FIRST NATIONS FOOD, NUTRITION & ENVIRONMENT STUDY

Results from Saskatchewan 2015

University of Ottawa | Université de Montréal | Assembly of First Nations 2018

"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 and fulfilling our sacred responsibility to protect and care for our traditional territories. Climate change is creating increased challenges for First Nations and the exercise of our traditional harvesting practices. These kinds of barriers to traditional food sources can increase food insecurity, which can have a profound impact on the lives of our people. The First Nations Food, Nutrition, Environment Study (FNFNES) demonstrates how traditional food consumption can have an immense, positive impact on the daily nutritional outcomes for First Nations people. The Assembly of First Nations (AFN) advocates on behalf of our inherent rights, Aboriginal and Treaty rights and our rights in international law, including the United Nations Declaration on the Rights of Indigenous Peoples. In all cases, these include our rights to access our traditional food sources.

The FNFNES serves as a point-in-time indicator of a changing world and seeks to capture the environmental and nutrition health of First Nations people. It is a ten-year project mandated by the Chiefs-in-Assembly and developed in partnership with First Nations and academia. The study seeks to quantify the health of our 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 their environment as well as environmental stewardship.

I want to extend my thanks for all those who made this report possible, including First Nation participants, coordinators, research assistants, Health Canada, principal investigators, and the First Nations themselves. This is about the health of our people and our traditional territories.

Kinanâskomitin,
Perry Bellegarde
National Chief
Assembly of First Nations

FOREWORD FROM THE SASKATCHEWAN REGIONAL CHIEF

Greetings,

First Nations in Saskatchewan are committed to maintaining and enhancing their relationship with the environment. As Regional Chief, it is an honour and a privilege to be an advocate for First Nations. As we seek to revitalize our Indigenous cultures, the powerful linkage between traditional foods and culture form a strong bond. As an advocate for the Inherent and Treaty Rights of First Nations in Saskatchewan, the use of data in producing better health outcomes will lead to stronger Indigenous peoples overall.

This is why we are pleased to present the First Nations Food, Nutrition and Environment Study (FNFNES) as an example of what partnerships can accomplish. Without the fulsome cooperation and inclusion of First Nations, this project would not have been possible. In building towards a collective vision of what First Nations' interaction with the environment can be, the baseline data in studies like FNFNES can serve as an important marker.

Please join us in congratulating these First Nations on the completion of this project and a thank you to all those who made this possible.

Bobby Cameron
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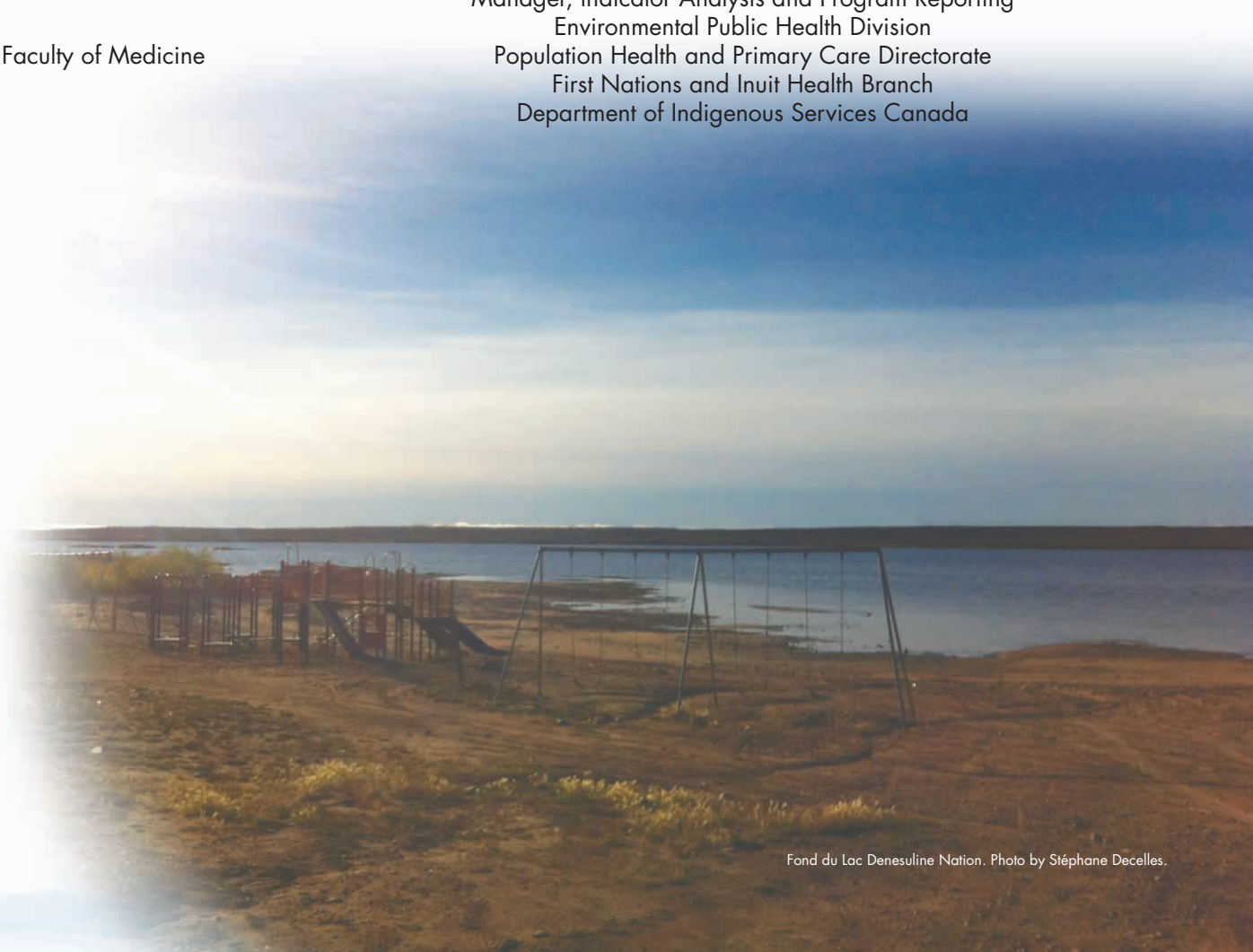

Fond du Lac Denesuline Nation. Photo by Stéphane Decelles.

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Lac La Ronge Culture Camp.
Photo by Rebecca Hare.

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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 (Health 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/PTDI	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.
- **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.

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

- **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).

- **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.

Mosquito, Grizzly Bear's Head, Lean Man First Nation. Photo by Nicole Pulvermacher.

- **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, south of the 60th parallel. 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. South of the 60th parallel, there are 11 ecozones within the eight Assembly of First Nation regions. In Saskatchewan, there are four ecozones: Taiga Shield, Boreal Shield, Boreal Plains and the Prairies.

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

In the fall of 2015, FNFNES was undertaken with 13 First Nations in Saskatchewan. Since one First Nation (Lac La Ronge Indian Band) had communities located in two ecozones (Boreal Shield and Boreal Plains), a decision was made to select a sample of households and analyze results within their respective ecozone. Therefore, results are presented for a total of 14 participating First Nations communities.

Due to the fact that only one community from the Taiga Shield was surveyed and could be easily identified, this report presents the aggregated results from the 14 participating First Nations communities combined and the three other ecozones. Results for the community in the Taiga Shield 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 (Schnarch 2004). 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.

James Smith Cree Nation. Photo by Kathleen Lindhorst

Results

In each community, households were randomly selected; one participant per household, 19 years and older, living on-reserve and who self-identified as a First Nation person, was invited to participate. There was a total of 1042 participants (721 women and 321 men). The overall participation rate was 84% for questionnaires. Fifty-three percent of respondents (n=555) participated in hair testing for mercury. The average age of the participants was 42 years for women and 43 years for men. The median number of people living in a household was five: 65% were between the ages of 15 and 65, 29% 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, 18% of adults were at a normal weight, while 33% of adults were overweight (33% of women and 34% of men) and 48% were obese (51% of women and 40% of men). One out of five adults (19%) reported that they had been told by a health professional that they had diabetes. Almost three-quarters of all adults (72%) were smokers. Twenty-six percent of adults said that their health was very good or excellent.

Traditional food appeared in the diet of almost all (94%) adults. Over 100 different traditional foods were harvested during the year, with the types varying across communities. Most reported eating land mammals (83%) and berries (78%), while many had fish (51%), wild birds (46%) and wild plants (43%) in their diet. The most frequently eaten traditional foods were moose, blueberries and Saskatoon berries. At the regional level, First Nations adults in Saskatchewan 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 95th percentile ate 175 grams/day. Sixty-two percent of households reported harvesting traditional food in the last year and more than three-quarters (78%) of participants reported that they would like to have more traditional food. However, the key barriers to increased use included a lack of a hunter in the household, time and equipment and/or transportation. External factors that inhibited access to traditional food included government restrictions, farming, as well as roadways. Climate change was also perceived by participants to have impacted both the seasonal round (lifecycle pattern of plants and animals and harvesting times) and the availability of traditional food.

In terms of overall diet quality, First Nations adults in Saskatchewan do not meet the amounts and types of food recommended in *Eating Well with Canada's Food Guide - First Nations, Inuit and Métis*. The intake of food from the Meat and Alternatives group is higher than recommended. For the other three food groups (Milk and Alternatives, Vegetables and Fruit, and Grain Products), intakes are lower than recommended. Fibre and many nutrients that are needed for good health and prevention of disease, including vitamin A, vitamin B6, folate, vitamin C, vitamin D, calcium and magnesium, are at risk of insufficient intake. Dietary quality was much improved on days when traditional foods were consumed, as traditional foods are important contributors of protein, vitamin D, iron, zinc, magnesium and other essential nutrients.

Almost two in five (37%) of households experienced food insecurity; 27% of the households were moderately food insecure and 10% 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 Saskatchewan was $258. Costs at the community level ranged from $176 to $479. When asked about traditional food security, 39% 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 18 water treatment systems serving communities. Two First Nations had agreements in place with nearby municipalities to provide treated water to some homes. In the 12 months preceding this study, water disruptions and drinking water advisories (DWAs) occurred in 11 of the systems serving communities. Water disruptions were reported to have occurred due to power outages, filtration system breakdowns, broken watermains, insufficient pressurization, the need to divert water for firefighting efforts, cleaning of the lines, or water delivery truck stoppages. Short term DWAs were reported in eight communities, lasting between 1 and 17 days. Long term boil water advisories (BWAs) lasting more than two years were reported in three First Nations.

South Saskatchewan River. Photo by Kathleen Lindhorst.

Muskeg Lake Cree Nation. Photo by Nicole Pulvermacher.

Almost all (99%) of the participants reported that their households have tap water; 26% of households reported having water storage tanks (63% had inside water storage tanks and 37% had exterior tanks). Sixty-five percent of participants reported that they use the tap water for drinking while 90% use it for cooking. Many adults reported using water from both the hot water and cold-water taps for drinking (31% of total participants) and cooking (70% of total participants). Of the 234 homes that had their tap water tested for metals for parameters of health concern, there were six exceedances in the flushed samples.

Testing for the presence of pharmaceuticals in surface water was undertaken in 13 communities: quantifiable pharmaceuticals were found in 12 communities. Seventeen pharmaceuticals were found in surface water and 26 were found in wastewater sites (tested in 2 communities). The FNFNES results are considerably lower than those found in other wastewater and 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.

Fifty-three percent of all participants provided hair samples for mercury testing. There were seven exceedances of Health Canada's mercury biomonitoring guidelines. The average mercury concentration in hair among adults was 0.30 µg/g (geometric mean was at 0.1 µg/g). However, as more than 40% of the sample was below the level of detection (LOD), these means are not reliable. The distribution of mercury in hair among the 90th and 95th percentile of First Nations living on-reserve in Saskatchewan indicate that average mercury body burden is generally below the established Health Canada mercury guideline (6 µg/g in hair for the general population). The data suggest that exceedances could be expected in the 95th percentile of First Nations males in the 51-70 age category. The analysis by ecozone demonstrated a difference in the profiles of mercury exposure among the study participants from one ecozone to the other. Out of 57 women of childbearing age who participated in the study in a northern ecozone, four exceeded the 2 µg/g mercury guideline at least once over the three-month period measured. This represents 7% of the sample and suggests that mercury risk communication should be focused on the First Nations women of childbearing age residing in the North. In general, however, FNFNES results suggest with some certainty that, at the First Nations population level across Saskatchewan, mercury exposure is not a significant health issue.

A total of 967 food samples representing 49 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 consumption. Some samples such as wild birds (grouse, goose and duck) and game meat (muskrat, moose, and rabbit) 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 2017, FNFNES shared and verified community-specific results with each First Nation in Saskatchewan that participated in the study. Communities perceived that results were generally accurate. Food insecurity was considered to be underestimated; it was suggested that recall bias may have occurred due to the sensitivity of this information.

Thus far, this study has been a valuable tool in addressing the gaps in knowledge about the diet, including both market and traditional food consumption and levels of environmental contaminants to which First Nations in Saskatchewan 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.

INTRODUCTION

In Canada, there remain large gaps in health between First Nations and the non-Aboriginal 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, 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 (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 market 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 various 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 metals 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 2017).

Canada is one of the global leaders in conducting Total Diet Studies (TDS). Health Canada (Health Canada 2009) 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 rely on traditionally harvested foods. A similar situation exists for the evaluation of food intake and diet quality. National dietary surveys, such as the 2004 Canadian Community Health Survey Cycle 2.2, Nutrition (Health Canada 2009), 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 shown consistently to be of greater nutritional quality when traditional food is consumed compared to when only market 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).

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 the eight Assembly of First Nation regions over a 10-year period and will be representative of all First Nations for 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, data collection occurred in nine Manitoba First Nations communities (Chan, Receveur, et al. 2012). A total of 18 First Nations in Ontario participated in 2011 and 2012 (Chan, Receveur and Batal, et al. 2014). In 2013, 10 First Nations from Alberta participated in the study (Chan, Receveur, et al. 2016). In 2014, 11 First Nations in the Atlantic region were surveyed (Chan, Receveur, et al. 2017).

Ahtahkakoop Cree First Nation. Photo by Carol Armstrong-Monohan.

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 Saskatchewan, FNFNES was presented to the Chief's Committee on Health, which was followed by invitations to communities to participate. Within Saskatchewan, there are 70 First Nations communities. According to Statistics Canada, 11% of individuals identifying as Aboriginal in Canada live in Saskatchewan, comprising 16% of this province's total population (Statistics Canada 2016) – the largest proportion of all provinces in Canada. As a result, Saskatchewan remains a central focus as a region in all of AFN's work, and the research done as part of the FNFNES contributes to the establishment of an important baseline of information for First Nations both regionally and nationally.

