.38 | 2.27 | 2.80 | 2.01 | 1.88 | 1.93 |
| Pear, raw | 1 KG | 4.64 | 4.87 | 4.98 | 5.36 | 3.07 | 4.72 | 3.70 |
| Raisin, seedless (sultana) | 750 GM | 7.48 | 8.73 | 12.38 | 6.12 | 7.05 | 6.24 | 7.39 |
| Strawberry, frozen, unsweetened | 600 GM | 5.86 | 7.04 | 7.49 | 6.03 | 4.99 | 4.50 | 5.00 |
| Apple juice, canned or bottled, added vitamin C | 1.36 L | 2.54 | 3.21 | 4.50 | 2.70 | 1.65 | 1.56 | 1.51 |
| Potato, white, raw | 4.54 KG | 6.33 | 7.15 | 12.56 | 5.48 | 4.99 | 4.99 | 2.99 |
| Corn, canned vacuum packed | 341 ML | 1.47 | 1.94 | 2.39 | 1.42 | 1.00 | 1.07 | 0.90 |
| Rutabaga (turnip), raw | 1 KG | 2.33 | 1.70 | 5.49 | 1.90 | 2.18 | 2.18 | 2.16 |
| Cabbage, raw | 1 KG | 1.74 | 1.61 | 2.89 | 1.45 | 1.96 | 1.52 | 1.28 |
| Cucumber, raw | 1 KG | 5.47 | 6.27 | 12.79 | 5.88 | 2.47 | 3.38 | 3.80 |

| Food Item | Purchase Unit | Across Quebec (n=10 stores) | Taiga Shield (n=2 stores) | Hudson Plains (n=1 store) | Boreal Shield (n=3 stores) | Mixedwood Plains (n=2 stores) | Atlantic Maritime (n=2 stores) | Montreal (n=2 stores) |
|---|---|---|---|---|---|---|---|---|
| | Price per purchase unit in CDN dollars | | | | | | | |
| Celery, raw | 1 KG | 3.56 | 4.85 | 10.11 | 2.67 | 1.85 | 2.07 | 2.03 |
| Lettuce, iceberg | 1 KG | 3.39 | 3.68 | 5.29 | 3.10 | 2.99 | 3.00 | 2.29 |
| Mushroom, raw | 1 KG | 11.16 | 11.12 | 19.16 | 10.24 | 9.43 | 10.31 | 8.28 |
| Onion, raw | 1 KG | 2.09 | 3.34 | 3.25 | 1.37 | 1.32 | 2.08 | 1.20 |
| Tomato, red, raw | 1 KG | 5.53 | 6.92 | 8.99 | 4.83 | 4.39 | 4.60 | 3.81 |
| Tomato, canned, whole | 796 ML | 2.09 | 1.93 | 5.09 | 2.42 | 1.09 | 1.25 | 1.00 |
| Vegetable juice cocktail | 1.89 L | 4.08 | 4.22 | 7.49 | 4.79 | 2.99 | 2.24 | 2.89 |
| **Whole Grain Products** | | | | | | | | |
| Cereal, bran flakes with raisins | 775 GM | 7.74 | 12.56 | 10.15 | 6.62 | 6.32 | 4.81 | 5.58 |
| Cereal, oats, quick cooking | 1 KG | 3.82 | 4.79 | 5.75 | 3.88 | 3.16 | 2.48 | 2.81 |
| Cereal, toasted oat Os | 525 GM | 6.17 | 7.64 | 12.19 | 5.49 | 4.99 | 3.88 | 4.38 |
| Bread, pita, whole-wheat | 284 GM | 1.96 | 1.80 | 2.34 | 1.84 | 2.55 | 1.53 | 1.48 |
| Bread, whole wheat | 675 GM | 3.51 | 4.78 | 3.65 | 3.45 | 3.49 | 2.25 | 2.52 |
| Grains, wheat flour, whole-grain | 2.5 KG | 6.12 | 5.54 | 6.09 | 8.52 | 4.24 | 4.99 | 3.96 |
| **Non Whole Grain Products** | | | | | | | | |
| Cookie, plain (arrowroot, social tea) | 350 GM | 3.75 | 5.59 | 5.99 | 2.90 | 3.54 | 2.31 | 3.09 |
| Roll, hamburger | 350 GM | 2.04 | 2.00 | 2.33 | 1.97 | 2.70 | 1.38 | 2.53 |
| Cracker, saltine, unsalted top | 450 GM | 5.17 | 6.64 | 6.49 | 6.00 | 3.49 | 3.49 | 2.47 |
| Bread, white | 675 GM | 2.89 | 3.02 | 3.65 | 2.59 | 3.49 | 2.25 | 2.86 |
| Pasta, spaghetti, enriched | 900 GM | 3.09 | 2.43 | 8.65 | 3.39 | 2.25 | 1.35 | 1.50 |
| Grains, wheat flour, white, enriched, all purpose | 2.5 KG | 5.67 | 8.49 | 7.59 | 5.26 | 4.24 | 3.96 | 3.96 |
| Rice, white, long-grain, parboiled | 900 GM | 3.73 | 3.03 | 4.69 | 4.60 | 2.37 | 4.00 | 2.37 |
| **Fats And Oils** | | | | | | | | |
| Vegetable oil, canola | 1.89 L | 8.66 | 13.67 | 10.97 | 8.84 | 6.64 | 4.24 | 5.60 |
| Salad dressing, mayonnaise type | 475 ML | 3.81 | 4.71 | 5.31 | 4.10 | 2.96 | 2.58 | 2.13 |
| Salad dressing, Italian, regular | 950 ML | 6.43 | 9.47 | 10.50 | 6.48 | 4.48 | 3.24 | 3.22 |
| Margarine, tub, non-hydrogenated | 907 GM | 5.87 | 8.83 | 8.09 | 5.96 | 4.14 | 3.38 | 3.39 |

# Appendix N. Participants' comments about traditional food

"Everyone is happy with traditional food."

"Easy to get, more natural, better for health, you know what you are eating, physical activity, get fresh air."

"Beneficial knowing what we're eating, save money, healthier eating habit due to fresh veggies."

"Traditional food tastes 100 times better than store-bought food."

"Full of protein, it's organic, nopreservatives or hormones, it's fresh."

"Food is fresh, coming from the local environment, better for you, tastes better."

"Keeps you healthy, prevents diabetes."

"For food security and food soveriegnty, appreciate culture more."

"Healthy and bonding with family."

"Healthy, good for you, it's a need in my lifestyle, it's part of our culture."

"People need to eat more traditional foods."

"Healthier food (no GMOs, no growth hormones, more natural", better for health, costs less."

"Traditional food is part of our culture and life."

"Teaching where food comes from and teaching how to die."

"It gives us a sense of where your food comes from."

"Our immune and digestive systems are already used to these foods and way of eating."

"Fresher, no preservatives, healthier, maintains our culture, leisure time, more accessible."

"A sense of responsibility to provide for family."

"Our culture, our way of life, part of our tradition."

"Keep you linked to your culture."

"Food is natural, no processing and rich in vitamins."

"Our immune and digestive systems are already used to these foods and way of eating."

"Shared with families, used in everyday meals and fun activity."

"Healthy food source and reduces cost of buying food at grocery store."

"Social activity - meeting other people, passing on culture to others."

"Brings you back to tradition, encourages you to eat better."

"I think it's important to find ways to encourage use of our traditional food such as food exchange programs, community gardens."

"Don't get hungry 10 hours after eating wild geese, caribou, and fish. Feel full all day."

"My generation is healthy because we grew up on it. We never got sick."

"I wish they could sell tradional food at the store. A place where people would drop off tradtional food and we pick it up."

Experience of cooking and eating traditional food, carrying on the tradition."

"More traditional, physical activity, take in fresh air, good way to keep our traditions alive."

# Appendix O. Healthy Food Guidelines for First Nations Communities[8]

Food is part of celebration, ceremony, social functions, learning functions and is one of our best ways to bring people together. With many occasions to offer and share food, we have plenty of opportunity to promote healthy choices by ensuring that healthy foods are available almost all of the time.

Serving healthy foods in communities means having healthy food selections at all community activities that include food such as: community programs, gatherings, meetings and special events as well as at daycares and schools and even as part of fundraising events. Serving healthy foods starts with the types of food offered as well as the amount of food offered.

The following table of foods was based on the Guidelines for Food and Beverage Sales in British Columbia Schools and further adapted from a document created by the First Nations Health Council in BC. It has been modified for this report to assist communities in the promotion of healthy food choices at community events. The table is broken into Food Categories based on nutrition criteria that assess the calories and amount of sugar, fat and salt (sodium) in these foods. The first category, 'Leave off the Table', contains foods that are generally high in fat and sugar and/or salt. The second category, 'Better on the Table', includes foods that may be low in fat or salt (sodium) but do not meet all of the criteria of foods that fit within the third category, 'Great on the Table Anytime'.

In order to promote healthy eating, we encourage communities to make and serve the types of foods listed under **'Sometimes on the Table'** and **'Great on the Table Anytime'** as often as possible. Foods listed under **'Leave off the Table'** should be offered as little as possible or only at special occasions.

[8]Adapted with permission from First Nations Health Authority. Healthy Food Guidelines for First Nations Communities. 2nd edition, 2014. The updated 2nd edition is available through First Nations Health Authority http://www.fnha.ca/ in their Wellness and healthy living section.

| Food Category | Leave off the Table | Sometimes on the Table | Great on the Table Anytime |
|---|---|---|---|
| **Grains** | | | |
| Grains must be the first or second ingredient (not counting water) Grain ingredients may include:<br>- rice, pot barley, corn, amaranth, millet, oats, buckwheat, bulgar, quinoa, etc<br>- flours made from wheat, rye, rice, potato, soy, millet, etc.<br>-flours that are made into:<br>Breads, pasta, etc.<br>  | • Flavoured or Instant rice<br>• Fried bread, White bread, White buns, English muffins<br>• Baked goods and pastries (ex. Commercial muffins with a diameter more than 2 inches, cakes, cookies, danishes, croissant, cinnamon buns)<br>• High fat crackers<br>• Commercial or home-made pasta salads made with lots of dressing<br>• Instant noodles (packages, cup) with seasoning mix<br>• Microwave popcorn and fried snack foods e.g. Potato, tortilla chips<br>• Commercial cereals high in sugar<br>• Instant, flavoured oatmeal | • Parboiled/converted rice, white rice, mix of brown and white rice<br>• Baked bannock, enriched breads, buns, bagels, tortillas, English muffins, pancakes, whole wheat fried bread (canola oil), etc<br>• Lower fat baked goods that are small in size (2-inch muffins, mini loaves<br>• Low-fat crackers (no trans fat)<br>• Pasta salads made with low fat dressing<br>• Other rice noodles<br>• Trans-fat free, low-fat baked grain and corn snacks (baked tortilla chips, popcorn)<br>• Whole grain cereals (limited sugar, fat content) | • Brown rice, wild rice<br>• Whole grain baked bannock, breads, buns, bagels, tortillas, English muffins, pancakes, etc<br>• Some small baked lower fat items with whole grains, fibre, fruit or nuts, such as loaves, muffins<br>• Low-fat whole grain crackers<br>• Most whole grain pastas<br>• Whole grain pasta salads made with low fat dressing and plenty of vegetables<br>• Brown rice noodles<br>• Whole grain and corn snacks (cereal mix, tortilla chips, hot air popcorn with no butter)<br>• Whole oatmeal or granola (homemade with fruits, sweetened with juices, baked) |
| Note: Foods high in starches and sugars (natural or added) can remain stuck on teeth and put dental health at risk. Grain food choices of concern are sugary cereals, granola and granola bars, crackers, cookies and chips (corn, wheat, rice, etc). The Canadian Dental Association suggests eating these clingy foods only at mealtimes and not as a snack. | | | |

| Food Category | Leave off the Table | Sometimes on the Table | Great on the Table Anytime |
|---|---|---|---|
| **Vegetables & Fruit** | | | |
| A vegetable or fruit or fruit puree must be the first or second ingredient, not counting water<br><br>(Juice and concentrated fruit juice does not count as a fruit ingredient for this food group – see "Vegetables and Fruit Juices)<br><br>  | • Raw, canned or cooked fresh/frozen fruits and vegetables served with buttery, creamy or overly sweet sauces (ex. Fruit in heavy syrup, canned vegetables with sodium > 300 mg/serving)<br>• Fruit with a sugar based coating (e.g., yogurt- or chocolate- covered raisins)<br>• Dried fruit (e.g., fruit roll-ups/leathers/ chips) or fruit juice snacks (e.g., gummies)<br>• Regular potato/vegetable chips<br>• Coated/breaded and deep-fried vegetables (e.g., French-fried potatoes, onion rings)<br>• High salt (sodium) pickles (see Condiments) | • Raw, canned or cooked fresh/frozen fruits and vegetables (including wild greens and berries) that are cooked or prepared with low salt, low-fat sauces (e.g. low-fat milk-based) or meet Better on the Table Criteria (ex. Fruit in light syrup, low sodium canned vegetables)<br>• Some sweetened baked fruit slices<br>• Dried fruit (fruit main ingredient), small portions, see health note below<br>• Low-salt, baked potato/vegetable chips<br>• Low salt (sodium) pickles | • Raw, canned (or sodium < 150 mg/ serving) or cooked fresh/frozen berries, fruit and vegetables (including wild greens and berries) that are served plain or with the minimum amount of dressing/ serving recommended in the Condiment Section<br>• Indian ice-cream<br>• Homemade salsa with fresh tomatoes or canned diced tomatoes and minimal salt |
| Note: Foods high in sugars and starches (natural or added) can leave particles clinging to teeth and put dental health at risk. Vegetable/fruit choices of concern include fruit leathers, dried fruit, and chips (potato or other). | | | |

| Food Category | Leave off the Table | Sometimes on the Table | Great on the Table Anytime |
|---|---|---|---|
| **Vegetable & Fruit Juices** | | | |
| A vegetable or fruit juice or puree must be the first ingredient (not counting water):<br>- may be diluted with water or carbonated water<br>- may have added food ingredients, e.g. Fruit pulp, fruit puree<br>- may not be fortified with vitamins other than Vitamin C, or with minerals other than calcium.<br>  | • All fruit juices of any kind including those containing 100% fruit juice, “drinks”, “blends”, “cocktails”, “splashes”, “punches” and “beverages” (if sweetened with added sugars)<br>• Most regular tomato and vegetable juices<br>• Juice crystals<br>• Fruit smoothies made with juice<br>• Slushy drinks and frozen treats (e.g., frozen fruit juice bars) with added sugars (note that concentrated fruit juice is considered an added sugar when it is not preceded by water in the ingredient list)<br>• Juice drinks with added caffeine, guarana or yerba | • Some lower-sodium tomato and vegetable juices<br>• Fruit smoothies made with soy or cow’s milk | • Soapberry or other natural berry juices with water but no added sugar |
| Note: 100% juice and other fruit-flavoured drinks contain sugars and acids (natural or added) that dissolve tooth enamel when sipped frequently. To avoid prolonged exposure to these sugars and acids, choose plain water over fruit juice. | | | |

| Food Category | Leave off the Table | Sometimes on the Table | Great on the Table Anytime |
|---|---|---|---|
| **Milk-based and Calcium Containing Foods** | | | |
| Milk must be the first ingredient;<br>Cream is NOT considered a milk ingredient<br>  | • Candy flavoured ice creams, sundaes and many frozen yogurts<br>• Frozen 'yogurt' not based on milk ingredients (see "Candies, Chocolates, etc" food grouping)<br>• Most ice milks, ice creams, and frozen novelties<br>• Some puddings/custards<br>• Some higher fat cheeses<br>• Most cream cheese and light cream cheeses and spreads (see condiment section)<br>• Most processed cheese slices and spreads made without milk<br>• Whole fat cottage cheese | • Small portions of some ice milks and frozen yogurts – simply flavoured<br>• Small portions of sherbet<br>• Puddings/custards made with low fat milk and limited added sugar<br>• Pudding/custards/ice milk bars with artificial sweeteners (not for children)<br>• Most flavoured yogurts<br>• Yogurt with artificial sweeteners<br>• Processed cheese slices made with milk<br>• 1-2% milk fat cottage cheese | • Canned salmon with bones<br>• Some flavoured yogurts (lower sugar and fat)<br>• Plain yogurt (low-fat)<br>• Most regular and reduced fat or light cheeses, cheese strings (unprocessed)<br>• Low-sodium cottage cheese (1% milk fat.) |
| **Milk & Calcium Containing Beverages** | | | |
| Milk must be the<br>first ingredient. Cream is NOT considered a milk ingredient.<br>Fortified soy drinks contain<br>protein and calcium and are included in this food grouping.<br>  | • Most candy flavoured milks<br>• Most eggnogs<br>• Most hot chocolate mixes made with water (see also "Other Beverages")<br>• Smoothies made with Leave off the Community Table ingredients<br>• Some blended sweetened regular and decaf coffee drinks<br>• Powdered coffee whitener<br>• Flavoured, creams and coffee whiteners | • Most basic flavoured milks and fortified soy drinks<br>• Yogurt drinks<br>• Some eggnogs if lower in sugar and fat<br>• Most hot chocolates made with milk<br>• Smoothies made with Sometimes on the Community Table ingredients<br>• Whole, 2% milk, soy milk or canned milk for coffee | • Plain, unflavoured fortified soy and rice drinks<br>• Skim, 1% and 2% milk<br>• Some hot chocolates made with milk and very little added sugar<br>• Smoothies made with ingredients from the "Great on the Table Anytime" list<br>• Decaffeinated, unsweetened tea/coffee latté |
| Note: Whole milk (3.25%) is best for children under 2 years of age. Lower fat milks are suitable for children older than 2 years of age. Individuals who do not eat or drink milk products should seek advice from a health care provider. | | | |