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 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 October 2017 and feedback on the content of these community level reports is included in this report.

METHODOLOGY

The FNFNES will eventually be 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 five aquatic ecozones. First Nations communities south of the 60th parallel are located within 11 ecozones.

In 2015, FNFNES was undertaken in 14 First Nations communities located in four ecozones in Saskatchewan: Taiga Shield, Boreal Shield, Boreal Plains and the Prairies. 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). Table A provides a brief description of the four ecozones within the Saskatchewan AFN region.

Figure A. Map of the four ecozones within the Saskatchewan AFN Region

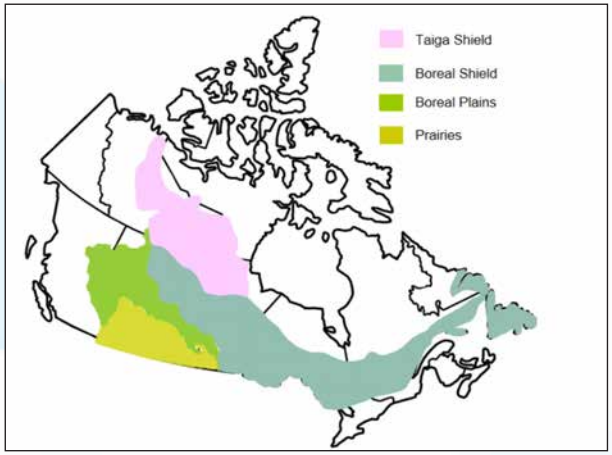


Table A. Description of the four ecozones within the Saskatchewan AFN Region

Ecozone name	General description
Taiga Shield	The Taiga Shield stretches across much of the Northwest Territories and the southern edge of this large ecozone dips down into Saskatchewan, north western 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.
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.
Boreal Plains	The low-lying valleys and plains of the Boreal Plains cover almost two-thirds of Alberta and stretches into Manitoba and Saskatchewan. The majority of the surface waters are part of three watersheds: those of the Saskatchewan River, the Beaver River, and Peace, Athabasca, and Slave rivers' watershed.
Prairies	Most of this ecozone is located within the United States with the northern boundary spanning southern areas of Alberta, Saskatchewan and Manitoba. This ecozone consists of flat and rolling plains and foothills covered by mixed grassland. A forest of aspen and poplar trees borders the area between the Prairies and the Boreal Plains.

From the 4 ecozones, 13 First Nations in Saskatchewan were allocated to participate. The sole community situated in the Taiga Shield ecozone was pre-selected. Twelve communities were randomly 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. The sampling strategy is similar to the one used by Leenen et al. (2008). After the random sampling of the communities, one community was added to the list of potential participant communities due to its proximity to the oil sands. Six communities declined participation thus, their alternates were invited to participate. By summer 2015, a total of 13 communities agreed to participate. Since one community (Lac La Ronge Indian Band) straddled two ecozones (Boreal Shield and Boreal Plains), a decision was made to select a sample of households in each of the two ecozones and analyze results separately. Using this approach, results are reported for 14 communities. Table B presents a summary of the collection effort in each ecozone.

Table B. Summary of collection effort for each ecozone in Saskatchewan

Ecozone area	Total population on-reserve per ecozone+	Total number of communities per ecozone	Sample allocation (number of communities selected to participate)	Sample collected (number of communities that participated)	Total population on-reserve for participating communities	Number of adults responding
Taiga Shield	1,055	1	1	1	1,055	92
Boreal Shield*	10,228	4	2	2	3,964	163
Boreal Plains*	34,983	33	7	7	12,420	513
Prairies	17,998	33	4	4	3,018	274
Total	**64,264**	**71**	**14**	**14**	**20,457**	**1,042**

+Total population at time of calculation was based on 2014 statistics *One First Nation straddled two ecozones. Two samples of households were selected; one in each ecozone.

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 Saskatchewan 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 Saskatchewan; 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).

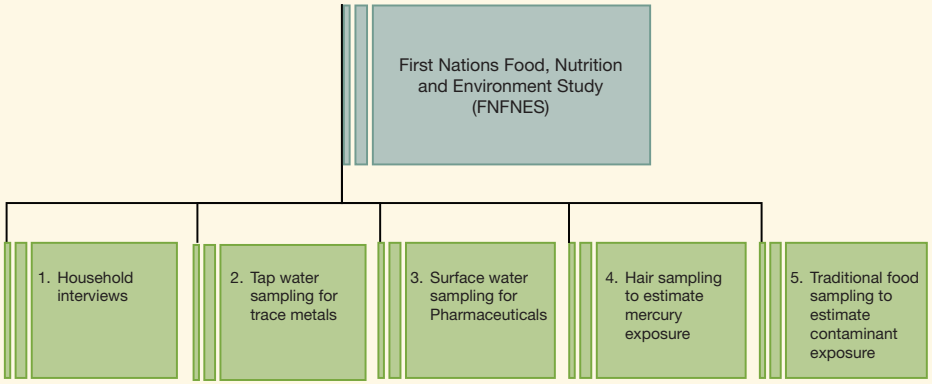
Sometimes, the sampling error might be difficult to interpret because the measure of precision is influenced by what is being estimated. For example, a sampling error of 100 would be considered large for measuring the average weight of people but would be considered small for estimating average annual 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 market 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 Nations community are collected to analyze for the presence of environmental contaminants.

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[1] This study determines the chemical safety of the community water supplies. The bacteriological safety is monitored by the 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 Saskatchewan 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-hr 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.

Justin St. John and Kathleen Shepherd. White Bear First Nation. Photo by Pamela Klassen.

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

Photo by Rebecca Hare.

Socio/Health/Lifestyle (SHL) Questionnaire

The SHL questionnaire incorporates several questions from the Canadian Community Health Survey 2.2 (CCHS 2.2) questionnaire (2004) and others derived from previous work with Aboriginal 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 2007). 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

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.

Kathleen Shepherd, White Bear First Nation. Photo by Pamela Klassen.

[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 Saskatchewan.

Lac La Ronge First Nation. Mohamad ElRafihi. Photo by Tahir Muhammad

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.

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), Saskatchewan region.

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 Gardner 2015). 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).

La Ronge Lake Island. Photo by Rebecca Hare.

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.

Beardy's and Okemasis First Nation. Photo by Jennifer Baker.

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.

Katelind Naistus and Alicia Oliver, Onion Lake First Nation. Photo by Lindsay Kraitberg.

Andrew Piche and Katelind Naistus, Onion Lake First Nation. Photo by Lindsay Kraitberg.

All hair samples, accompanied by a duly filled in Chain of Custody form, are sent by the national study coordinator to the Department of Indigenous Services Canada Co-Investigator who entered the hair samples in a spreadsheet and then sent them 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.

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

Amanda Thomas, Pelican Lake First Nation. Photo by Lindsay Kraitberg.

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.

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 H2SO4 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 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 H2SO4 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.

Timeline for Data Collection

After communities were selected to participate in FNFNES, they were contacted by the Assembly of First Nations and invited to send a representative to a two-day Methodology Workshop where the study design was presented in detail. After this workshop, 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.

Black Lake Denesuline Nation. Photo by Stéphane Decelles.

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 Northern British Columbia, 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 (Schnarch 2004). 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 participant. 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.

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-hr 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-hr 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.

[5] More information about the software is available online: <http://www.cdc.gov/epiinfo>
[6] More information about the software is available online: <http://www.candat.ca>
[7] More information about the software is available online: http://www.cssm.iastate.edu/software/side/

Onion Lake First Nation. Photo by Lindsay Kraitberg.

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 2007), traditional food use, income-related household food security, environmental concerns, contaminant exposure, and drinking water and hair analyses.

Sample Characteristics

In the fall of 2015, FNFNES was undertaken with 13 First Nations in Saskatchewan located in four ecozones. Since one First Nation (Lac La Ronge Indian Band) had communities located in two ecozones (Boreal Shield and Boreal Plains), a decision was made to select a sample of households and analyze results within their respective ecozone (Table 1). Therefore, at the regional level, this report presents the aggregated results from 14 communities. As the most northern ecozone (Taiga Shield) had participation of one community which could be easily identified, ecozone level results are presented for the Boreal Shield, Boreal Plains and the Prairies. Results for the community in the Taiga Shield will be included in a future report combining results by ecozone at the national level.

The two most northern communities only have winter road access and are located more than 900 kilometres north of Prince Albert. With the exception of Mosquito, Grizzly Bear's Head, Lean Man First Nation, all communities were located between 50 and 920 kilometres away from an urban centre. Only one First Nation had fewer than 100 households on their reserve lands.

Data collection in Saskatchewan was conducted from September to December 2015 in the following First Nations communities: Fond du Lac Denesuline First Nation, Black Lake Denesuline First Nation, Lac La Ronge Indian Band (Grandmother's Bay, Sucker River, Stanley Mission) Lac La Ronge Indian Band (La Ronge, Hall Lake, Little Red River), Pelican Lake First Nation, Onion Lake Cree Nation, Ahtahkakoop Cree Nation, Shoal Lake Cree First Nation, James Smith Cree Nation, The Key First Nation, Muskeg Lake Cree Nation, Beardy's and Okemasis First Nation, Mosquito, Grizzly Bear's Head, Lean Man First Nation, and White Bear First Nations (Figure 1).

Pelican Lake First Nation. Photo by Lindsay Kraitberg.

The majority of results presented in this report are based on in-person interviews conducted with 1042 First Nations respondents living on-reserve in Saskatchewan. 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 Saskatchewan. 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 Saskatchewan. Approximately 1673 households were randomly selected with the aim of reaching a targeted survey sample size of 1400 adults. Community research assistants visited 1343 homes (80% of homes selected). In the households visited, 1244 adults were eligible to participate. The overall participation rate was 84% (1042/1244 eligible households) which is higher than the rate reported for the CCHS 2.2 (2004) at 76.5%. No formal probing was conducted to determine how participants differed from non-participants but there was a higher ratio of female participants (69%) than male participants (31%).

The Key First Nation. Photo by Carla Coulson.

Socio-demographic Characteristics

A total of 1042 individuals (721 women and 321 men) participated in this study. The average age was 42 years for women and 43 years for men (Table 3). Figures 2a and 2b demonstrate the age group distribution of participants by gender. The percentage of participants aged 19-30 was highest in the Boreal Shield, while elders aged 71 and over only comprised 3% of all female participants and 5% of all male participants.

In participating First Nations households in Saskatchewan, 65% of individuals were between the ages of 15-65, with children under 15 years of age representing 29%, and elders (over the age of 65), representing 6% (Figure 3). These results are similar to those reported in the 2015 Indian Registration System (IRS) population count for Saskatchewan (31% under 15 years, 65% between 15-65, and 4% over the age of 65) (First Nations and Inuit Health (FNIH), Personal communication. 2016) .

In terms of household size, the median number of people living in a First Nations household in Saskatchewan was 5, with a range of 1 to 18 people (Table 4). One quarter (25%) of households contained 7 or more people (results not shown). Half of the adults reported that they had completed up to 12 years of education, with 25% having completed 12 or more years.

Figure 4 displays further results on education: 39% of all First Nations adults in Saskatchewan had obtained a high school diploma, 14% had obtained a general education development (GED) certificate, 19% had obtained a vocational degree, and 17% had obtained a postsecondary degree (11% college degree, 6% bachelor's degree) (Figure 4).

Figure 5 shows that the main source of income was wages (46%), followed by social assistance (38%), and pension/senior's benefits (9%). Overall, 67% 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 24%-63% between 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, 882 individuals provided both measured height and weight while 87 individuals provided only self-reported height and/or weight. Statistical differences were found between measured and self-reported body weights (underestimated by women only) and heights (overestimated by women only). 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 for women only. 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, 18% of adults had a normal or 'healthy weight', 33% were classified as overweight and 48% of adults were classified as obese while 1% were underweight (Figure 8a). Seventy-nine percent of women

aged 19-30, 82% aged 30-50 and 88% of women aged 51 and older were overweight or obese (Figure 8b). The overweight/obesity rate was 61% for men aged 19-30, 77% for men aged 30-50 and 80% for men aged 71 and older (Figure 8c). Nationally, the 2008/2010 RHS reported that 34.2% of First Nations adults living on-reserve were overweight and 40.2% were obese based on self-reported height and weight (First Nations Information Governance Centre (FNIGC) 2012). In the Canadian general population, based on measured weight and height data from the 2015 CCHS, 61.3% of Canadians and 73.3% of Saskatchewan adults aged 18 years and older are either overweight or obese. (Statistics Canada 2017).

Diabetes

Obesity is a major risk factor for diabetes and heart disease. The self-reported rate of diabetes in First Nations adults in Saskatchewan was 19% (Figure 9). Adults aged 40 and over were six times more likely to report having diabetes than younger adults (Figure 10). Type 2 diabetes was the most common form of diabetes reported (Figure 11). 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 18.1% (Table 5). This rate is triple the age standardized rate of 5.2% reported nationally and 5.3% in Saskatchewan for Canadians aged 12 and older (Statistics Canada 2015) but is slightly lower than reported in other studies involving First Nations, Inuit and Métis communities including the 2008/2010 RHS (age standardized rate of 20.7% among adults 25 years and older) (FNIGC 2012).

In an effort to lose weight, a small percentage of adults (10%) did report that they were dieting on the day of the 24-hour recall (Figure 12a). Dieting among participants aged 19-30 (especially men) appeared to be more common than among older adults (Figure 12b).

Smoking

More than three-quarters (72%) of First Nations adults in Saskatchewan reported that they smoked cigarettes (Figure 13). This is higher than the national smoking rate of 57% among First Nations adults reported in the 2008/2010 RHS (FNIGC 2012). This rate is several times higher the national smoking rate of 13%, and 16.9% in Saskatchewan, for all Canadians aged 15 and older (Reid, Hammond, et al. 2017). The rate of smoking among First Nations adults in Saskatchewan is the highest of the 6 regions participating in FNFNES (Figure 13b). First Nations adults in this study smoked an average of 9 cigarettes a day (just under half a pack), which is below the average number of cigarettes reported across Canada (14 cigarettes) and in Saskatchewan (13 cigarettes) (Reid, Hammond, et al. 2017).

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

Two-thirds of all adults (67%) 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 14a-c). Men more frequently reported that their daily activities included lifting or carrying light or heavy loads. As such, men were more likely to have their activity level categorized as 'highly active'. The latest CCHS reports that 45.6% of Canadians aged 12+ and 46.9% in Saskatchewan are inactive in their leisure time (Statistics Canada 2017).

Self-perceived health

In terms of self-perceived health, only 26% of adults said their health was 'very good' or 'excellent' while 40% said their health was 'good' (Figure 15a). Older adults (51+) were more likely to report their health as 'poor' (Figures 15b and 15c). In the 2008/2010 RHS, 44% of First Nations adults nationally (FNIGC 2012) reported that their health was 'excellent' or 'very good'. In contrast, 61.5% of all Canadians and 59.8% in Saskatchewan aged 12+ say that their health is 'very good' or 'excellent' (Statistics Canada 2017).

Traditional Food Use and Gardening

In Saskatchewan, traditional food harvesting (hunting, fishing, and gathering of wild plants), 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 150 traditional foods specific to Saskatchewan. 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.

Almost all adults (94%) 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 Saskatchewan ate land mammals (83%) and berries (78%), while many consumed fish (51%), wild birds (46%) and wild plant foods and teas (43%). The most frequently consumed traditional foods in Saskatchewan were moose (consumed by 71% of participants), blueberries (54%), Saskatoon berries (52%) and deer (50%).

Geographically, there was diversity in the percentage reporting overall use and kinds of traditional food eaten. A greater proportion of adults in the Boreal Shield (northern Saskatchewan) reported eating wild game (moose and caribou), fish (walleye/pickerel, lake whitefish, northern pike/jackfish), birds and bird eggs (mallard, grouse and Canada goose), and plant foods (berries, roots, greens, tree foods). However, the reliance on wild game and berries was high in all ecozones, with more than 50% of adults eating these foods. Blueberries and Saskatoon berries were the most commonly eaten berries in all three ecozones.

Tables 7a-7d summarizes the average and 95th percentile frequency of use for 10 traditional food species that appeared most often in the diet. Results are presented for all Saskatchewan 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 twice a month throughout the year, while blueberries and deer were consumed about twice per season. High consumers (those individuals reporting use at the upper end or 95th percentile) ate moose as often as 10 times per month (or twice per week), blueberries five times per month (or once per week) and deer six times per month. Tables 7b-7d illustrates differences between the top 10 traditional foods by ecozone. In all ecozones, moose appeared on the table consistently throughout the year but more often in the Boreal Shield and Boreal Plains (three times per month) than in the Prairies (once a month). Caribou was only eaten in the Boreal Shield and at a higher rate than moose. Deer and elk meat were reported to be eaten by more adults in the Prairies than in the Boreal Plains (no adults reported eating these species in the Boreal Shield) at a similar frequency (once a month). Fish appeared in the diet on a weekly basis in the Boreal Shield but was rarely eaten in the Boreal Plains or Prairies. Berries were more commonly eaten in the summer and fall in all ecozones.

Shoal Lake First Nation. Photo by Carol Armstrong-Monohan.

To estimate the amount of traditional food consumed per day by First Nations adults in Saskatchewan, the traditional food frequency of use data (Table 6) were multiplied by the average portion size reported by consumers of traditional food from the 24hr 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 24hr recalls from Saskatchewan, 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 37.3 grams (or about 2.5 tablespoons), whereas high consumers (those individuals eating at the upper end or the 95th percentile of intake) had 174.8 grams per day (about ¾ of 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 fish, game organs and birds, traditional food intakes among consumers were quite different from to all participants. For fish, the average and 95th percentile intake for all adults in Saskatchewan was 10.4 and 52.1 grams per day compared to 20.4 and 101.9 grams per day for consumers (Table 9a). For game organs, the average intake was 1.6 grams/day among all participants compared to 7.4 grams among consumers. Similarly, usual consumption of birds by all participants was 2.1 grams/day and 4.7 grams for consumers only. Among all participants, the consumption of plant foods (berries, roots, greens) was 4.2 grams/day but only slightly higher at 5.1 grams 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, northern pike and lake whitefish were the most frequently eaten kinds of fish, with some adult females and males consuming upwards of 37.1 and 85.6 grams, respectively, of walleye daily. Moose, deer and elk were the most heavily consumed game meats, while mallard, Canada goose and grouse were the most consumed wild birds. The top three consumed traditional berries were blueberry, Saskatoon berry and raspberry.

Traditional food intake by ecozones for consumers only is presented in Tables 10a-10d. Up to 357 grams/day (or almost 1 ½ cups) of traditional food are consumed in the Boreal Shield, compared to 116 grams/day (or ½ a cup) in the Prairies and 152 grams/day (or 2/3 of a cup) in the Boreal Plains. Information on the daily intake (mean and 95th percentile intake) of traditional foods by species for participants by age group can be found in Appendix G.

Results for participation in traditional food harvesting and cultivation practices among participants and other household members are displayed in Figures 16a to 16c. Over half (62%) of all households reported participating in traditional harvesting and gathering activities in the year preceding the interview (Figure 16a). This figure rose to 90% for households in the northern ecozone of the Boreal Shield. Almost one in five participants reported fishing (18%), while 25% hunted, 25% collected wild plants and 15% had a garden (Figure 16b). At the household level, 41% fished, 44% hunted, 31% collected wild plants and 18% had a garden (Figure 16c). The different kinds of garden vegetables and fruits reported to be eaten by First Nations in Saskatchewan are listed in Appendix H. Potatoes, carrots and onions were the top three commonly consumed garden vegetables in Saskatchewan.

Whether it be hunting, fishing, plant harvesting or gardening, a clear pattern emerged: traditional food production depends on the contribution from various family members. The proportion of households participating in any activity (Figure 16c) was greater than participants surveyed (Figure 16b). Fishing, hunting and collecting wild plants were more frequently practiced by households in the Boreal Shield, while planting a garden was more commonly seen in the Boreal Plains and Prairies.

White Bear First Nation. Photo by Pamela Klassen.

Although overall only 18% of households reported gardening, 59% of all First Nations adults in Saskatchewan reported eating vegetables from a family or community garden (Figure 17). 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 44% of households reported hunting, 83% of adults reported eating traditional meat in the last year. These findings reinforce that for many communities, traditional food harvesting and cultivation are significant contributors to the intake of the variety of food on the table, including vegetables and fruits and that sharing remains a cornerstone activity among First Nations in Saskatchewan.

When asked if their household would like to have more traditional food, over three-quarters of all adults (78%) said that they would (Figure 18). Households reported that the main barriers preventing greater use of traditional food were a lack of: hunters, time, equipment and/or transportation and knowledge (Figure 19). At the ecozone level, a lack of a hunter was predominantly reported by participants in the Boreal Plains and Prairies. Other reported barriers that limit harvesting for traditional food included: government restrictions, farming, roadways, forestry operations, and oil and gas operations (Figure 20).

When asked to list the most important benefits of traditional food, the top three responses were that they were healthy, natural, and cost less than store-bought food. As well, traditional foods were perceived to be an important part of the culture and tasty (Figure 21). Store-bought foods were valued most for their availability, convenience and variety (Figure 22).

Nutrient Intake

In order to understand how well First Nations adults in Saskatchewan 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 Saskatchewan. 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 2007). Alcohol 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 Saskatchewan to the DRIs. The SIDE SAS sub-routine (see methodology section), nutrient analyses were performed on data from a total of 951 participants (647 women and 304 men) to obtain the distribution (percentiles) of usual intake and to estimate adequacy of intake of the population.

Although 1042 interviews were completed, nutrient data from 91 individuals were excluded from the analyses: 46 pregnant and/or lactating women due to higher nutrient requirements for these groups; 39 participants aged 71 and over due to a low sample size, and 2 participants with missing age group values. Additionally, four participants who reported that they did not eat anything the day prior to the 24hr recall (resulting in zero kcal intake) were not included since these extreme values made the calculation of all percentiles and standard errors very unreliable.

For nutrients with an EAR, values that are greater than 50% in the '%<EAR' column indicate a problem of inadequate intake in the population, while 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 the Tables 10.1-10.37 by the symbol (-).

When the CVs 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. 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 high CVs, adequacy of intake for certain gender and age groups was based on the aforementioned method: fibre, vitamin C, folate, vitamin B6, vitamin B12, niacin, iron, phosphorus and zinc.

Energy or caloric intakes estimates for First Nations adults in Saskatchewan (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 Saskatchewan adult population in CCHS 2015 (Statistics Canada 2017). In this study, males aged 19-50 had an average energy intake of 2386

Photo by Rebecca Hare.

kcal/day while CCHS reported an energy intake of 2076 kcal/day for males aged 19-30 and 2147 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 2056 kcal/day in the general population. This was a similar picture for females. Females in this study had an energy intake of 1794 kcal/day (aged 19-50) and 1533 kcal/day (51-70), while CCHS energy intakes for females were 1693 kcal/day (19-30), 1581 (31-50), and 1634 (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 column are associated with a reduced risk of chronic disease. The percentage of energy from protein (Table 11.30) for all adults was within the recommended range (Table 11.30). The percentage of energy from carbohydrates (Table 11.31) was within the recommended range for females and males aged 19-50. The percentage of energy from fat was slightly above the recommended range for males and younger females aged 19-50 (Table 11.32). However, the percent of energy from saturated fat was greater than the recommended 10% (Table 11.33). In the general Saskatchewan population, the percentage of energy intake from protein (17.0 -20.2%) and fat (28.8 to 36.6%) appeared similar.

Overall, in comparison to the Dietary Reference Intakes, First Nations adults in Saskatchewan have:

- Adequate intakes for iron, vitamin B12, riboflavin, niacin, thiamin and phosphorous and potassium;
- Adequate intakes for zinc, except possibly for older men 51-70;
- High intakes of saturated fat;
- High intakes of sodium;
- Low intakes of vitamin A, vitamin D, calcium and magnesium;
- Low intake of fibre;
- Low intakes of vitamin C for older women and men aged 51-70, as well as all smokers;
- Low intakes of folate for all women; and
- Low intake of vitamin B6 among older women aged 51-70

High (excess), as well as low (inadequate) intakes can have serious consequences on health. A high intake of saturated fat is associated with heart disease (Wang, et al. 2016) and a high intake of sodium (salt) has been linked to high blood pressure, which can also lead to heart disease. People with diabetes are two to three times more likely to develop heart disease than those without. Average sodium intakes, for most gender and age groups (except older women) were above the Upper Limit (2300 mg/day) while intakes of saturated fat were just slightly above guidelines (it is recommended to limit saturated fat intake to 10% of energy intake). Reducing intake of processed foods high in 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). Reducing intake of foods high in saturated fat and sodium are key steps to promoting better health. Increasing the intake of fibre improves the intestinal transit and control of blood sugar.

Eating Well with Canada's Food Guide - First Nations, Inuit and Métis (Health Canada, 2007) describes the amount and types of food needed on a daily basis to supply the nutrients needed for good health and to lower the risk of obesity, type 2 diabetes, heart disease, some cancers, and osteoporosis. 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 adults in Saskatchewan do not appear to be meeting the recommendations for healthy eating (Table 12). First Nations adults in Saskatchewan consumed above the recommended number of servings from the Meat and Alternatives group, while the intake was below the recommended levels for the other three food groups (Vegetables and Fruit, Grain Products, and Milk and Alternatives). The following describes the eating patterns of First Nations adults in Saskatchewan 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 of vegetables and fruit per day. A Food Guide serving from this food group is equivalent to ½ cup (4 ounces) of a fresh, frozen or canned vegetable, berries, fruit or 100% fruit juice or 1 cup (8 ounces) of raw leafy greens). Adults from First Nations in Saskatchewan consumed about half the minimum recommended amounts (3 servings per day by First Nations men and women). As well, a large portion of the vegetable servings came from potatoes (Table 13), which are not as rich in vitamins and minerals as leafy green and orange vegetables. Not eating the recommended amount of fruits and vegetables on a regular basis can lead to low intakes of fibre and several nutrients, including vitamin A, vitamin C, magnesium and folate. 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).

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 and women in Saskatchewan fell short of the recommended number of servings from this group by 1 Food Guide serving a day.

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. In Saskatchewan, both male and female First Nations adults reported having 1 serving per day. This may be explained, in part, by some milk product intolerance, as reported by 17% of the respondents (see Appendix J). 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, men consumed an average of 4 Food Guide servings from this food group daily and women consumed 3 servings per day. 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 Saskatchewan are very similar. Within each of the four food groups, there is a limited variety of foods that appear frequently (Table 13). The low consumption of whole grains, fresh berries and fruit, and the low consumption of fresh and frozen vegetables relative to the use of potatoes, are particularly problematic. This highlights the need to find ways to increase their consumption to improve the intake of fibre, vitamins and minerals but decrease sodium.

Photo by Nicole Pulvermacher.

Table 14 lists the foods that are the most important contributors to each nutrient, ranked in descending order. The main sources of fat (both total and saturated) were processed meats such as cold cuts and sausages, beef and chicken. Together, white bread, cereal and pasta supplied 26% of the iron and 41% of folate in the diet. Margarine, milk and eggs provided 58% of vitamin D in the diet. Wild meats contributed 14% of protein and 14% of iron in the diet. As mentioned above, salt intakes for all age groups and saturated fat intakes for adults aged 19-50 were above the recommended levels. The main sources of salt were processed food: soup, white bread 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, 21% of the 24-hour recalls included at least one traditional food item (Figure 23). 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 than on days that only included market food. It should also be noted that intake of saturated fat, sugar, and sodium (nutrients linked with a variety of diseases) was significantly higher on days when only market food was consumed.

Table 16 shows the top 10 market foods consumed for Saskatchewan. For the longer list of market foods consumed by adults in Saskatchewan, see Appendix K (market foods are organized/coded using the Total Diet Study food codes). There is little variation observed in the types of foods being consumed. Soup was the most popular food consumed by First Nations adults in Saskatchewan. Coffee was the most popular beverage, followed by water and soft drinks, with ¾ of a cup consumed per person per day. When combined with fruit drinks, iced tea and sports drinks, the intake of sugar-sweetened beverages averaged 1 1/3 cups per person per day. It should be noted that sugar-sweetened beverages such as soft drinks, fruit-flavoured drinks, lemonade, sweetened iced tea, sports drinks, and energy drinks can increase the risk of becoming overweight, thereby increasing the risk of diabetes and heart disease (Hu and Malik 2010). Plain water would be a healthier alternative, however, drinking water quality appears to be a barrier to greater consumption as 35% of adults across Saskatchewan did not use tap water for drinking. Short term DWAs were reported in eight communities in the previous year while long term BWAs were reported in three First Nations. There were also elevated levels of aluminum (discolours water), iron and manganese (give water a metallic taste) and sodium (unpleasant taste) in the tap water in some communities which can prevent use (see Section 2: Tap water sampling).