| Food Category | Leave off the Table | Sometimes on the Table | Great on the Table Anytime |
|---|---|---|---|
| **Meat & Alternatives** | | | |
| A meat or meat alternative must be the first or second ingredient (excluding nuts and seeds*). Meat and meat alternatives include: beef, pork, poultry, fish, wild meat, eggs, soybeans, legumes, tofu.<br>*See the "Nuts & Seed Mixes or Bars" category for guidelines on these items<br>  | • Many products breaded and/or deep fried in hydrogenated or partially hydrogenated oils or in vegetable shortening (e.g. Chicken fingers)<br>• Marbled or fatty meats<br>• Many cold cuts and deli meats (deli chicken, deli beef, pepperoni, bologna, salami, etc) if high in salt or contain nitrates<br>• Canned meats (Kam, Klik, corned beef, ham, etc)<br>• Some seasoned chicken or tuna salads<br>• Most regular wieners, sausages, smokies, bratwurst<br>• Most pepperoni/chicken sticks<br>• Some jerky<br>• Bacon | • Some breaded and baked chicken/fish/meat<br>• Some marinated poultry<br>• Some fish canned in oil<br>• Some deli meats if not too salty<br>• Some chicken or tuna salads, lightly seasoned<br>• Some lean wieners, sausages<br>• Lean pepperoni/chicken/turkey sticks<br>• Some jerky, lightly seasoned<br>• Smoked fish (salt used)<br>• Some egg salads, lightly seasoned<br>• Legume salads, lightly seasoned<br>• Some refried beans<br>• Turkey bacon | • Chicken, turkey<br>• Fish, seafood, fresh or canned in water/broth<br>• Lean meat (beef, pork, lamb)<br>• Lean traditional meats (venison, bison, moose, caribou, duck, etc)<br>• Eggs<br>• Tofu<br>• Chicken salads if lower salt and fat<br>• Lean wieners if lower salt<br>• Jerky (plain), dried deer/moose/caribou meat<br>• Beans, peas, lentils<br>• Most legume salads if lower salt<br>• Refried beans (lower fat) |
| Note: Many processed meats are high in saturated fat, salt and nitrates. Choose non-processed, lean meat, poultry or fish instead. Traditional meats, fish and seafood are higher in nutrients such as iron and lower in fat than domestically raised meats. | | | |
| **Nuts & Seeds (Mixes or Bars)** | | | |
| Peanuts, nuts or seeds must be the first or second ingredient.<br>  | • Nuts with a sugar based coating (eg. Chocolate, yogurt covered nuts)<br>• Salty or sugary nut/seed bars and mixes (e.g. sesame snap bars)<br>• Nuts/seeds that are highly salted or flavoured and roasted in additional oil | • Nuts/seed bars and mixes with nuts/seeds or fruit as the first ingredient and no sugar based coatings | • Nut/seed bars and mixes with nuts/seeds or fruit as first ingredient<br>• Nuts/seeds, natural or dry roasted |
| Mixes or bars containing dried fruit, sugars, crackers, or other sugars/starches can leave particles clinging to teeth and put dental health at risk. Eat these foods only at mealtimes. At snack times, choose plain nut/seed choices that clear quickly from mouth. | | | |

| Food Category | Leave off the Table | Sometimes on the Table | Great on the Table Anytime |
|---|---|---|---|
| **Mixed Entrée Foods** | | | |
| Note: Some trans fats occur naturally in meats like beef, lamb, goat, deer, moose, elk, and buffalo. Naturally occurring trans fats are considered healthy.<br>  | • Sandwiches with deli or processed meats<br>• Subway style sandwiches greater than 6 inches<br>• Some pizzas (4 cheese/double cheese, meat lover)<br>• Pizza pockets<br>• Meat pot pies<br>• Sausage/vegetable rolls<br>• Pasta with a cream based sauce | • Most sandwiches<br>• Short (e.g. 6 inch) submarine sandwiches, and burgers made with lean roasted meats (turkey, chicken, beef), but few vegetables<br>• Whole wheat pizza topped with lean meat and vegetables and lightly topped with cheese<br>• Baked pizza pockets, pizza pretzels, pizza bagels<br>• Some curries, moderately salted<br>• Stir fries prepared with low sodium sauces<br>• Sushi<br>• Rice and egg/meat Pilaf<br>• Pasta with milk or vegetable based sauce<br>• Hard tacos with meat or bean filling | • Whole grain sandwiches<br>• Sandwiches, short (6 inch) submarine sandwiches, and burgers made with whole grain breads and lean meats (turkey, chicken, beef) and plenty of vegetables and whole grain bread/buns<br>• Whole wheat pizzas with vegetables<br>• Stews, chilies, curries (lower sodium)<br>• Stir fries on rice, if sauce is low in sodium<br>• Pilaf (with vegetables)<br>• Pasta with vegetable and meat based sauce<br>• Burritos (bean or meat)<br>• Soft tacos filled with “Great on the Table” ingredients<br>• Some low sodium frozen entrees |
| **Candies, Chocolates** | | | |
|  | • Most regular packages<br>• Most very small packages of candies/ chocolates<br>• Very small portions of dessert gelatins | • Sugar-free gum or mints or cough drops<br>• Diabetic candies (adults only)<br>• Dark chocolate > 55% cocoa | None |

| Food Category | Leave off the Table | Sometimes on the Table | Great on the Table Anytime |
|---|---|---|---|
| **Soups** | | | |
| Includes dry, canned and fresh<br>  | • Some instant soups, plain or seasoned<br>• Ramen noodles<br>• Regular canned soups, broth or milk based<br>• Many canned soups, broth or milk based | • Soups made with soup bouillon/stock and other ingredients from the "Great on the Table Anytime" list<br>• Homemade chicken noodle soup<br>• Hamburger soup made with regular fat meat<br>• Some low-sodium canned or instant soups | • Home-made soups made with homemade stocks or without added bouillon/stock<br>• Hamburger soup made with lean meat (lean ground beef, moose or deer meat)<br>• Some soups made with meat or beans/ lentils<br>• Some low-sodium canned or instant soups made with meat or beans/lentils |
| **Other Beverages* (Non-Juice/Non-Milk based)** | | | |
|  | • Most drinks with sugars as the first ingredient (not counting water) – e.g. iced teas, fruit 'aides', pops<br>• Most sport drinks*<br>• Most hot chocolate mixes made with water<br>• Water (flavoured or not) minimally sweetened<br>• Diet decaffeinated soft drinks and diet non-carbonated drinks (Secondary schools only) | • Soda water **<br>• Decaffeinated tea<br>• Decaffeinated coffee | • Water, plain<br>• Lemon/lime water<br>• Soda water **<br>• Soapberry punch<br>• Sparkling/carbonated water or water with added flavours (no added sugar and/or no artificial sweeteners)<br>• Indian tea/Labrador Tea<br>• Herbal teas (fruit/mint flavoured unsweetened teas)<br>• Homemade ice tea |

Sport/electrolyte drinks containing added sugars are not recommended. These beverages may be useful during sports events lasting more than 1 hour on hot days. Plain water is the best beverage when exercising.

* Other Beverages may provide excess calories, caffeine, artificial sweeteners, or acids and often displace healthier food/beverage choices. These beverages often contain acids (natural or added) that may dissolve tooth enamel when sipped frequently. To reduce risk of damage to tooth enamel, choose water most often as a beverage. Limit portion sizes of "Other Beverages" (except plain water) to: 250 mL or less per serving for children (aged 5-12) and 360 mL or less for children aged 12 and older.

** If serving soda water, check the sodium content as some brands may have higher levels. Consider keeping coffee/tea Off the Table for gatherings with a prenatal/postnatal, child or youth focus.

| Food Category | Use in Moderation | Generally No Limits |
|---|---|---|
| **Condiments & Add-Ins** | | |
|  | • Soy sauce: ½ teaspoon (2 - 3 mL)<br>• Hot sauce: 5 - 10 mL<br>• Table salt: ¼ - ½ mL<br>• Soft margarine, butter: 5 - 10 mL<br>• Cream: 5 - 15 mL Whipped Cream (from cream): 15 - 30 mL<br>• Regular/light cream cheese or processed cheese spread: 5 - 15 mL<br>• Regular sour cream: 15 - 30 mL<br>• Low-fat sour cream: 15 – 45 mL<br>• Fat-free sour cream: 15 – 60 mL<br>• Low-fat/fat-free dips, dressings, spreads (e.g., mayonnaise, miracle whip, sandwich spread): 5 - 15 mL<br>• Regular dips, dressings, spreads: 5 - 10 mL<br>• Oil for sautéing or dressing (e.g., homemade vinegar and oil): 5 - 10 mL<br>• Ketchup, mustard, relishes: 10 - 15 mL<br>• Pickles (regular): 10-15 ml (Low sodium pickles: no limit)<br>• Horseradish: 10 - 45 mL<br>• Jarred salsa, sauerkraut: 10 - 30 mL (fresh salsa can fit into the Vegetables and Fruit food grouping)<br>• Salad toppers (e.g. Bacon bits): 5 - 10 mL Croutons: 25 - 50 mL<br>• Sugars, honey, jams/jellies, molasses, syrups (e.g., pancake): 15 mL<br>• Flavoured syrups (e.g. for lattes): 1 pump (10 mL) | • Herbs and salt-free seasonings, garlic, pepper, lemon juice, Mrs. Dash<br>• Horseradish: 10-45 ml<br>• Fresh salsa |
| Condiments and add-ins can be used to enhance the flavour of Sometimes on the Table and Great on the Table Anytime items.<br>Serve condiments and add-ins on the side whenever possible. | | |

# Appendix P. Summary of Results for Quebec

## First Nations Food, Nutrition and Environment Study (FNFNES)

Quebec-Labrador 2016

University of Ottawa
Université de Montréal
Assembly of First Nations

**Summary of Results: Quebec-Labrador**

## Who participated?

**420** Ave. age: 41

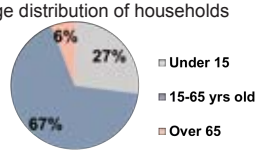
**573**

**4** is the median # of people living in each home

**69%** of households had at least **1** adult working full-time

**153** Ave. age: 44

Age distribution of households




## What is the FNFNES about?

FNFNES took place in **10 First Nations** communities in Quebec/Labrador in 2016 to answer these questions:

- What kinds of traditional and store bought foods are people eating?
- What is the diet like?
- Is the water safe to drink?
- Are the levels of pharmaceuticals in the water safe?
- Are people being exposed to harmful levels of mercury?
- Is traditional food safe to eat?