Nineteen percent of adults reported taking a nutritional supplement with higher use among older women and men aged 31-50 (Figure 24). The most commonly reported supplements were vitamin D, multivitamin/mineral supplements, and calcium (Appendix L). In the general population, 47% of adults across Canada and 50% in Saskatchewan report using nutritional supplements (Statistics Canada 2017). 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, 2007).

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 19) prevent greater access. Almost 2 in 5 participants (39%) said that they often or sometimes worried that their traditional food supplies would run out before they could get more (Figure 25). Almost half (45%) of the population also worried that they wouldn't be able to replace their traditional foods when they ran out (Figure 26).

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, 69% contained children under the age of 18 years. In previous FNFNES reports, the percentages of households with children were: 58% (BC), 68% (AB), 74% (Manitoba), 48% (Ontario), and 48% (Atlantic). 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, 39% of households worried that their food would run out before they could buy more, 32% said that the food that they bought didn't last and there wasn't any money to get more and 33% couldn't afford to eat balanced meals. Moreover, 39% of households with children relied on less expensive foods to feed their children and 22% said they couldn't afford to feed their children balanced meals.

Based on the three categories of food security, 37% of First Nations households in Saskatchewan were classified as food insecure: 27% of all households were classified as moderately food insecure and 10% were classified as severely food insecure (Table 18 and Figure 27). Households with children experienced significantly greater food insecurity (41%) (Table 18 and Figure 28) than those without children (25%) (Table 18 and Figure 29). Among households with children, 24% 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 (10% of adults with severe food insecurity vs 2% 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 Aboriginal households off reserve. In Saskatchewan, 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 households and 19.7% of Aboriginal households off-reserve experienced food insecurity while in Saskatchewan household food insecurity was measured at 7.0% (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). The rate of food insecurity among First Nations in Saskatchewan rose to 49% (Figure 30) when this approach was taken.

There appeared to be no difference in the level of food insecurity when stratified by ecozone (Figure 31). However, when stratified by income level, adults on social assistance reported the highest levels of food insecurity (36% moderately and 16% severely) (Figure 32). Moreover, one quarter (25%) of households with at least one adult earning wages reported was food insecure.

Likely, 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 2009). 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 Saskatoon. 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).

Community garden in Fond du Lac Denesuline Nation. Photo by Stéphane Decelles.

The average weekly cost of groceries was $258, compared to $177 in Saskatoon (Figure 33). At the community level, costs ranged from $176 to $479 (results not shown), with prices more than double in the north. To note, the actual food basket costs may be different than reported here as typically at least 1 item was missing in each store while the three most northern stores did not have 10-12 food items on their shelves. 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 Saskatchewan 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 here differ from those reported in *The Cost of Healthy Eating in Saskatchewan 2015* (Saskatchewan Food Costing Task Group 2016). This can be attributed to a few factors including: costing at a different time of year (October versus June), the number of stores costed (14 stores versus 104), the types of stores targeted (discount grocery stores identified as frequented by community members versus a random sample of stores in a geographical area). In 2015, the provincial weekly food basket cost was estimated at $243.64, rising to $440.74 in the Far North and as low as $215.20 in a large city in southern Saskatchewan. Overall, the same trend was seen in both studies: costs were more than double in far northern communities compared to southern Saskatchewan.

Concerns about Climate Change

When asked if they had noticed any significant climate change in their traditional territory in the last ten years, over half (54%) of all participants said that they had (Figure 34). 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 35).

Stanley Mission (Lac La Ronge). 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.

All participating First Nations reported that most households receive treated tap water from a PWS located and operated on reserve lands. Additionally, two First Nations have transfer agreements with other agencies (one municipality, one First Nation) to supply treated water to some households. Lac La Ronge Indian Band is also a joint owner of the Lac La Ronge Regional Water Corporation (2010) which serves First Nation households at La Ronge and residents of the nearby Town of La Ronge and Village of Air Ronge. The water source for most PWS reported is groundwater (10) or groundwater under the direct influence of surface water (GUDI) (two) while six PWS receive surface water (Neegan Burnside Ltd. 2011).

In each First Nation, a series of questions were asked about the water treatment plant and distribution system. The oldest water treatment plant was constructed in 1994 and the most recent was completed in 2014. At the time of data collection, 13 First Nations indicated that their water treatment plant operators had adequate certification. All communities indicated that the water was both filtered (ex. gravity, green sand, multimedia) and disinfected (automatic chlorine injector system). One community indicated that ozonation was also used for disinfection. Chemicals reported to be used for water treatment included: sodium hypochlorite, chlorine and potassium permanganate, soda ash, powdered activated carbon. Nine First Nations reported challenges in the past year related to maintenance/repair services or procuring required supplies and/or replacement parts. Seven communities reported that their water treatment plant needed upgrades: one community indicated that their system was being upgraded. In terms of the water distribution system, most communities indicated that the pipes were made of plastic of the following types: high density polyethylene (PE), polyvinyl chloride (PVC) or acrylonitrile butadiene styrene (ABS). In terms of water storage reservoirs, five communities reported large tanks at the treatment plant and eight communities indicated that there were water storage tanks at individual homes.

With respect to water availability and bacteriological safety, water disruptions and drinking water advisories (DWA) occurred in 11 of the systems serving communities in the 12 months preceding the study. Water disruptions were reported to have occurred due to power outages, filtration system breakdowns, broken watermains, insufficient pressurization, the need to divert water for firefighting efforts, cleaning of the lines, or water truck delivery stoppages. Short term DWAs were reported in eight communities, lasting between 1 and 17 days. Long term boil water advisories (BWAs) lasting more than two years were reported in three First Nations. Additionally, one First Nation reported that some of the households on an IWS were on a BWA. As of May 2018, long term BWAs remain in effect in two First Nations.

Table 19 reports the characteristics of all First Nations households and plumbing systems in Saskatchewan. At the time of the study, the average age of a home was reported to be 21 years with the oldest house in the study being built in 1950 and the newest house in 2015. A total of 26% of households had upgraded plumbing, 21% of households treated their water (mainly by using filters or boiling it) and 26% had water storage tanks, mainly located outside of the home. Over half of the households (56%) had plastic pipes under their kitchen sink, while 14% had plastic with metal fittings and 12% had metal pipes attached to PEX or flex lines.

Figure 36 shows that almost all participants have tap water, however, only 65% use it for drinking while 90% use it for cooking. Ninety-one percent of households reported that the source of their drinking water was the FN PWS, while 8% were on an IWS (Figure 37). In households where tap water was not used for drinking or cooking, bottled water was the common replacement used (Figure 38). The main deterrents reported for not using the tap water included the lack of confidence in the water quality, taste, preference for other beverages, a BWA and smell (Figure 39). Of the participants who drink the tap water in their homes, 21% treated it, mainly by boiling it or with filters (Figure 40). In four of the 14 communities, fewer than 65% of respondents reported using the tap water for drinking.

Almost half (48%) 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 41). As for cooking water, this figure rose to 78% (Figure 42). 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 6 to 20 households in 14 of the participating communities (17 was the average number of samples). It is the standard protocol to invite up to 20 households in each community to provide tap water samples for analysis. A total of 234 of a planned 280 household sampling plan participated in the tap water sampling component. There were two 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:

- 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 234 households, exceedances of metals of public health concern were found in 2.6% (6/234) homes. An exceedance is determined if the levels are above the MAC in the flushed sample (not the first draw). Three households had elevated levels of arsenic in the first draw with **two** exceedances in the flushed samples. Three households had elevated levels of lead in the first draw with **one** in exceedance in the flushed sample. Selenium had an elevated first draw sample and flushed sample exceedance for one household. Lastly, two households had elevated levels of uranium, in the first draw and exceedances in the flushed samples.

Arsenic: One community had arsenic above the guidance value of 10 ug/L.

- Three households in two Prairies communities had first draw sampling levels ranging from 11 to 14 ug/L. Following a five-minute flush, there were two exceedances in one community. One household had an elevated level of 12 ug/L in the flushed sample and a second household had an elevated level in the duplicate flushed sample. These results indicate that, in the homes where levels remained elevated after flushing, the water should not be used for drinking or cooking. In the home that had an acceptable level after flushing, the water needs to be run for several minutes before used for drinking or cooking purposes. This information was communicated to the Chief and Council. A new water treatment system will be installed in the near future that will remove arsenic from the community's water.

Lead: One community had lead above the guidance value of 10 ug/L.

- In one Boreal Plains community, one household had an elevated lead level in the first sample taken (44 ug/L). Following a five-minute flush, the lead level remained above the guideline with a level of 22 ug/L. Tap water should not be used for drinking or cooking in homes where the lead level remains above the guideline after flushing. This information was communicated to the Chief and Council.
- In one Prairies community, one household had an elevated lead level in the first sample taken of 11ug/L. Following a five-minute flush, the level was acceptable. In homes which have an acceptable level of metals after flushing, tap water should be flushed for several minutes before use. This information was communicated to the Chief and Council.

Selenium: One community had selenium above the guidance value of 50 ug/L.

- One household in a Prairies community had a first-round sampling level of 79 ug/L. Following a five-minute flush, this household still had a level of 76 ug/L. This indicates that water in this household should not be used for drinking or cooking purposes. This information was communicated to the Chief and Council.

Uranium: One community had uranium above the guidance value of 20 ug/L:

- Two households in a Prairies community had first draw sampling levels ranging from 29 to 30 ug/L. Following a five-minute flush, the levels were still above guideline ranging from 28 to 46 ug/L). This indicates that water in these households should not be used for drinking or cooking purposes. This information was communicated to the Chief and Council.

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

Five metals had concentrations above the aesthetic guidelines of the Canadian Guidelines of Drinking Water Quality (Health Canada, 2017). The results of water sample testing for metals with OG and AO values in drinking water are listed in Table 21.

Aluminum: Three communities had aluminum levels above the guidance value of 100 µg/L:

- Seven households in a Boreal Shield community had first round sampling levels ranging from 111 -141 µg/L. Following a 5-minute flush, seven households still had elevated levels of 105 – 144 µg/L.
- Two households in two communities in the Boreal Plains had first round sampling levels ranging from 150 -194 µg/L. Following a 5-minute flush, two households still had elevated levels of 108 – 196 µg/L.

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

Copper: One community had copper levels above the guidance value of 1,000 ug/L:

- One household in each of five Boreal Plains communities had first round sampling levels ranging from 1,070 -5,130 µg/L. Following a 5-minute flush, no households had elevated levels.
- One household in a Prairies community had first round sampling of 1,260 ug/L. Following a 5-minute flush this household still had an elevated level of 1,190 ug/L.

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

Iron: Two communities had elevated levels of iron above the guideline of 300 µg/L:

- In two communities in the Boreal Plains, one household had an elevated first draw between 370 – 2,910 µg/L. Following a 5-minute flush, both households still had elevated levels ranging from 1,960 – 2,790 µg/L.
- One household in a community in the Prairies had an elevated first draw level of 580 µg/L.

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

Manganese: Five communities were found to have elevated levels of manganese above the aesthetic objective of 50 µg/L:

- Five households from three communities in the Boreal Plains had first round sampling levels ranging from 58 – 175 µg/L. Following a 5-minute flush, four households still had elevated levels of 93 – 157 µg/L.
- Nine households from two communities in the Prairies had first round sampling levels ranging from 64 – 3,130 µg/L. Following a 5-minute flush, 12 households had elevated levels of 83 – 3,250 µg/L.

While there are no health concerns, the Chief and Council, the Department of Indigenous Services 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:

- 18 households from one community in the Prairies had first round sampling levels ranging from 630,000 – 766,000 µg/L. Following a 5-minute flush, these 18 households still had elevated levels of 629,000 – 698,000 µg/L.

While there are no health concerns, the Chief and Council, the Department of Indigenous Services 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. In total, chlorine was measured from water samples in 219 households. Sixty-one samples had levels of free chlorine below the minimal level of disinfection: free chlorine was not detected in 23 of the tap water samples. Only 10 of these samples were taken from an IWS, which may not have chlorine added. Therefore, in at least 23% (51/219) of tap water samples, where chlorine is actively being used as a disinfectant, levels are inadequate.

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 measured in 223 of the 280-household sampling plan. In 10 communities, all tap water samples were within the acceptable range. In four communities the pH level was slightly acidic at 6.2 in some of the tap water samples.

Tanja Head, Shoal Lake First Nation. Photo by Carol Armstrong-Monohan.

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). Temperature levels were measured in 219 households and revealed that 82% of tap water samples had temperature levels within the optimal range. In total, 18 samples had high temperature readings. These higher temperature readings may be due to hot water mixing with the cold when sampling at the tap or if drinking water is stored in a tank located indoors.

Surface Water Sampling for Pharmaceuticals

James Smith Cree Nation. Photo by Mohamad ElRafihi.

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; Kone, 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).

In all, 52 samples were collected at 39 sampling sites (36 surface water sites and 3 wastewater sites in 2 communities) in 13 First Nations communities in Saskatchewan region. Eleven communities chose three surface water sites for testing. Two communities chose to test at one to two wastewater sites. Pharmaceuticals were found in 28/36 surface water sites and 3/3 wastewater sites. In all, pharmaceuticals were found in 12 of the 13 communities. The results of the pharmaceuticals component of the FNFNES study in Saskatchewan are summarized in Table 23 at the regional level and separately for the Boreal Shield, Boreal Plains and Prairies. As in the other sections, results for the Taiga Shield are not presented. Overall, there were 27 distinct pharmaceuticals found: 17 pharmaceuticals were detected in surface water in 12 communities and 26 were detected in wastewater sampled in two communities.

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

Pharmaceuticals Detected by Type and Prevalence in Surface water

The 17 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.

Cimetidine is an ulcer medication and was the most prevalent pharmaceutical detected in surface water. It was detected in nine of the 13 communities sampled and 24 of the 36 surface water sites. Cimetidine is not on the list of medications prescribed in the communities where it was found (Booker and Gardner 2015).

Cotinine (a metabolite of nicotine) was the second most prevalent pharmaceutical detected. It was detected in eight of the 14 communities and 12 of the 36 surface water sites sampled in Saskatchewan. An average of 80% of nicotine that is consumed by people is excreted as cotinine. However, although nicotine is prescribed (e.g. smoking cessation products, such as patches and gum) in one of the communities where it was detected (Booker and Gardner 2015), its presence most probably reflects tobacco use.