## Which communities participated?

| | |
|---|---|
| Naskapi Nation of Kawawachikamach | Cree Nation of Mistissini |
| Whapmagoostui First Nation | Mohawks of Kahnawá:ke |
| The Crees of Waskaganish First Nation | Odanak First Nation |
| Montagnais de Unamen Shipu | Micmacs of Gesgapegiag |
| La Nation Anishnabe du Lac Simon | Listuguj Mi'gmaq First Nation |

## What were the findings on health?

**30%** of adults said their health was **very good to excellent**

**30%** of adults are **physically active**

**9%** of adults are at a **healthy weight**

**25%** of adults have **diabetes**
**Type 2 diabetes is more common**

**46%** of adults **smoke**

**Thank you to everyone who participated!**

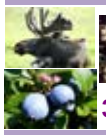
## How many households are harvesting traditional food?

**78%** of households harvested traditional food
**59%** hunted
**60%** fished
**50%** harvested wild plants

**84%** want more traditional food.

**Top barriers** to greater use are lack of: time, a hunter in the household, equipment/ transportation, money to purchase traditional food and availability.

## What and how much traditional food are people eating?



**95%** of adults reported eating traditional food. **Moose**, **Labrador tea** and **blueberry** are the **3 foods** most commonly eaten.

**37 grams** of **traditional food** or **2.5 tablespoons** are eaten daily.

## How well are First Nations adults in Quebec-Labrador eating?

Adults **eat fewer than** the recommended servings of:


Grain Products


Vegetables and Fruit


Milk and Alternatives

Adults **eat more** than the recommended servings of:


Meat and Alternatives

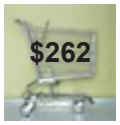
Inadequate amounts can lead to **nutrient deficiencies** and **poor health**.

## Can households afford sufficient, safe and nutritious food?

Household food security is defined as "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."

**36%** of households are **food insecure**
**28%** are **moderately** food insecure: families relied on lower quality/priced foods
**8%** are **severely** food insecure: families regularly experience food shortages

**Weekly grocery costs for a family of four**:




Costing was done in a grocery store near each community.

Costs ranged from **$179** to **$336**.

Costs were calculated using the National Nutritious Food Basket, which is **a list of 67** basic food items. Foods that require **little or no** preparation, spices, condiments, household supplies or personal care items are **not** included. Transportation costs are not included.

**Recommendations**:

- Talk to a local dietitian for more information on healthy eating.
- Choose more vegetables and fruit, including wild plants and berries.
- Choose whole grains more often. Make baked bannock with whole wheat flour.
- Choose milk and milk products (such as cheese or yogurt) or beverages fortified with calcium and vitamin D (such as soy beverages) more often.
- Choose leaner meats, plus game and fish.

## Is the water safe to drink?

Only **52%** of participants said they usually **drink** the tap water (**19%** sometimes do) while **96% cook** with it. Reasons for avoidance included: **preference for other beverages**, **unpleasant taste** and **distrust of the quality/safety**.

**Testing** of tap water was undertaken in **156** homes for metals that can affect **health** or have an **aesthetic objective/operational guidance** value.

**Metals** that can affect **health** were **within** guidelines.

**Metals** that can affect **colour, taste,** or **smell** were **not within** guidelines for **aluminum** (2 homes), **iron** (3 homes), **manganese** (3 homes) and **sodium** (9 homes).

## Are the levels of pharmaceuticals in the water safe?

**Low** levels were found in surface water samples in **9** communities. These levels should not be harmful to human health.

**25** pharmaceuticals were found including: **caffeine** (pain med./beverages), **metformin** (diabetes med.), **sulfamethoxazole** (antibiotic), **carbamazepine** (mood/anti-convulsant), **cotinine** (nicotine metabolite), **atenolol** (heart med.), **naproxen** (inflammation/pain med.), **clarithromycin** (antibiotic), **acetaminophen** (pain med.), **metoprolol** (blood pressure med.), **gemfibrozil** (lipid med.), **bezafibrate** (lipid med.), **cimetidine** (ulcer med.), **ketoprofen** (arthritis/pain med.), **hydrochlorothiazide** (hypertension med.), **codeine** (pain med.), **diclofenac** (arthritis/pain), **ibuprofen** (pain/fever med.), **ranitidine** (ulcer med.), **ciprofloxacin** (antibiotic), **sulfamethazine** (antibiotic), **pentoxifylline** (diabetes med.), **diphenhydramine** (antihistamine), **furosemide** (diuretic), and **atorvastatin** (cholesterol med.)

## Are people being exposed to harmful levels of mercury?

**Hair** samples were collected from **381** adults. **Mercury** levels were **within** Health Canada's guideline normal acceptable range **except** for **23** participants (**6%**). There was a greater percentage of **exceedances** among participants in the **northern regions**. Letters were sent to these individuals with suggestions on how to reduce their exposure to mercury.

## Is traditional food safe to eat?

**682 food samples** from **80** species were collected.

**Fish:** salmon, sturgeon, bass, trout, catfish, cisco, cod, eel, whitefish, lobster, mackerel, pike, scallop, sea snail, shrimp, smelt, crab, clam, sucker, walleye
**Land mammals:** bear, beaver, caribou, deer, hare/rabbit, moose, muskrat, porcupine, squirrel **Birds:** arctic tern, black guillemot, Canada goose, eider, golden eye, grouse, mallard, ptarmigan, scoter, snow goose, wood duck **Plants:** wild apple, bear root tea, blackberry, blueberry, butternut squash, yew, cedar tea, chaga tea, chanterelle mushroom, chokecherry, cloudberry, clover tea, crab apple, cranberry, dandelion, fiddlehead, honey, Jerusalem artichoke, Labrador tea, maple syrup, muskrat root tea, pine tea, raspberry, raspberry leaf tea, stinging nettle, strawberry, sweetgrass tea, tamarack tea, teaberry **Cultivated foods:** chicken eggs, pole beans, potatoes, white corn flour, white washed corn

**Traditional food is safe and healthy to eat.**

### Recommendations

- To help protect the environment, **return unused medications to a pharmacy** for proper disposal.
- **Use non lead ammunition.** Ammunition can shatter and fragments can be **too small to detect** by sight or feel. Eating meat contaminated by lead shot can be harmful to health, especially to a child's brain development.
- Some lakes have fish advisories. Information can be found online at the Ministry of Environment's website and the Government of Canada's Dept. of Environment and Climate Change webpage, *Fish Consumption Advisories*

**Quebec-Labrador 2016**

## Key Results For All Participating First Nations in Quebec-Labrador

1. The diet of First Nations adults in Quebec-Labrador does not meet nutrition needs, but the diet is healthier when traditional foods are eaten.
2. Overweight/obesity, smoking, and diabetes are major public health issues.
3. Household food insecurity is a major issue.
4. Water quality, as indicated by the trace metals and pharmaceutical levels, is satisfactory overall, but close monitoring is needed as water sources and water treatment vary by community.
5. Levels of chemical contamination of traditional food are generally low. At the current rate of consumption, the total dietary contaminant exposure from traditional food is generally low and is not a health concern.
6. Mercury exposure, as measured in hair samples suggests some concern and a strong south-north gradient of increasing exposures. There appears to be a greater frequency of exceedances among women of childbearing age and adults age 71+. Of the 381 adults in the Quebec region who provided hair samples, 23 (**6%**) had a mercury level above Health Canada's guideline.
7. Elevated levels of lead were found in some food items: it is important to identify the sources.
8. Future monitoring of trends and changes in the concentrations of environmental pollutants and the consumption of key traditional foods is needed.

**More information can be found on the FNFNES website: www.fnfnes.ca**

If you have any questions about these results or the project itself, please contact:
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# REFERENCES


Adelson, N. 2005. "The embodiment of inequity: health disparities in Aboriginal Canada." Canadian Journal of Public Health 96 (Suppl 2): S45-61.

Aga, D.S. 2008. Fate of Pharmaceuticals in the Environment and Water Treatment Systems. Boca Raton: CRC Press.

Agunbiade, F.O., and B. Moodley. 2014. "Pharmaceuticals as emerging contaminants in Umgeni River system, KwaZulu-Natal, South Africa." Environmental Monitoring Research 186: 7273-7291.

Anderson, P., N. Denslow, J.E. Drewes, A. Olivieri, D. Schlenk, and S. Snyder. 2010. Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water. Recommendations of a Science Advisory Panel. Final Report, Sacramento: State Water Resources Control Board. Accessed 2015. http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/docs/cec_monitoring_rpt.pdf.

Archer, E., B. Petrie, B Kasprzyk-Hordern, and G.M. Wolfaardt. 2017. "The fate of pharmaceuticals and personal care products (PPCPs), endocrine disrupting contaminants (EDCs), metabolites and illicit drugs in a WWTW and environmental waters." Chemosphere 174: 437-446.

Aus der Beek, T., T. Weber, A. Bergmann, S. Hickmann, I. Ebert, A. Hein, and A. Küster. 2016. "Pharmeceuticals in the environment-Global occurences and perspectives." Environmental Toxicology and Chemistry 35 (4): 823-35.

Australian guidelines for Water Recycling. 2008. "Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Augmentation of Drinking Water Supplies." Canberra: Environment Protection and Heritage Council, the National Health and Medical Research Council and the Natural Resource Management Ministerial Council.

Ayach, B.B., and H. Korda. 2010. "Commentary: Type 2 diabetes epidemic in First Nations peoples in Canada." Ethnicity and Disease 20 (3): 300-303.

Bartelt-Hunt, S., D.D. Snow, T. Damon, J. Shockley, and K. Hoagland. 2009. "The occurrence of illicit and therapeutic pharmaceuticals in wastewater effluent and surface waters in Nebraska." Environmental Pollution 157: 786-91.

Batt, A.L., T.M. Kincaid, M.S. Koshtich, J.M. Lazorchak, and A.R. Olsen. 2016. "Evaluating the extent of pharmaceuticals in surface waters of the United States using a National-scale Rivers and Streams Assessment survey." Environmental Toxicology and Chemistry 35 (4): 874-94.

Bayen, S., H. Zhang, M.M. Desai, S.K. Ooi, and B.C. Kelly. 2013. "Occurrence and distribution of pharmaceutically active and endocrine disrupting compounds in Singapore's marine environment: influence of hydrodynamics and physical-chemical properties." Environmental Pollution 182: 1-8.

Belanger-Ducharme, F., and A. Tremblay. 2005. "A Prevalence of obesity in Canada." Obesity Review 6 (3): 183-6.

Bellinger, D.C., J. Burger, T. J. Cade, D. A. Cory-Slechta, M. Finkelstein, H. Hu, M. Kosnett, et al. 2013. "Health Risks from Lead-Based Ammunition in the Environment." Environmental Health Perspectives 121 (6): a178-a179. https://dx.doi.org/10.1289/ehp.1306945.

Blair, B. D., J. P. Crago, and C. J. Hedman. 2013. "Pharmaceuticals and personal care products found in the Great Lakes above the concentration of environmental concern." Chemosphere 93: 2016-2123.

Booker, D., and J. Menzies. 2017. "First Nations in Quebec pharmaceutical use. List of pharmaceuticals from the Non-Insured Health Benefits Directorate (NIHB). First Nations and Inuit Health Branch, Health Canada." Personal communication.

Bradley, P.M., L.B. Barber, J.W. Duris, W.T. Foreman, E.T. Furlong, L.E. Hubbard, K.J. Hutchinson, S.H. Keefe, and D.W. Kolpin. 2014. "Riverbank filtration potential of pharmaceuticals in a wastewater-impacted stream." Environmental Pollution 193: 173-180.

Brun, G.L., M. Bernier, R. Losier, Jackman, P. Doe K., and Lee H.B. 2006. "Pharmaceutically Active Compounds in Atlantic Canadian Sewage Treatment Plant Effluents and Receiving Waters, and Potential for Environmental Effects as Measured by Acute and Chronic Aquatic Toxicity." Environmental Toxicology and Chemistry 25 (8): 2163-2176.

Canada. Crown-Indigenous Relations and Northern Affairs (CIRNAC). 2018. Canadian Arctic Contaminants Assessment Report : Human Health Assessment 2017. Edited by M.S. Curren. Gatineau, Quebec: Government of Canada. http://publications.gc.ca/pub?id=9.834692&sl=0.

Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada . 2010. Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans. http://www.pre.ethics.gc.ca/pdf/eng/tcps2/TCPS_2_FINAL_Web.pdf.

Chan, L., O. Receveur, D. Sharp, H. Schwartz, A. Ing, and C. Tikhonov. 2011. First Nations Food, Nutrition and Environment Study (FNFNES): Results from British Columbia (2008/2009). Prince George: University of Northern British Columbia. www.fnfnes.ca.

Chan, L., O. Receveur, D. Sharp, H. Schwartz, A. Ing, K. Fediuk, A. Black, and C. Tikhonov. 2012. First Nations Food, Nutrition and Environment Study (FNFNES): Results from Manitoba (2010). Prince George: University of Northern British Columbia. www.fnfnes.ca.

Chan, L., O. Receveur, M. Batal, W. David, H. Schwartz, A. Ing, K. Fediuk, A. Black, and C. Tikhonov. 2014. First Nations Food, Nutrition and Environment Study (FNFNES): Results from Ontario (2011/2012). Ottawa: University of Ottawa. www.fnfnes.ca.

Chan, L., O. Receveur, M. Batal, W. David, H. Schwartz, A. Ing, K. Fediuk, and C. Tikhonov. 2016. First Nations Food, Nutrition and Environment Study (FNFNES): Results from Alberta (2013). Ottawa: University of Ottawa. www.fnfnes.ca.

Chan, L., O. Receveur, M. Batal, W. David, H. Schwartz, A. Ing, K. Fediuk, and C. Tikhonov. 2017. First Nations Food, Nutrition and Environment Study (FNFNES): Results from the Atlantic (2014). Ottawa: University of Ottawa.

Chan, L., O. Receveur, M. Batal, T. Sadik, H. Schwartz, A. Ing, K. Fediuk, and C. Tikhonov. 2018. First Nations Food, Nutrition and Environment Study (FNFNES): Results from Saskatchewan (2015). Ottawa: University of Ottawa.

Chen, D., and R.C. Hale. 2010. "A global review of polybrominated diphenyl ether flame retardant contamiation in birds." Environment International 36 (7): 800-11.

Chiu, C., and P.K. Westerhoff. 2010. "Trace organics in Arizona surface and waste waters." Chap. 4 in Contaminants of Emerging Concern in the Environment: Ecological and Human Health Considerations. American Chemical Society Symposium Series, edited by R. U. Halden, 81-117. Washington, D.C.: American Chemical Society.

Choi, K., Y. Kim, J. Park, C.K. Park, M.Y. Kim, H.S. Kim, and P. Kim. 2008. "Seasonal variations of several pharmaceutical residues in surface water and sewage treatment plants of Han River, Korea." Science of the Total Environment 405 (1-3): 120-28.

Conley, J.M., S.J. Symes, M.S. Schorr, and S.M. Richards. 2008. "Spatial and temporal analysis of pharmaceutical concentrations in the upper Tennessee River basin." Chemosphere 73: 1178-1187.

Cree Board of Health and Social Services of James Bay. 2017. "Access to a Nutritious Food Basket in Eeyou Istchee. 2016 Update. Project Report."

Dabeka, R., and X. Cao. 2013. "The Canadian total diet study design: 1992-1999." Food additives & contaminants: Part A 30 (3): 477-490. https://dx.doi.org/10.1080/19440049.2012.747004.

de Solla, S.R., È.A. Gilroy, J.S. Klinck, L.E. King, R. McInnis, J. Struger, S.M. Backus, and P.L. Gillis. 2016. "Bioaccumulation of pharmaceuticals and personal care products in the unionid mussel Lasmigona costata in a river receiving wastewater effluent." Chemosphere 146: 486-96.

Deo, R.P. 2014. "Pharmaceuticals in the surface water of the USA: A review." Current Environmental Health Reports 1 (2): 113-22. https://dx.doi.org/10.1007/s40572-014-0015-y

Deur, D.E., and N.J. Turner. 2005. Keeping it living. Traditions of plant use and cultivation on the northwest coast of North America. Vancouver: UBC Press.

Diaz-Cruz, M.S., M.J. Garcia-Galan, and D. Barcelo. 2008. "Highly sensitive simultaneous determination of sulfonamide antibiotics and one metabolite in environmental waters by liquid chromatography–quadrupole linear ion trap–mass spectrometry." Journal of Chromatography A 1193: 50-59.

Donaldson, S.G., J. Van Oostdam, C. Tikhonov, M. Feeley, B. Armstrong, P. Ayotte, O. Boucher, et al. 2010. "Environmental contaminants and human health in the Canadian Arctic." The Science of the Total Environment 408 (22): 5165-234. http://www.ncbi.nlm.nih.gov/pubmed/20728918.

Egeland, G., and G.G. Harrison. 2013. "Health Disparities: Promoting Indigenous Peoples' health through traditional food systems and self-determination." In Indigenous Peoples' food systems and well-being: interventions and policies, edited by H. V. Kuhnlein, B. Erasmus, D. Spigelski and B. Burlingame, 9-21. Rome: Food and Agricultural Organization.

First Nations and Inuit Health (FNIH), Personal communication. 2017. "Indian Register Data by Individuals Age 19 years and older for Quebec and Labrador First Nations, December 31, 2016. Indigenous and Northern Affairs Canada. Unpublished file."

Fono, J., E. Kolodziej, and D. Sedlak. 2006. "Attenuation of wastewater-derived contaminants in an effluent- dominated river." Journal of Environmental Science and Technology 40: 7257-62.

Food and Agriculture Organization. 2002. "The State of Food Insecurity in the World 2001." Rome. Accessed October 31, 2011. www.fao.org/docrep/003/w3613e/w3613e00.htm.

Frohlich, K. L., N. Ross, and C. Richmond. 2006. "Health disparities in Canada today: some evidence and a theoretical framework." Health Policy 79 (2-3): 132-143.

Ginebreda, A., I. Munoz, M.L. De Alda, R. Brix, J. Lopez-Doval, and D. Barcelo. 2010. "Environmental risk assessment of pharmaceuticals in rivers: relationships between hazard indexes and aquatic macroinvertebrate diversity indexes in the Llobregat River (NE Spain)." Environment International 36: 153-162.