Caffeine was detected in eight of the 13 communities sampled and nine of the 36 surface water sites sampled throughout the province. Caffeine is a component of one of the most highly prescribed pharmaceuticals in First Nations in Saskatchewan (Booker and Gardner, 2015). The top ten pharmaceutical prescribed in most First Nation communities in Canada is: Acetaminophen/caffeine/codeine (Tylenol No. 1). It is also present in many coffees, teas, soft drinks, energy drinks, and foods containing chocolate.

Metformin is an antidiabetic medication that was detected in three of the 13 communities and in three of the 36 sites sampled throughout the province. Metformin was one of the top seven prescribed medications in 2011, 2012, 2013, 2014 and 2015 in the all but one (4/5) communities where it was detected (Booker and Gardner 2015).

Carbamazepine was detected in four of the 13 communities sampled and in four of the 36 surface water sites. Carbamazepine is a medication prescribed as an anticonvulsant and mood stabilizer. It is a potential endocrine disrupting chemical. Carbamazepine is not highly prescribed in Saskatchewan. From 2011 to 2015 it was only prescribed in one of the communities it was detected (Booker and Gardner, 2015).

Sulfamethoxazole, an antibiotic used to treat urinary tract and respiratory tract infections was found in three of the 13 communities and in three of the 36 sites sampled throughout the province. Sulfamethoxazole is moderately prescribed in Saskatchewan. From 2011 to 2015 it has ranged from the top 59th to as high as the top 16th prescribed medication in the communities it was detected (Booker and Gardner, 2015).

Ketoprofen is an arthritis and pain medication that was detected in three of the 13 communities sampled and two of the 36 surface water sites sampled throughout Saskatchewan. Ketoprofen is not a prescribed pharmaceutical in the communities where it was found (Booker and Gardner, 2015).

Acetaminophen, a pain reliever and a fever reducer, was detected in two communities at two sites. From 2011 to 2015 it was ranked within the top 5 prescribed medications in the communities where it was detected. Acetaminophen is also a component of one of the top prescribed pharmaceuticals in Saskatchewan First Nations (Tylenol No. 1) (Booker and Gardner, 2015).

Naproxen, a pain reliever and a fever reducer, was detected in two communities at two sites. Naproxen was the top 19th pharmaceutical prescribed in the two communities where it was detected (Booker and Gardner, 2015).

Clarithromycin, an antibiotic used to treat bacterial infections such as strep throat and pneumonia was found in one community at one site. Clarithromycin is not highly prescribed in Saskatchewan. It was the top 42nd prescribed medication in the community it was detected (Booker and Gardner, 2015).

Bezafibrate is a cholesterol medication that was detected in one community at one site. Bezafibrate is not a prescribed medication in Saskatchewan (Booker and Gardner, 2015).

Gemfibrozil is a cholesterol medication that was detected in one community at one site. Gemfibrozil is not a prescribed medication in the Saskatchewan First Nation community (Booker and Gardner, 2015).

Metoprolol is a blood pressure medication that was detected in one community at one site. Metoprolol is a highly prescribed medication in Saskatchewan and was the top 24th pharmaceutical prescribed in the community it was found (Booker and Gardner, 2015).

Trimethoprim is an antibiotic medication used to treat bladder and ear infections that was detected in one community at one site. Trimethoprim is a moderately prescribed medication in Saskatchewan and was the top 59th pharmaceutical prescribed in the community it was found (Booker and Gardner, 2015).

Codeine is a pain and cough relief medication that was detected in one community at one site. Codeine is a highly prescribed medication in Saskatchewan and was the most prescribed in the community it was found (Booker and Gardner, 2015).

Clofibric Acid is a cholesterol medication to reduce risk of heart attack and/or stroke. It was detected in one community at one site. Clofibric Acid is not a prescribed medication in Saskatchewan First Nations communities (Booker and Gardner, 2015).

Atenolol was detected in one community and one of the 36 surface water sites. Atenolol is a heart medication that is minimally prescribed in Saskatchewan. It was the top 92nd pharmaceutical prescribed in the community it was found (Booker and Gardner, 2015).

Pharmaceuticals Detected in Wastewater by Type

Two communities requested that their wastewater be tested for the presence of pharmaceuticals. Wastewater samples were taken from three sites: two lagoons and one dump pond. In the wastewater, twenty-six pharmaceuticals were detected.

Analgesic/Anti-inflammatory:

- Acetaminophen was found in both communities in the garbage dump water and the lagoon
- Diclofenac was found in one lagoon
- Ibuprofen was found in all three sites tested
- Ketoprofen was found in the garbage dump water and lagoon of one community

Antibiotic:

- o Ciprofloxin was found in both lagoons
- o Clarithromycin was found in all three sites tested
- o Erythromycin was found in one lagoon
- o Sulfamethoxazole was found in all three sites tested
- o Trimethoprim was found in all three sites tested

Antacid:

- o Cimetidine was found in all three sites tested
- o Ranitidine was found in both lagoons

Antidiabetic:

- o Metformin was found in all three sites tested

Antihypertensive (Beta-blocker):

- o Atenolol was found in one lagoon
- o Metoprolol was found in all three sites tested

Antihypertensive:

- o Diltiazem was found in one lagoon

Anticoagulant:

- o Warfarin was found in the garbage dump water and lagoon of one community

Anticonvulsant:

- o Carbamazepine was found in all three sites tested

Antihistamine:

- o Diphenhydramine was found in one lagoon

Diuretic:

- o Furosemide was found in one lagoon
- o Hydrochlorothiazide was found in all three sites tested

Analgesic:

- o Codeine was found in both lagoons

Lipid Regulator:

- o Clofibric Acid was found in the garbage dump water
- o Gemfibrozil was found in all three sites tested

Stimulant:

- o Caffeine was found in all three sites tested

Metabolite of nicotine:

- o Cotinine was found in all three sites tested

Overview of Pharmaceuticals Detected by Ecozone

The results of the pharmaceuticals found in the Boreal Shield, Boreal Plains and the Prairies ecozones in Saskatchewan are summarized in Table 23.

Boreal Shield: Two communities were sampled

In surface water, five pharmaceuticals were detected:

- Analgesic/Anti-inflammatory: Ketoprofen
- Antibiotic: Sulfamethoxazole
- Antacid: Cimetidine
- Anticonvulsant: Carbamazepine
- Stimulant: Caffeine

Boreal Plains: Seven communities were sampled

In surface water, 14 pharmaceuticals were detected:

- Analgesic/Anti-inflammatory: Ketoprofen
- Antibiotics: Clarithromycin, Sulfamethoxazole and Trimethoprim
- Antacid: Cimetidine
- Antidiabetic: Metformin
- Antihypertensives (Beta-blockers): Atenolol and Metoprolol
- Anticonvulsant: Carbamazepine

- Analgesic: Codeine
- Lipid Regulators: Bezafibrate and Gemfibrozil
- Stimulant: Caffeine
- Metabolite of nicotine: Cotinine

Prairies: Four communities were sampled

In surface water, nine pharmaceuticals were detected:

- Analgesics/Anti-inflammatory: Acetaminophen, Ketoprofen and Naproxen
- Antacid: Cimetidine
- Anticonvulsant: Carbamazepine
- Antidiabetic: Metformin
- Lipid Regulator: Clofibric Acid
- Stimulant: Caffeine
- Metabolite of nicotine: Cotinine

In wastewater, 26 pharmaceuticals were detected:

- Analgesic: Codeine
- Analgesics/Anti-inflammatory: Acetaminophen, Diclofenac, Ibuprofen, Ketoprofen and Naproxen
- Antacids: Cimetidine and Ranitidine
- Antibiotics: Ciprofloxin, Clarithromycin, Sulfamethoxazole and Trimethoprim
- Anticoagulant: Warfarin
- Anticonvulsant: Carbamazepine
- Antidiabetic: Metformin
- Antihistamine: Diphenydramine
- Antihypertensives (Beta-blockers): Atenolol and Metoprolol
- Antihypertensive: Diltiazem
- Diuretic: Hydrochlorothiazide
- Lipid Regulator: Clofibric Acid and Gemfibrozil
- Stimulant: Caffeine
- Metabolite of nicotine: Cotinine

FNFNES Saskatchewan 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). This pharmaceutical was not detected in the surface water of First Nations communities in Saskatchewan. The European Commission (EC) has proposed a freshwater Environmental Quality Standard of 0.035 ng/L for Ethinylestradiol. No Saskatchewan site detected Ethinylestradiol. The EC has also proposed a freshwater Environmental Quality Standard of 100 ng/L for Diclofenac. Diclofenac is moderately prescribed in Saskatchewan and was prescribed in all but one (13/14) of the Saskatchewan FNFNES communities in 2015. Diclofenac was detected in the wastewater samples of two Saskatchewan FNFNES communities; however, no surface water samples of any Saskatchewan FNFNES community detected diclofenac.

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 16 of the pharmaceuticals found in surface water of Saskatchewan: acetaminophen, bezafibrate, caffeine, carbamazepine, cimetidine, clarithromycin, clofibric acid, codeine, cotinine, gemfibrozil, ketoprofen, metformin, metoprolol, naproxen, sulfamethoxazole and trimethoprim (Australian guidelines for Water Recycling 2008). In addition, the state of California has developed Monitoring Trigger Levels (MTLs) for potable water reuse for 11 of the pharmaceuticals found in Saskatchewan: acetaminophen, atenolol, caffeine, carbamazepine, clofibric acid, gemfibrozil, ketoprofen, metoprolol, naproxen, sulfamethoxazole and trimethoprim (Anderson, et al. 2010). The state of New York has established standards for: acetaminophen, caffeine, cotinine, carbamazepine and sulfamethoxazole (New York City Environment Protection 2011). No Saskatchewan FNFNES samples exceeded these guideline levels. The comparison of the Saskatchewan results to drinking water guidelines in Australia, California and New York is provided in Table 25.

The concentrations of the pharmaceuticals found in the Saskatchewan FNFNES study should not pose a threat to human health. In several communities there are as many as 12 pharmaceuticals in the surface water. It is unknown at this time the health effects from drinking the water from these surface water sites over a prolonged period.

Mercury in Hair Results

Of the 1042 FNFNES adult participants in Saskatchewan, 555 agreed to have their hair sampled and tested for mercury. This represents about 53% of the respondents to the household surveys. Therefore, mercury component weights were calculated based on data from 555 actual First Nations participants. The weighted results are presented in Table 26.

Health Canada has a mercury guideline of 2 µg/g in hair (8 ppb mercury in blood) for women of childbearing age (19-50) and children (0-18). The guideline is higher at 6 µg/g in hair for adult males and older women (20 ppb mercury in blood). In the entire sample there were seven exceedances (two males in the 51-70 age category and five females of childbearing age) of the Health Canada mercury biomonitoring guidelines (1.3% of the sample). An exceedance was reported if any of the three individual hair segments analysed for a three-month period was above the guidelines.

The arithmetic mean of mercury concentration in hair among the First Nations population living on-reserve in Saskatchewan (sample data weighted) was 0.30 µg/g, while the geometric mean was at 0.10 µg/g. However, as more than 40% of the sample was below the level of detection (LOD), these means are biased. The only weighted means with the LOD below 40% were for the age category of 51-70 (which is expected to have higher exposure), with an arithmetic mean of 0.47 µg/g (CV=24%, thus the estimate should be used with caution) and a geometric mean of 0.13 µg/g (CV=18%). For women of childbearing age (19-50 age category), the means also can not be used, as about 45% of the sample was below the LOD.

The distribution of mercury in hair, among the 90th and 95th percentile of First Nations adults living on-reserve in Saskatchewan (presented in Table 26) indicate that, at the population level, mercury body burden is below the established Health Canada mercury guideline of 6 µg/g in hair (1.33 µg/g +/- 0.23). The data also suggest that the exceedances of the guideline could be expected in the 95th percentile of First Nations males in the 51-70 age category. The entirety of the weighted data is characterized by high variability, coupled with a large proportion of the sample in different age categories in both genders that tested below the LOD.

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 Taiga Shield as previously mentioned. Figures 43a-c and 44a-c, which depict average mercury levels in hair for a three-month period illustrate that the northern ecozone (Boreal Shield) is characterized by a greater frequency of higher exposures to mercury in comparison with the Boreal Plains and Prairies. Out of the 57 women of childbearing age from the northern ecozone who provided a hair sample, four exceeded the 2 µg/g mercury guideline at least once over the three-month period measured. This represents 7% of the sample and suggests that mercury risk communication should be focussed on the First Nations women of childbearing age residing in the northern ecozone. In general, however, FNFNES results suggest with some certainty that at the First Nations population level across Saskatchewan, mercury exposure is not a significant health issue. Nevertheless, further community-based, possibly intervention, study of women of childbearing age living in northern ecozones may be beneficial to both investigate the prevalence of higher mercury exposures and to provide coherent risk communication and nutritional advice.

Traditional Food Contaminant Results and Risk of Exposure

A total of 967 food samples representing 49 different types of traditional foods were collected for heavy metals and persistent organic pollutants analyses. To estimate the daily contaminant intake from traditional food, the amount of traditional food consumed per day by First Nations in Saskatchewan (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 (95th percentile intake/PTDI). Due to the susceptibility of the fetus to mercury toxicity, the PTDI for women of childbearing age is lower than for women over 50 and adult males: hence for mercury, the HQ is calculated separately for women of childbearing age. 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 Saskatchewan 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 undertaken for all adults (Table 29) and separately for mercury for women of childbearing age (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-d, Table 32).

Arsenic: Overall, caribou and whitefish were the main traditional food sources of arsenic (Table 28a). For both the average (mean/PTDI) and the high traditional food consumers (95th/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, rabbit, caribou and deer) and liver (moose and caribou). 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 (grouse, goose and duck) and game meat (muskrat, moose, rabbit). The main traditional food contributors of lead in the diet were grouse, moose and goose (Table 28c). The finding of lead in meat samples is likely due to residuals from lead-containing ammunition. 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 market 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 pike (jackfish) and walleye (pickerel). 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 pike, walleye and trout (Table 28d).

For the adult population, both the average (average/PTDI) and high (95th percentile/PTDI) HQ values for mercury were lower than 1, therefore the risk of harm is negligible based on current consumption (Table 29). Table 30 shows the exposure estimates for mercury for women of childbearing age. Due to the susceptibility of the fetus to mercury toxicity, the PTDI for women of childbearing age (as well as teenagers and children) is lower at 0.2 µg/kg/day. The HQs for both the average and the high traditional food consumers (95th percentile intake) using the average and maximum mercury concentrations in food were below 1, which means that the risk of mercury exposure is low.