Glassmeyer, S.T., E.T. Furlong, D.W. Kolpin, J.D. Cahill, S.D. Zaugg, S.L. Werner, M.T. Meyer, and D.D. Kryak. 2005. "Transport of chemical and microbial compounds from known wastewater discharges: potential for use as indicators of human fecal contamination." Environmental Science & Technology (American Chemical Society) 39 (14): 5157–5169. Accessed April 19, 2011. https://dx.doi.org/10.1021/es048120k.

Grund, M.D., L. Cornicelli, L.T. Carlson, and E.A. Butler. 2010. "Bullet fragmentation and lead deposition in white-tailed deer and domestic sheep." Human Wildlife Interactions 4 (2): 257-65.

Guerra, P., M. Kim, A. Shah, M. Alaee, and S.A. Smyth. 2014. "Occurrence and fate of antibiotic, analgesic/anti-inflammatory and antifungal compounds in five wastewater treatment processes." Science of the Total Environment 473-474: 235-243.

Guigueno, M.F., and K.J. Fernie. 2017. "Birds and flame retardants: A review of the toxic effects on birds of historical and novel flame retardants." Environmental Research 154: 398-424.

Health Canada. 2003. "Canadian Guidelines for Body Weight Classification in Adults." Health Canada. Food and Nutrition. https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/healthy-weights/canadian-guidelines-body-weight-classification-adults/questions-answers-public.html.

—.2006. "Canadian Community Health Survey, Cycle 2.2, Nutrition (2004): A Guide to Accessing and Interpreting the Data" Health Canada. Food and Nutrition. Food and Nutrition Surveillance. Health and Nutrition surveys. Canadian Communty Health Survey. ISBN: 0-662-43554-0 https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/canadian-community-health-survey-cycle-2-2-nutrition-2004-guide-accessing-interpreting-data-health-canada-2006.html#a1.2.1

—. 2007a. Canadian Community Health Survey Cycle 2.2, Nutrition (2004). Income-Related Household Food Security in Canada. Ottawa: Health Canada. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/fn-an/alt_formats/hpfb-dgpsa/pdf/surveill/income_food_sec-sec_alim-eng.pdf.

—. 2007b. "Eating Well with Canada's Food Guide: First Nations, Inuit and Métis." Health Canada. Food and Nutrition. https://www.canada.ca/en/health-canada/services/canada-food-guides.html.

—. 2009a. "Canadian Total Diet Study." Health Canada. Food and Nutrition. Food and Nutrition Surveillance. https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/canadian-total-diet-study.html.

—. 2009b. Do Canadian Adults meet their nutrient requirements through food intake alone? Ottawa: Health Canada. Cat. No.: H164-112/3-2012E-PDF http://publications.gc.ca/pub?id=9.692449&sl=0

—.2009c. "National Nutritious Food Basket." Health Canada. Food and Nutrition. Food and Nutrition Surveillance. https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/national-nutritious-food-basket.html.

—. 2014. A Statistical Profile on the Health of First Nations in Canada. Vital Statistics for Atlantic and Western Canada 2003-2007. Ottawa: Health Canada. http://publications.gc.ca/collections/collection_2014/sc-hc/H34-193-3-2014-eng.pdf.

—. 2017. "Guidelines for Canadian Drinking Water Quality - Summary Table." Health Canada. Environmental and Workplace Health. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf.

—. 2018. Sodium Reduction in Processed Foods in Canada: An Evaluation of Progress toward Voluntary Targets from 2012 to 2016. Ottawa: Minister of Health. Accessed March 1, 2018. https://www.canada.ca/en/health-canada/services/food-nutrition/legislation-guidelines/guidance-documents/guidance-food-industry-reducing-sodium-processed-foods-progress-report-2017.html.

Health Canada and Statistics Canada. 2009. Canadian Community Health Survey Cycle 2.2, Nutrition (2004). Nutrient intakes from food. Provincial, Regional and National summary data tables (Volume 1). Ottawa: Health Canada.

Health Canada and the Public Health Agency of Canada. 2015. Evaluation of Phase II of the Chemicals Management Plan 2011-2012 to 2015-2016. Final Report. Ottawa: Health Canada and the Public Health Agency of Canada. Accessed June 2016. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ahc-asc/alt_formats/pdf/performance/eval/evaluation-chemicalsplan_planproduitschimiques-2011-2016-eng.pdf.

Hectors, T.L.M., C. Vanparys, K. van der Ven, G.A. Martens, P.G. Jorens, L.F. Van Gaal, A. Covaci, W. De Coen, and R. Blust. 2011. "Environmental pollutants and type 2 diabetes: A review of mechanisms that can disrupt beta cell function." Diabetologia 54: 1273-1290.

Hu, F.B., and V.S. Malik. 2010. "Sugar-sweetened beverages and risk of obesity and type 2 diabetes." Physiology & Behavior 100: 47-54. https://dx.doi.org/10.1016/j.physbeh.2010.01.036.

Institute of Medicine. 2000. Dietary Reference Intakes. Applications in Dietary Assessment. Washington, District of Columbia: National Academies Press.

—. 2007. Preterm Birth. Causes, Consequences, and Prevention. Edited by Richard E. Behrman and Adrienne Stith Butler. Washington, District of Columbia: National Academies Press.

Katamay, S.W., Esslinger, K.A., Vigneault, M., Johnston, J.L., Junkins, B.A., Robbins, L.G., Sirois, I.V., Jones-McLean, E.M., Kennedy, A.F., Bush, M.A., Brulé, D., and C. Martineau. 2007 Eating Well with Canada's Food Guide (2007): Development of the Food Intake Pattern. Nutrition Reviews 65(4):155-66.

Kasprzyk-Hordern, B., R.M. Dinsdale, and A.J. Guwy. 2008. "The occurrence of pharmaceuticals, personal care products, endocrine disruptors and illicit drugs in surface water in South Wales, UK." Water Research 42: 3498-3518.

—. 2009. "The removal of pharmaceuticals, personal care products, endocrine disruptors and illicit drugs during wastewater treatment and its impact on the quality of receiving waters." Water Research 43: 363-380.

Khan, G.A., B. Berglund, K.M. Khan, P.E. Lindgren, and J. Fick. 2013. "Occurrence and abundance of antibiotics and resistance genes in rivers, canal and near drug formulation facilities–a study in Pakistan." PLoS One 8 (6): e62712. Accessed June 2015. https://dx.doi.org/10.1371/journal.pone.0062712.

Kirkpatrick, S., and V. Tarasuk. 2008. "Food insecurity is associated with nutrient inadequacies among Canadian adults and adolescents." Journal of Nutrition 138: 604-12.

Kleywegt, S., V. Pileggi, P. Yang, C. Hao, X. Zhao, C. Rocks, S. Thatch, P Cheung, and B. Whitehead. 2011. "Pharmaceuticals, hormones and bisphenol A in untreated source and finished drinking water in Ontario, Canada- occurrence and treatment efficiency." Science of the Total Environment 409 (8): 1471-1478.

Kolpin, D.W., E.T. Furlong, M.T. Meyer, E.M. Thurman, S.D. Zaugg, L.B. Barber, and H.T. Buxton. 2002. "Pharmaceuticals, Hormones and Other Organic Wastewater. Contaminants in U.S. Streams, 1999-2000. A National Reconaissance." Environmental Science & Technology 36 (6): 1202-1211.

Koné, M., D.L. Cologgi, W. Lu, D.W. Smith, and A.C. Ulrich. 2013. "Pharmaceuticals in Canadian sewage treatment plant effluents and surface waters: occurrence and environmental risk assessment." Environmental Technology Reviews 2 (1): 17-27. https://dx.doi.org/10.1080/21622515.2013.865793.

Kong, L., K. Kadokami, S. Wang, H.T. Duong, and H.T.C. Chau. 2015. "Monitoring of 1300 organic micro-pollutants in surface waters from Tianjin, North China." Chemosphere 122: 125-30.

Kostich, M. S., A. L. Batt, and J. M. Lazorchak. 2014. "Concentrations of prioritized pharmaceuticals in effluents from 50 large wastewater treatment plants in the US and implications for risk estimation." Environmental Pollution 184: 354-359.

Kuhnlein, H.V., and O. Receveur. 1996. "Dietary change and Traditional Food Systems of Indigenous People." Annual Review of Nutrition 16: 417-442.

Kuhnlein, H.V., B. Erasmus, D. Spigelski, and B. Burlingame, . 2013. Indigenous Peoples' food systems and well-being: interventions and policies for healthy communities. Rome: Food and Agricultural Organization.

Kuhnlein, H.V., O. Receveur, and H.M Chan. 2001. "Traditional Food systems research with Canadian Indigenous Peoples." International Journal of Circumpolar Health 60 (2): 112-122.

Laird, B.D., A.B. Goncharov, G.M. Egeland, and H.M. Chan. 2013. "Dietary advice on Inuit traditional food use needs to balance benefits and risks of mercury, selenium and n3 fatty acids." Journal of Nutrition 143: 923-930.

Lee, D., M.W. Steffes, A. Sjodin, R.S. Jones, L.L. Needham, and D.R. Jacobs. 2011. "Low dose organochlorine pesticides and polychlorinated biphenyls predict obesity, dyslipidemia, and insulin resistance among people free of diabetes." PLoS ONE 6 (1).

Legrand, M., M. Freeley, C. Tikhonov, D. Schoen, and A. Li-Muller. 2010. "Methylmercury blood guidance values for Canada." Canadian Journal of Public Health 101 (1): 28-31. http://journal.cpha.ca/index.php/cjph/article/view/2181/2060.

Li, Q.Q., A. Loganath, Y.S. Chong, J. Tan, and J.P. Obbard. 2006. "Persistent organic pollutants and adverse health effects in humans." Journal of Toxicology and Environmental Health, Part A 69 (21): 1987-2005.

Lissemore, L., C. Hao, Yang P., P.K. Sibley, S Mabury, and K.R. Solomon. 2006. "An Exposure Assessment for Selected Pharmaceuticals within a Watershed in Southern Ontario." Chemosphere 64 (5): 717-29.

Lopez-Roldan, R., M. Lopez de Alda, M. Gros, M. Petrovic, J. Martin-Alonso, and D. Barcelo. 2010. "Advanced monitoring of pharmaceuticals and estrogens in the Llobregat River Basin (Spain) by liquid chromatography-triple quadrupole-tandem mass spectrometry in combination with ultra performance liquid chromatography-time of flight-mass spectrometry." Chemosphere 80: 1337-44.

Mikkonen, J., and D. Raphael. 2010. Social Determinants of Health: The Canadian Facts. Toronto, ON: York University School of Health Policy and Management. http://www.thecanadianfacts.org/The_Canadian_Facts.pdf.

Montreal Diet Dispensary. 2016. "Cost of the Nutritious Food Basket - May 2016." Montreal Diet Dispensary. Accessed 2018. https://www.dispensaire.ca/app/uploads/16-05-Co%C3%BBt-PPN-ANG.pdf

Muir, D.C.G., and P.H. Howard. 2006. "Are there other persistent organic pollutants? A challenge for environmental chemists." Environmental Science and Technology 40 (23): 7157-7166.

Nagpal, N K, and C L Meays. 2009. Water Quality Guidelines for Pharmaceutically-active Compounds (PhACs): 17 αethinylestradiol (EE2) – Overview Report. Government report, Ministry of Environment, Government of British Columbia, Victoria: Ministry of Environment.

New York City Environment Protection. 2011. 2010 Occurrence of Pharmaceuticals and Personal Care Products (PPCPs) in Source water of the New York City Water Supply. Final Report, New York: NYC EP. Accessed July 2015. http://www.nyc.gov/html/dep/pdf/quality/nyc_dep_2010_ppcpreport.pdf.

Pain, D.J., R.L. Cromie, J. Newth, M.J. Brown, E. Crutcher, P. Hardman, L. Hurst, et al. 2010. "Potential hazard to human health from exposure to fragments of lead bullets and shot in the tissues of game animals." PLoS ONE 5 (4): e10315. https://dx.doi.org/10.1371/journal.pone.0010315.

Pascual-Aguilar, J., V. Andreu, and Y. Pico. 2013. "An envinronmental forensic procedure to analyse anthropogenic pressures of urban origin on surface water of protected coastal agro-environmental wetlands (L'Albufera de Valencia Natural Park, Spain)." Journal of Hazardous Materials 263: 214-223.

Power, E.M. 2008. "Conceptualizing food security of aboriginal people in Canada." Canadian Journal of Public Health 99 (2): 95-7.

Public Health Agency of Canada. 2010. "HIV/AIDS Epi Update. HIV/AIDS Among Aboriginal People in Canada." Public Health Agency of Canada. http://www.phac-aspc.gc.ca/aids-sida/publication/epi/2010/8-eng.php.

—.2011. "Diabetes in Canada: Facts and figures from a public health perspective." Public Health Agency of Canada. http://www.phac-aspc.gc.ca/cd-mc/publications/diabetes-diabete/facts-figures-faits-chiffres-2011/chap1-eng.php#DIA.

—.2012. Tuberculosis in Canada 2008. Report, Ottawa: Minister of Public Works and Government Services Canada, 85. http://www.publications.gc.ca/collections/collection_2012/aspc-phac/HP37-5-2008-eng.pdf.

Reading, C.L., and F. Wein. 2009. Health Inequalities and Social Determinants of Aboriginal Peoples'Health. Prince George: National Collaborating Centre for Aboriginal Health.

Reid, J. L., D. Hammond, V. L. Rynard, C.L Madill, and R. Burkhalter. 2017. Tobacco Use in Canada: Patterns and Trends. Waterloo: Propel Centre for Population Health Impact, University of Waterloo. . https://uwaterloo.ca/tobacco-use-canada/tobacco-use-canada-patterns-and-trends.

Ripley, S., E. Robinson, L. Johnson-Down, A. Andermann, P. Ayotte, M. Lucas, and E. Nieboer. 2018. "Blood and hair mercury concentrations among Cree First Nations of Eeyou Istchee (Quebec, Canada): time trends, prenatal exposure and links to local fish consumption." International Journal of Circumpolar Health (Taylor & Francis). https://dx.doi.org/10.1080%2F22423982.2018.1474706.

Roden, N.M. 2013. "The cumulative risk of pharmaceuticals in New Jersey surface water to human health. PhD Thesis." University of Medicine and Dentistry of New Jersey. Graduate School-New Brunswick Rutgers. The State University of New Jersey.

Sacher, F., M. Ehmann, S. Gabriel, C. Graf, and H.J. Brauch. 2008. "Pharmaceutical residues in the river Rhine-results of a one-decade monitoring programme." Journal of Environmental Monitoring 10: 664-670.

Sadezky, A., R.D. Löffle, M. Schlüsener, B. Roig, and T. Ternes. 2010. "Real Situation: Occurrence of the main investigated PPs in water bodies. European Water Research Series." Chap. 4 in Pharmaceuticals in the Environment: Current Knowledge and need assessment to reduce presence and impact., edited by B. Roig. London: IWA Publishing.

Saudny, H., D. Leggee, and G. Egeland. 2012. "Design and methods of the Adult Inuit Health Survey 2007-2008." International Journal of Circumpolar Health 71: 1-9.

Schnarch, B. 2004. "Ownership, Control, Access and Possession ( OCAP ) or Self-Determination Applied to Research. A critical analysis of contemporary First Nations research and some options for First Nations communities." Journal of Aboriginal Health (January).

Selke, S., M. Scheurell, M. R. Shah, and H. Hühnerfuss. 2010. "Identification and enantioselective gas chromatographic mass-spectrometric separation of O-desmethylnaproxen, the main metabolite of the drug naproxen, as a new environmental contaminant." Journal of Chromatography A 1217 (3): 419-23.

Smith, S., and I. Marshall. 1995. "Defining the Framework." Ecozones. Accessed January 28, 2011. http://ecozones.ca/english/preface.html.

Spongberg, A.L., J.D. Witter, J. Acuna, J. Vargas, M. Murillo, G. Umana, E. Gomez, and G. Perez. 2011. "Reconnaissance of selected PPCP compounds in Costa Rican surface waters." Water Research 45: 6709-6717.

Statistics Canada. 2013. "Health Fact Sheets (82-625-X), Household food insecurity, 2011-2012. Percentage of households with food insecurity, by province/territory, CCHS 2011-2012." Statistics Canada. Accessed 2014. https://www150.statcan.gc.ca/n1/pub/82-625-x/2013001/article/11889-eng.htm.

—.2017. "Canadian Community Health Survey – Nutrition (CCHS)." Statistics Canada. Surveys and statistical programs. Released June 20, 2017 . Accessed 2019. http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5049#a2

—. 2018. "Aboriginal Population Profile, 2016 Census. Catalogue no. 98-510-X2016001 ." Statistics Canada. Released June 2018. Accessed July 31, 2018. http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/abpopprof/index.cfm?Lang=E.

—. n.d.(a) "Canadian Health Measures Survey (CHMS)." Statistics Canada. Accessed October 2018. http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5071.

—. n.d. (b)"Table 13-10-0794-01 Measured adult body mass index (BMI) (World Health Organization classification), by age group and sex, Canada and provinces, Canadian Community Health Survey-Nutrition." Statistics Canada. Accessed 2017. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310079401.

—. n.d. (c) "Table 13-10-0453-01. Health indicator profile, age-standardized rate, annual estimates." Statistics Canada. Accessed 2015. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310045301&pickMembers%5B0%5D=1.6&pickMembers%5B1%5D=2.1.

—. n.d. (d) "Table 13-10-0113-01. Canadian health characteristics, two year period estimates." Statistics Canada. Accessed 2018. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310011301.

—. n.d. (e) "Table 13-10-0772-01. Total energy intake from foods, by dietary reference intake age-sex group, household population aged 1 and over, Canadian Community Health Survey (CCHS) - Nutrition, Canada and provinces." Statistics Canada. Accessed 2018. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310077201.

—. n.d. (f)"Table 13-10-0771-01. Percentage of total energy intake from protein, by dietary reference intake age-sex group, household population aged 1 and over, Canadian Community Health Survey (CCHS) - Nutrition, Canada and provinces1 2." Accessed 2018. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310077101.

—. n.d.(g) "Table 13-10-0770-01. Percentage of total energy intake from carbohydrates, by dietary reference intake age-sex group, household population aged 1 and over, Canadian Community Health Survey (CCHS) - Nutrition, Canada and provinces." Statistics Canada. Accessed 2018. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310077001.

—. n.d. (h)"Table 13-10-0769-01. Percentage of total energy intake from fat, by dietary reference intake age-sex group, household population aged 1 and over, Canadian Community Health Survey (CCHS) - Nutrition, Canada and provinces." Accessed 2018. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310076901.

—. n.d. (i) "Table 13-10-0773-01. Nutritional supplements - past month consumption, by age group and sex, household population aged 1 and over, Canadian Community Health Survey (CCHS) - Nutrition, Canada and provinces." Statistics Canada. Accessed 2018. https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1310077301.