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

The risk of exposure to metals from traditional food are generally low for traditional food consumers at the regional level (Table 31a). A similar low risk was found among participants in the two southern ecozones, the Boreal Plains (Table 31c) and the Prairies (Table 31d). An elevated risk of exposure to **lead** and **mercury** from traditional food was seen for **high** traditional food consumers in northern Saskatchewan, in the Boreal Shield (Taiga Shield results

are not presented here due to confidentiality). The elevated risk of exposure to **lead** was caused by both a higher intake of birds in this ecozone (30.4 grams, Table 10a), as well as a higher **maximum** concentration in wild birds (Table 27). An elevated risk of exposure to **mercury** among high consumers was found using **either** the mean or the maximum concentration from food samples. This is due to the much higher intake of fish, particularly predatory fish species (Table 10a-d). Among women of childbearing age who are high consumers, there was an increased risk of exposure both across Saskatchewan and in the Boreal Shield (Table 32) due to their higher fish intake.

The results of mercury exposure estimates based on dietary information was confirmed by the results of the hair mercury biomonitoring. We found a higher number of cases of WCBA exceeding the hair mercury guidelines in the Boreal Shield than in the other two ecozones. The relationship between the estimated dietary mercury exposure from traditional food and hair mercury levels was investigated using correlation analyses. Dietary intake of mercury was correlated with hair mercury for all adults (Pearson correlation coefficient=0.39) (Figure 45) and for women of childbearing age (Pearson correlation coefficient=0.23) (Figure 46). To minimize the risk of exposure to mercury, it is suggested to follow local fish advisory information available from the Government of Saskatchewan. Mercury in Saskatchewan Fish: Guidelines for Consumption Updated to 2015 can be found online under the Ministry of Environment's website, under the topic of Angling, within Fish populations, Management and Research. The general inquiry line can also be reached at 1-800-567-4224.

Persistent Organic Pollutants

Polycyclic Aromatic Hydrocarbons (PAHs): Table 33 presents the concentrations of polycyclic aromatic hydrocarbon (PAH) in selected traditional food samples from Saskatchewan. The highest levels were found in smoked whitefish and smoked moose samples. 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

Carla Burns, James Smith Cree Nation. Photo by Lacy Eggerman.

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 lake trout. The reason for these higher concentrations is unknown but there is no concern with exposure to PBDEs from any of the samples analyzed.

Perfluorinated compounds (PFCs): Table 36 presents the concentration of perfluorinated compounds (PFCs) in selected traditional foods. The highest concentration was found in the caribou liver samples. 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).

COMMUNITY INPUT

This report would not have been possible without the commitment and participation of the First Nations across the Saskatchewan 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 national coordinator and the lead nutrition research coordinator worked with participating First Nations in Saskatchewan to organize a results verification presentation. Each First Nation hosted either a Principal Investigator or another FNFNES team member, who presented the community's results in November 2017. 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 representatives from Chief and Councils, health centres and land and resources boards participating.

Following each presentation, discussions were focused on answering community questions, verifying that the reports and accompanying documents met expectations and gaining 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?

Community Reports:

Participating communities perceived that most results 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. The participants at one First Nation commented that self-reported diabetes appeared too low. Water quality results also generated discussion; some asked for more frequent water testing and other community members perceived that drinking water sources conveyed in the report were not always an accurate representation of what sources communities were actually using for drinking. When discussing future research many participants felt the need for more environmental research (eg. climate change, water quality, impact on traditional food, agricultural contaminants).

Community Programs:

At a number of presentations, ideas were generated to assist community members in improving their overall health with an emphasis on engagement in both cultural and physical activities that could improve health and food security. Suggestions included offering culture camps to First Nation members on a regular basis as well as a hunting subsidy to address financial barriers to acquiring traditional foods. Community farms, greenhouses, cooking classes and food banks were presented as a range of solutions to increase both access and use of a greater variety of foods often absent in the diet. One group of respondents requested resources that could help to reduce the risk of contaminant exposure.

Suggestions for communicating relevant FNFNES results included a radio-based discussion of the survey results as well as translation into their native language.

Many attendees indicated that results, especially from the 4-page summary, will be shared via social media. Many respondents liked the survey results summary for its concise nature and ease of use.

Nutrition:

Once briefed on the nutrition survey results, participants had an opportunity to share what they thought might facilitate better nutritional outcomes. One group discussed how more support, such as educational resources and financial aid, was needed to encourage individuals to select healthier foods. Another respondent highlighted the need for local food resources, such as community gardens and other potential sources of local food. The creation of a traditional food bank was also discussed as a possible solution to encourage individuals to consume more traditional foods. One group of respondents noted that increased teachings on how to properly harvest traditional foods could be beneficial for increasing traditional food usage.

Some communities hoped to use the information provided to seek more funds for local gardening/agricultural projects. One community identified inadequate funding as a barrier to local production and consumption of more nutritious foods. Other participants discussed how the results may assist their program planning. The survey results were viewed by one community as a beneficial tool in seeking funding for traditional food harvestings and nutritional programming. One person indicated from their First Nation's results that they were glad that the numbers reflected the quality of traditional foods.

Photo by Carol Armstrong-Monohan

Environment:

One community was planning to use the FNFNES environmental data as a baseline for future comparison. One respondent commented that it would be good to see educational resources that indicated ways to reduce risk of contaminate exposure. Another saw the use of pesticides and herbicide applications by surrounding farms as a deterrent to the development of local produce. Some participants noted that due to climate change, the migratory patterns of some animals appear to have changed. This presented additional problems for First Nation food security as those animals became harder to find/harvest. Some respondents were pleased with the results of their water analysis results while other expressed concerns.

Next Steps:

One community stated they did not want more baseline surveys but were interested in intervention research. One community wished to see a study that would monitor household air quality. Other suggestions included the need for research on pesticides, herbicides, and parasites in traditional foods, regular water quality analysis, ground water analysis and a repeat of the FNFNES study in 5 to 10 years. Other respondents would like to see land surveys conducted to map traditional territory and more research on food security to better understand its correlates. Another group of respondents wanted more research to help better understand the contributive factors to illness. Others wanted annual studies that included a qualitative component which interviewed elders about traditional foods and the environment. One group also wanted to see more research done on waste management, climate change, and growing food year-round and possible research about hydroponics given the local climate.

Being responsive to feedback from First Nation communities 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 communities, 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.

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 Saskatchewan 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 Saskatchewan. Participants' own comments about the relevance of traditional food for well-being are found in Appendix N.

Food insecurity, obesity, smoking and diabetes are major health issues across Saskatchewan. The diet does not meet nutrition needs; there are excess intakes of saturated fat and sodium (salt), and inadequate intakes of fibre, vitamin A, vitamin B6, vitamin C, vitamin D, calcium, magnesium and folate. 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.

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 communities are working to improve food security and nutrition through initiatives aimed at addressing both short term relief (food banks, school feeding programs, food giveaways, bulk buying programs, community harvests) and capacity building through community agriculture (from assistance in private garden preparation (roto-tilling, provision of seeds, soil), to garden towers in classrooms to community gardens, to greenhouses that sell local produce with proceeds supporting living wages for workers and maintenance costs), as well as intergenerational skills training related to both the traditional food system (harvesting techniques, culture camps, food safety, food processing and food preservation (smoking/canning/drying) and cooking meat and berries), and market food system (healthy cooking, food safety, canning). Funding is pulled together for these activities from several sources including: the Canada Prenatal Nutrition Program, the Aboriginal Diabetes Initiative, the Department of Indigenous Services Canada, provincial agencies or charities. Additional activities not mentioned already that also have the potential to improve nutrition and food security in First Nations communities include: grants to support hunter safety training and direct subsidies on supplies for traditional food harvesting (gas, non-lead ammunition, fish lures).

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* (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 for First Nations Communities provides an expanded list of appropriate foods for all kinds of community settings. Appendix O of this report, adapted from the Healthy Food Guidelines, contains a listing of the types of foods to serve (and not serve) at community events. Additionally, a key means of improving nutrition lies in altering policies to ensure that traditional foods can be served in schools, Aboriginal head start programs and other settings as a means of increasing access and introduction to foods which may not be available at home. The employment of registered dietitians working in Indigenous communities has increased support for food security initiatives in Saskatchewan through awareness, skill building and advocating for a more food secure community. Registered dietitians can work with Indigenous communities as allies in addressing food security interventions prioritized by the Tribal Council or First Nation.

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, both gaps in stable funding and/or capacity are a chronic barrier to adequately support community food and nutrition activities. The endemic need to hunt for additional funds (grant writing, raffles, etc) and in-kind donations or partnerships with other organizations to address these fundamental needs is troublesome. Both further work, and stable and dedicated funding is needed to reduce the gaps revealed in this report.

In addition to food security, issues of food sovereignty have been identified. Many First Nations have reported that they have limited ability to control what foods are available for purchase in the communities. Others have reported various restrictions on traditional food harvest. Self-determination and respect for Inherent 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, 23% of samples had inadequate levels of free chlorine levels while 18% of temperature readings were outside the optimal range. Many adults reported using water from both the hot water and cold-water taps for drinking (31% of total participants) and cooking (70% 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 food.

The levels of pharmaceuticals found in the surface water in Saskatchewan 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 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. However, elevated lead concentrations were commonly found in wild bird (such as grouse, goose and duck) and game meat (such as muskrat, moose and rabbit), 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 (ie. 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.

Both the hair sampling and diet estimate results showed that there is minimal concern for mercury exposure at the First Nations population level across Saskatchewan. Only seven individuals exceeded the guidelines at least one time during a three-month period. However, both the level of exceedances, at **7%** among women of childbearing age living in the Boreal Shield, and the limited number of hair samples, do suggest that further community-based studies of women of childbearing age 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 the next five or ten years.

Highlights of results:

1. The diet of First Nations adults in Saskatchewan 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. Mercury exposure, as measured in hair samples and calculated through dietary estimates, is low and is not a health concern. Of all 555 Saskatchewan region samples, only seven (**1.3%**) had mercury levels above Health Canada guidelines. However, exceedances among women of childbearing age living in the Boreal Shield suggest that mercury risk communication should be focused on this population group and further community-based study of women of childbearing age living in northern ecozones may be beneficial.
6. 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 low and is not a health concern.
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 Saskatchewan can be found in Appendix P.

TABLES AND FIGURES

Sample Characteristics

Table 1. Participating First Nations communities in Saskatchewan

Ecozone	Name of participating community	Number of participants	Driving distance to City/ service centre (INAC)	Access	Registered 2015 population total / on-reserve*	Number of homes in communities
Taiga Shield	Fond du Lac Denesuline First Nation	92	920 Km N of Prince Albert	Fly-in. Summer-Boat Winter-Ice road	1,958/ 1,108	205
Boreal Shield	Black Lake Denesuline First Nation	69	890 Km N of Prince Albert	Fly-in. Road to Stony Rapids hamlet. Winter road	2,075/ 1,604	228
	Lac La Ronge Indian Band (Grandmother's Bay, Sucker River, Stanley Mission)	94	260-330 km N of Prince Albert	Year round road access	10,385/ 6,484	1,497
Boreal Plains	Lac La Ronge Indian Band (La Ronge, Hall Lake, Little Red River)	79	173 km W of Prince Albert			
	Pelican Lake First Nation	85	325 NW of Saskatoon, 51 km N of Lloydminster	Year round road access	1,616/ 1,217	186
	Onion Lake Cree Nation	79	72 km NW Prince Albert	Year round road access	5,892/ 3,787	840
	Ahtahkakoop Cree Nation	57	117 km SW of The Pas, MB	Year round road access	3,463/ 1,850	420
	Shoal Lake Cree First Nation	64	67 km NW of Prince Albert	Year round road access	991/ 856	103
	James Smith Cree Nation	98	275 km NE of Regina, 86 km NE of Yorkton	Year round road access	3,391/ 2,057	255
	The Key First Nation	51	96 km SW of Prince Albert	Year round road access	1,301/ 311	56
Prairies	Muskeg Lake Cree Nation	49	96 km SW of Prince Albert	Year round road access	2,054/ 371	125
	Beardy's and Okemasis First Nation	96	118 km N of Saskatoon	Year round road access	3,325/ 1,198	319
	Mosquito, Grizzly Bear's Head, Lean Man First Nation	42	142 km NW of Saskatoon, 6 km SE of North Battleford	Year round road access	1,360/ 779	134
	White Bear First Nation	87	216 km SE of Regina, 183 SE of Yorkton	Year round road access	2,628/ 909	185

*(First Nations and Inuit Health (FNIH), Personal communication. 2016)

Figure 1. Map of participating First Nations communities in Saskatchewan

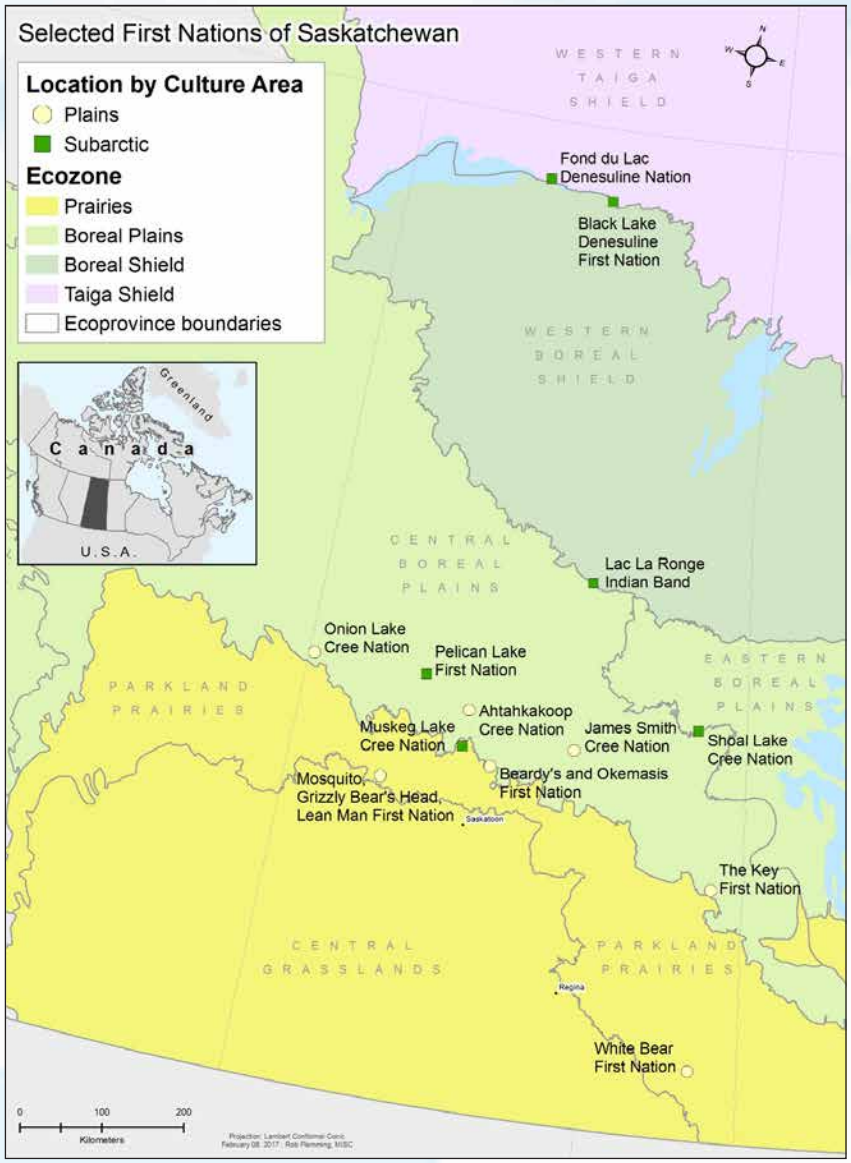


Table 2. Number of First Nations households surveyed and participation rate

Sampling characteristics		All participating First Nations in Saskatchewan
On-reserve and crown land Registered population 2015[a]		22,531
On-reserve Registered population 2014, 19 years+[a]		13,387
No of occupied households (HHs)		4,553
No. of HHs selected to participate[b]		1,673
Targeted survey completion		1,400
No. of HHs contacted		1,343
Not eligible		8
Reason for non-eligibility		deaf, mute, underage, not First Nations, unable to understand
No. of vacant homes		27
No. of eligible HHs		1,244
HH Non-response	Refused	139
	Accepted but no survey	33
	No. of incomplete records	30
No. of HHs (participants) that participated (complete records[c])		1,042
No. of participating females		721
No. of participating males		321
HH Participation rate (# of participating HHs/ # eligible HHs)		**83.8%**

[a] (First Nations and Inuit Health (FNIH), Personal communication. 2016). Non-published information as of December 31, 2015 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

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

Socio-demographic Characteristics

Table 3. Average age (SE) of participants

Gender	Boreal Shield (n=155)	Boreal Plains (n=486)	Prairies (n=272)	First Nations adults in Saskatchewan (n=1042)
Women	33 (8.1)	40 (1.8)	46 (1.6)	42 (1.9)
Men	36 (6.0)	42 (1.6)	46 (3.0)	43 (1.8)

Figure 2a. Percentage of female respondents in each age group across Saskatchewan and by ecozone

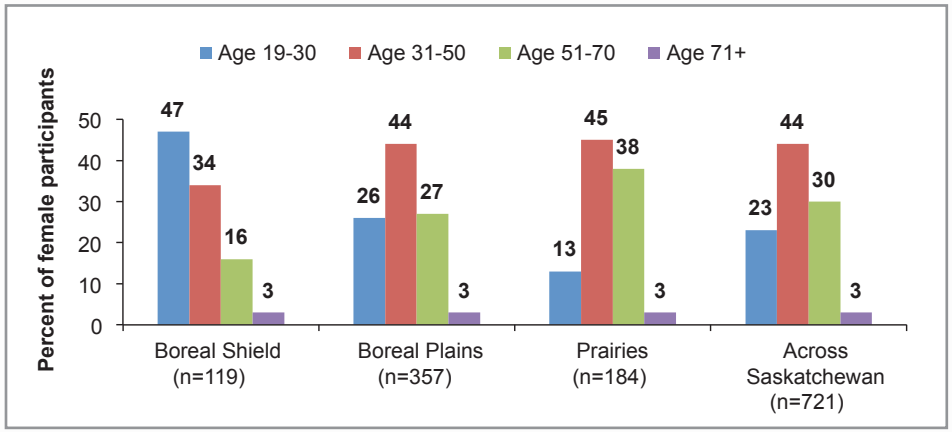


Figure 2b. Percentage of male respondents in each age group across Saskatchewan and by ecozone

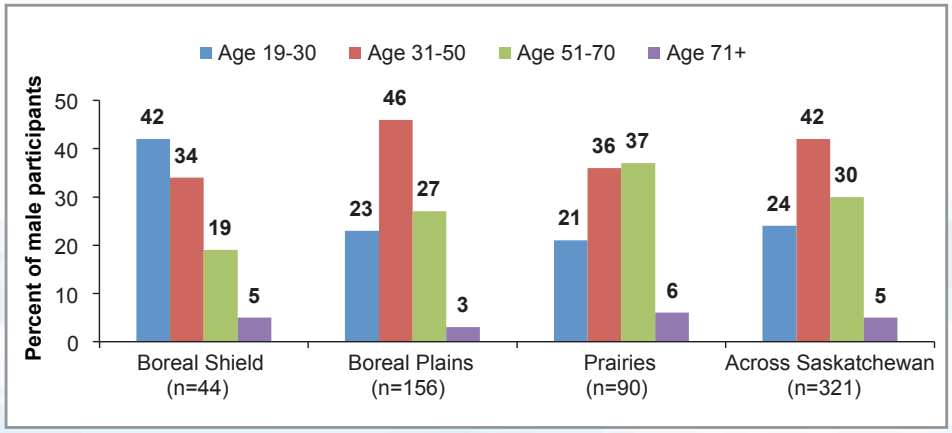


Figure 3. Percentage of household members by age group, across Saskatchewan (n=1042)

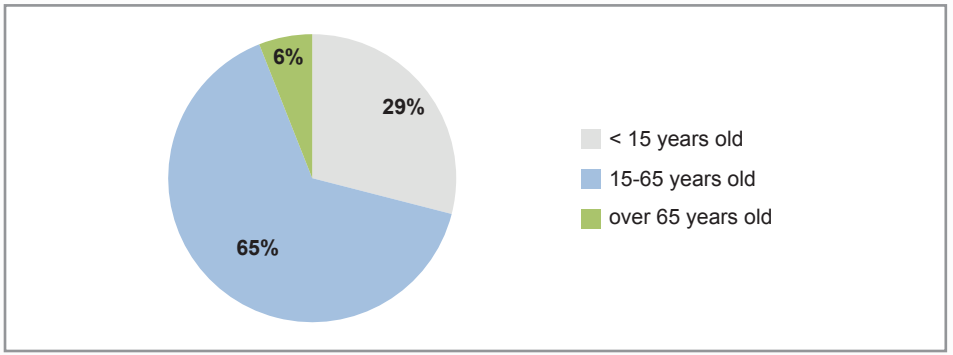


Table 4. Median household size and years of education across Saskatchewan and by ecozone

Household size and education	Median (range)			
	Boreal Shield (n=163)	Boreal Plains (n=513)	Prairies (n=274)	Across Saskatchewan (n=1042)
Number of people living in the household	5 (1, 14)	5 (1, 18)	5 (1, 15)	5 (1, 18)
Number of years of school completed	11 (0, 18)	11 (0, 20)	12 (0, 20)	12 (0, 20)

Figure 4. Diplomas, certificates and degrees obtained by First Nation adults across Saskatchewan and by ecozone (n=1036)

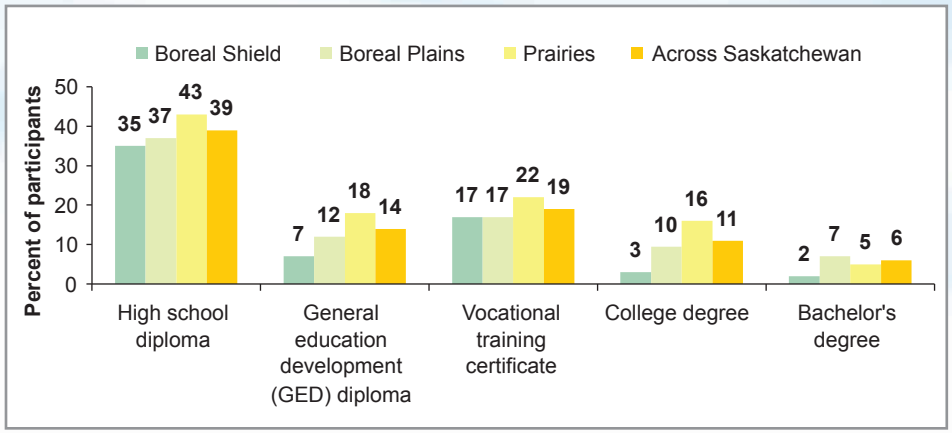
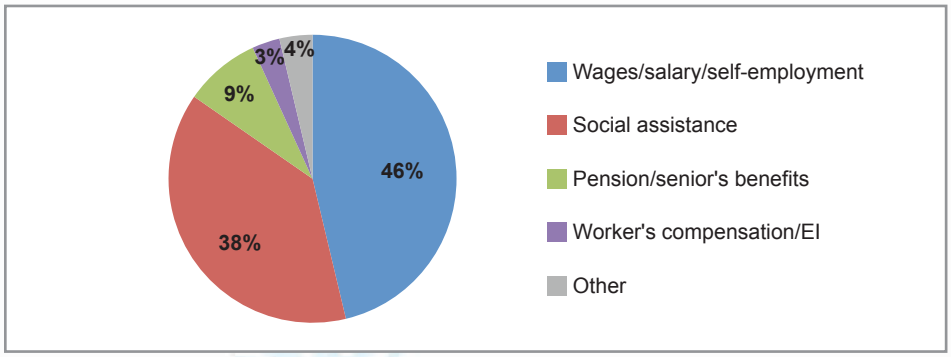


Figure 5. Main source of income for First Nations adults in Saskatchewan (n=1038)



Notes:

EI= Employment insurance

Other includes student scholarship, spousal/parental support, savings, residential school compensation, none

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

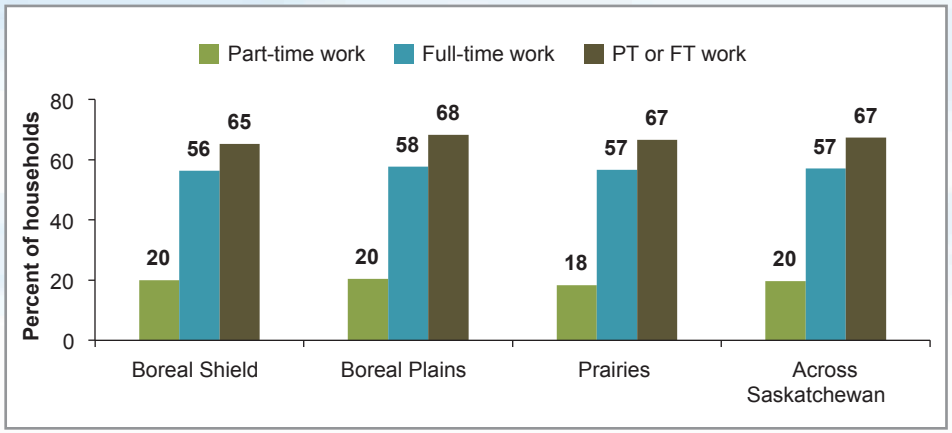
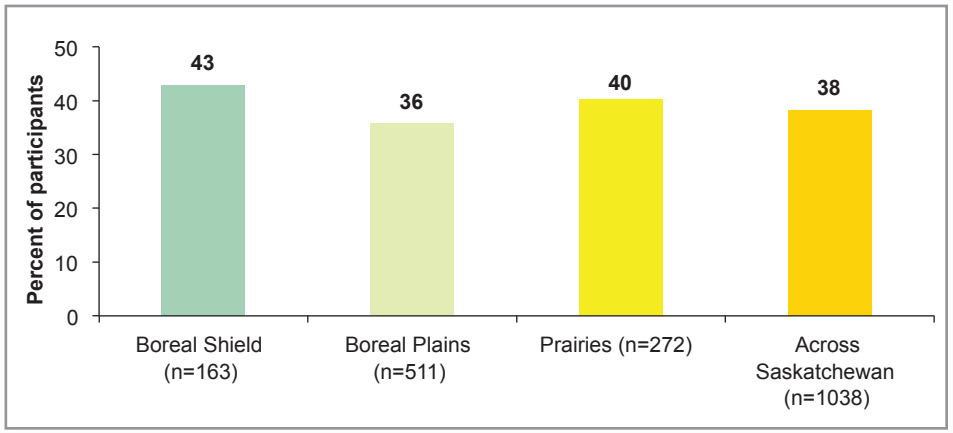


Figure 7. Percent of First Nations adults on social assistance, across Saskatchewan and by ecozone



Health and Lifestyle Practices

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

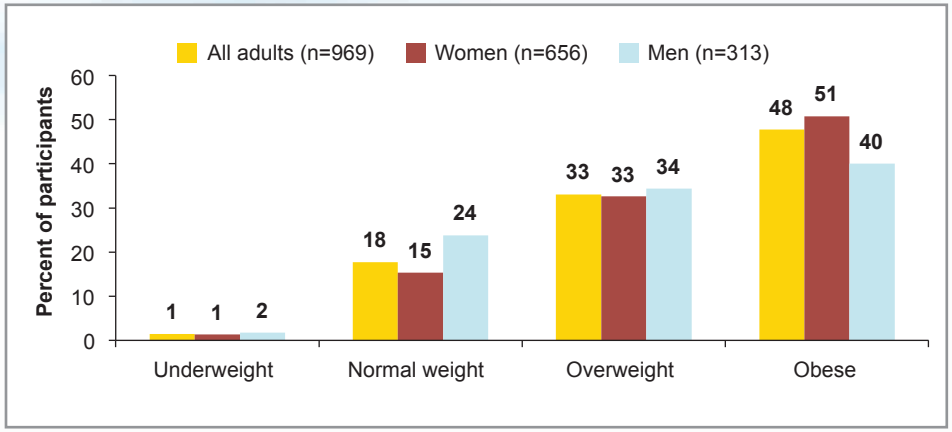


Figure 8c. Overweight and obesity among First Nations men in Saskatchewan by age group*