Tarasuk, V., A. Mitchell, and N. Dachner. 2013. Household food insecurity in Canada 2011. Toronto: Research to identify policy options to reduce food inseucrity (PROOF). http://nutritionalsciences.lamp.utoronto.ca/.

—. 2016. Household food insecurity in Canada, 2014. Toronto: Research to identify policy options to reduce food insecurity (PROOF). http://proof.utoronto.ca/resources/proof-annual-reports/annual-report-2014/.

The First Nations Information Governance Centre (FNIGC). 2012. First Nations Regional Health Survey (RHS) 2008/10: National report on adults, youth and children living in First Nations communities. Ottawa: First Nations Information Governance Centre. Accessed 04 26, 2012. http://fnigc.ca/sites/default/files/First_Nations_Regional_Health_Survey_2008-10_National_Report.pdf.

—. 2014. Ownership, Control, Access and Possession (OCAP™): The Path to First Nations Information Governance. Ottawa: The First Nations Information Governance Centre (FNIGC). Accessed 2017. https://fnigc.ca/sites/default/files/docs/ocap_path_to_fn_information_governance_en_final.pdf.

—. 2018a. National Report of the First Nations Regional Health Survey Phase 3: Volume One. Ottawa: The First Nations Information Governance Centre (FNIGC). Accessed 2018. https://fnigc.ca/sites/default/files/docs/fnigc_rhs_phase_3_national_report_vol_1_en_final_sm_1.pdf.

—. 2018b. National Report of the First Nations Regional Health Survey. Phase 3: Volume Two. Ottawa: The First Nations Information Governance Centre (FNIGC). Accessed 2018. https://fnigc.ca/sites/default/files/docs/fnigc_rhs_phase_3_volume_two_en_final_screen.pdf.

Treadgold, J., Q.T. Liu, and J. Plant. 2012. "Pharmaceuticals and personal-care products." In Pollutants, Human Health and the Environment: A Risk Based Approach, edited by Jane Plant, Nick Voulvoulis and K Vala Ragnarsdottir. Wiley-Blackwell.

U.S. Department of Health and Human Services. 2014. The Health Consequences of Smoking - 50 Years of Progress: A Report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease prevention and Health Promotion, Office on Smoking and Health,. Accessed 4 8, 2014. http://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/index.htm.

Valcarcel, Y., A.S. Gonzalez, J.L. Rodriguez-Gil, Romo Maroto R., A. Gil, and M. Catala. 2011a. "Analysis of the presence of cardiovascular and analgesic//anti-inflammatory/antipyretic pharmaceuticals in river- and drinking water of the Madrid Region in Spain." Chemosphere 82: 1062-1071.

Valcarcel, Y., A.S. Gonzalez, J.L. Rodriguez-Gil, A. Gil, and A. Catala. 2011b. "Detection of pharmaceutically active compounds in the rivers and tap water of the Madrid Region (Spain) and potential ecotoxicological risk." Chemosphere 84: 1336-1348.

Waiser, M.J., D. Humphries, V. Tumber, and J. Holm. 2011. "Effluent-dominated streams. part 2: Presence and possible effects of pharmaceuticals and personal care products in Wascana creek, Saskatchewan, Canada." Environmental Toxicology and Chemistry 30 (2): 508-519.

Waldram, J.B., D.A. Herring, and T.K. Young. 1995. Aboriginal Health in Canada. Historical, Cultural and Epidemiological Perspectives. Toronto: University of Toronto Press.

Wang, D. D., Y. Li, S. E. Chiuve, M. J. Stampfer, J. E. Manson, E. B. Rimm, and F. B. Hu. 2016. "Association of specific dietary fats with total and cause-specific mortality." JAMA Internal Medicine. Accessed 2016. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5123772/pdf/nihms-821537.pdf.

Willett, W.C., A Green, M.J. Stampfer, F.E. Speizer, G.A. Colditz, B. Rosner, and et al. 1987. "Relative and absolute excess risks of coronary heart disease among women who smoke cigarettes." New England Journal of Medicine 317: 1303-1309.

Willows, N. 2005. "Determinants of healthy eating in Aboriginal Peoples in Canada: the current state of knowledge and research gaps." Canadian Journal of Public Health 96 (Suppl 3): S32-6, S36-41.

Willows, N., P. Veugelers, K. Raine, and S. Kuhle. 2011. "Associations between household food insecurity and health outcomes in the Aboriginal population (excluding reserves)." Statistics Canada, Catalogue no. 82-003-XPE, Health Reports, June.

World Health Organization. 2010. "Indigenous Peoples & Participatory Health Research: Planning & Management, Preparing Research Agreements." Geneva.

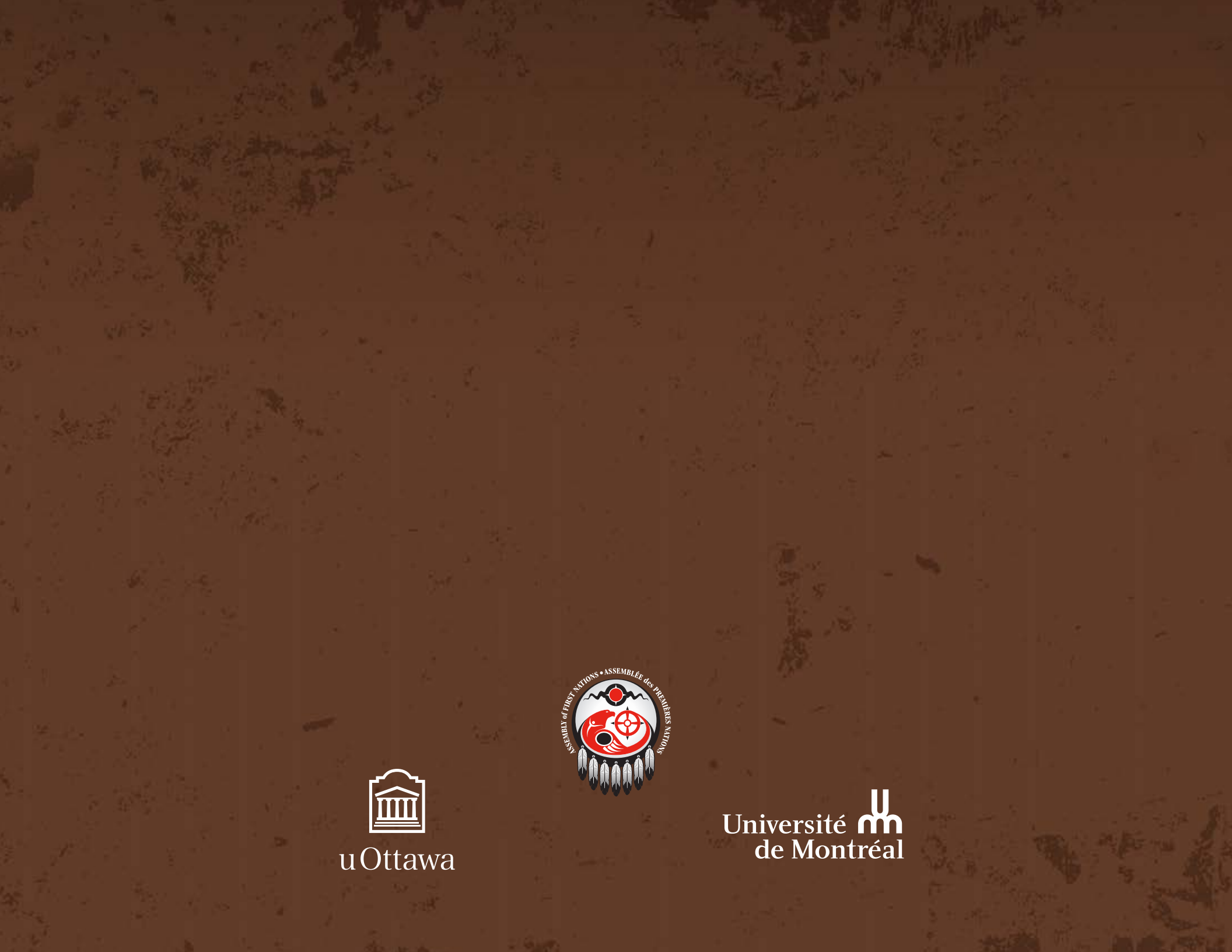
Wu, C., J.D. Witter, A.L. Spongberg, and K.P. Czajkowski. 2009. "Occurence of selected pharmaceuticals in an agricultural landscape, western Lake Erie basin." Water Research 43 (15): 3407-3416. Accessed April 19, 2011. http://www.iwaponline.com/wr/default.htm.

Yargeau, V., A. Lopata, and C. Metcalfe. 2007. "Pharmaceuticals in the Yamaska River, Quebec, Canada." Water Quality Research Journal of Canada 42 (4): 231 - 239. Accessed 04 19, 2011. http://www.cawq.ca/cgi-bin/journal/abstract.cgi?language=english&pk_article=361.

Young, T.A., J. Heidler, C.R. Matos-Perez, A. Sapkota, T. Toler, K.E. Gibson, K.J. Schwab, and R.U. Halden. 2008. "Ab initio and in situ comparison of caffeine, triclosan and triclocarbon as indicators of sewage –derived microbes in surface water." Environmental Science and Technology 42 (9): 3335-3340.

Young, T.K. 1994. The health of Native Americans: towards a bio-cultural epidemiology. New York: Oxford University Press.

# NOTES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