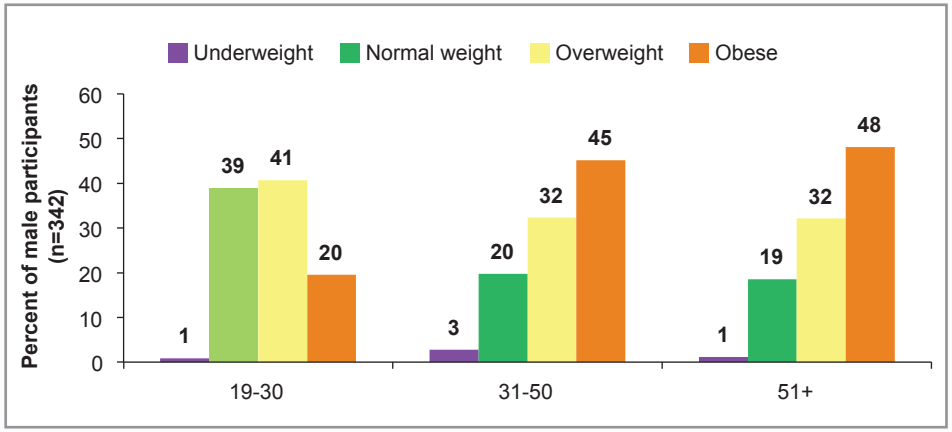
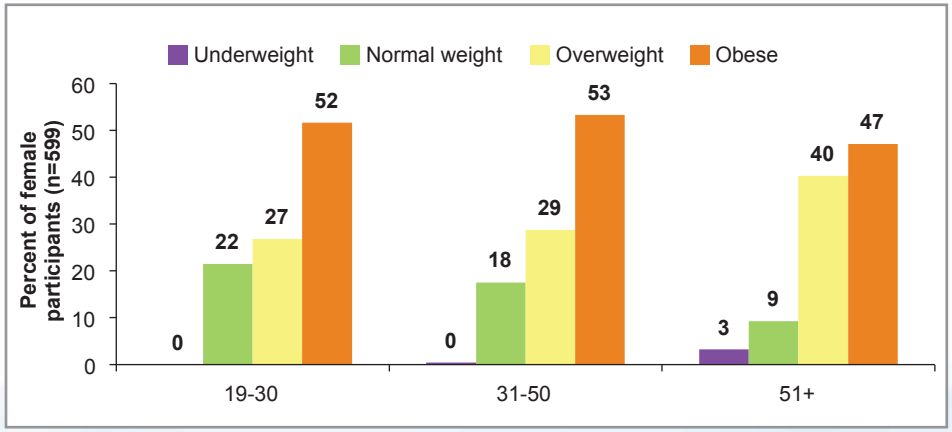
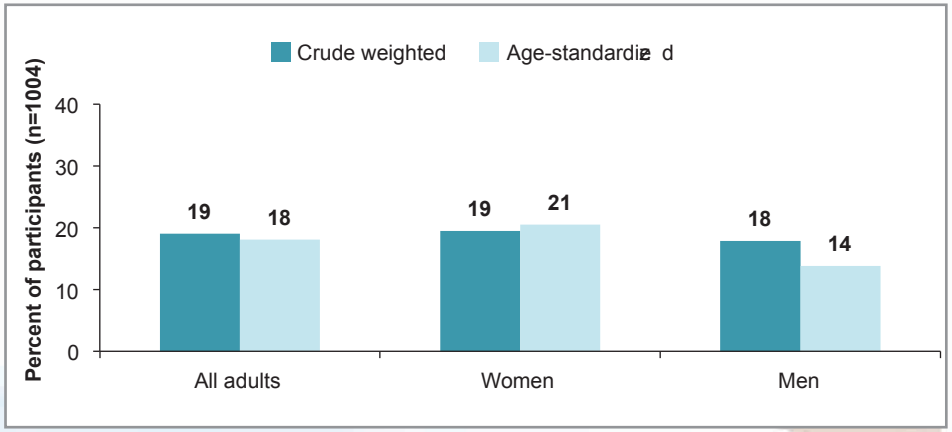


Figure 8b. Overweight and obesity among First Nations women in Saskatchewan by age group*



Figures 8a-c* Classified using Health Canada's BMI categories (Health Canada 2003). Results exclude pregnant and breastfeeding women (n=46). Results include both measured and reported weight and height values. Paired t-tests showed significant differences between reported and measured values for women only, therefore all BMIs for women based on reported values (n=58) were adjusted to account for the estimated bias.

Figure 9. Prevalence of self-reported diabetes in First Nations adults in Saskatchewan, total and by gender (weighted and age-standardized rates)+



+Excludes gestational diabetes; age-standardized to the 1991 Canadian population

Figure 10. Prevalence of self-reported diabetes in First Nations adults in Saskatchewan among adults younger and older than 40 years

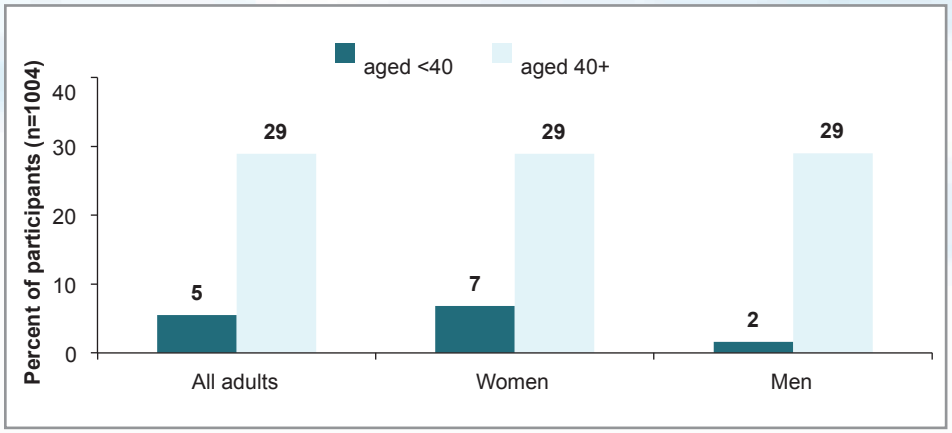
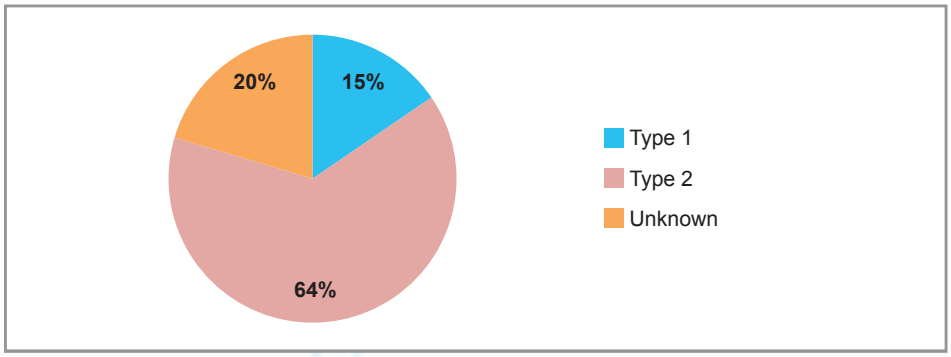


Figure 11. Type of diabetes reported by First Nations adults (n=174)+



+Due to rounding, the percentage equals 99%

Table 5. Prevalence of self-reported diabetes among First Nations adults in Saskatchewan 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+	16.2	20.7	2008-2010 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 Altantic+ (on-reserve)	19+	20.2	23.2	2014 FNFNES
First Nations in Saskatchewan (on-reserve)	19+	19.0	18.1	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 (2008/2010) (FNIGC 2012)

APS = Aboriginal Peoples Survey

FNFNES = First Nations Food, Nutrition and Environment Study, (Chan et al., 2012; 2014; 2015; 2017)

Figure 12a. Percentage of First Nations adults in Saskatchewan dieting (to lose weight) on the day before the interview, by gender

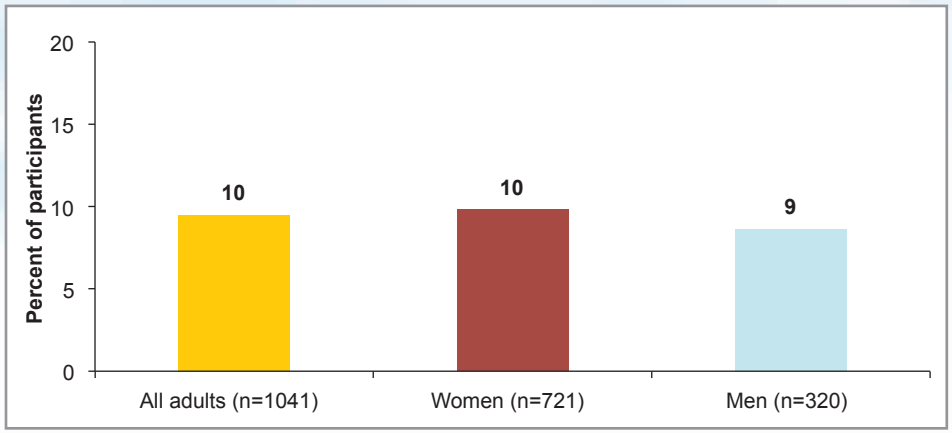


Figure 12b. Percentage of First Nations adults in Saskatchewan dieting (to lose weight) on the day before the interview, by gender and age group

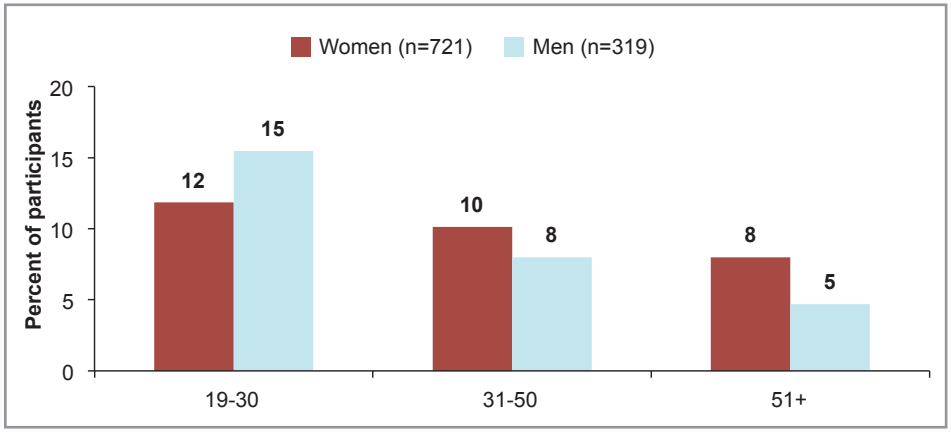


Figure 13a. Percent of First Nations adults in Saskatchewan who smoke, by region and ecozone

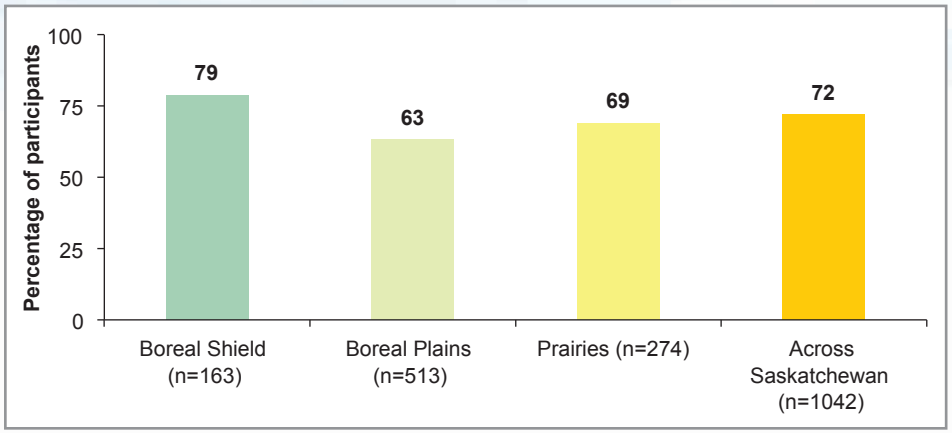
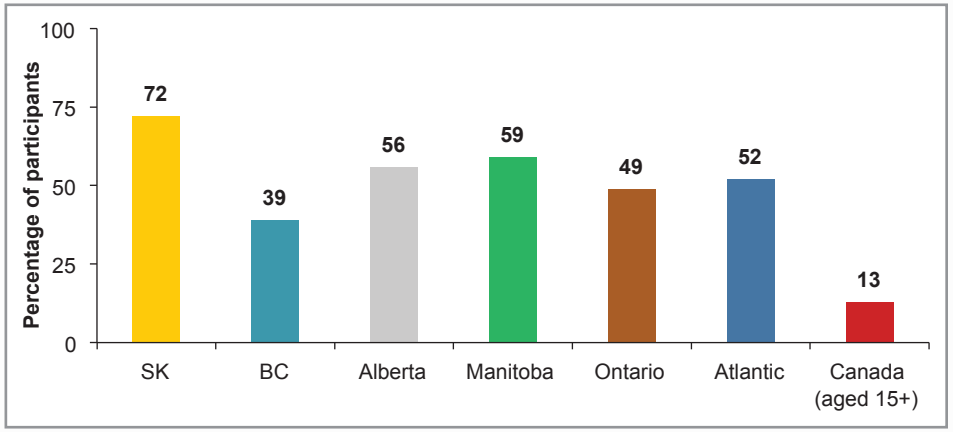


Figure 13b. Smoking among First Nation adults in Saskatchewan compared to other FNFNES regional findings and to the general Canadian population*



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

Figure 14a. Self-reported activity level in First Nations adults in Saskatchewan+

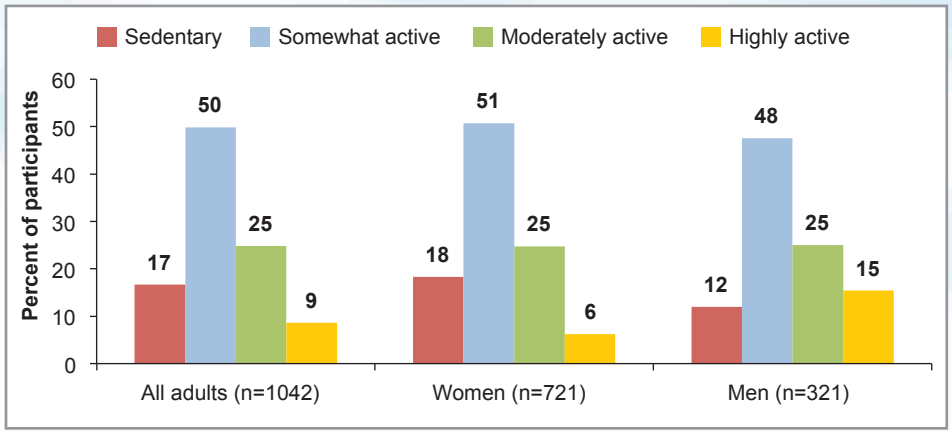
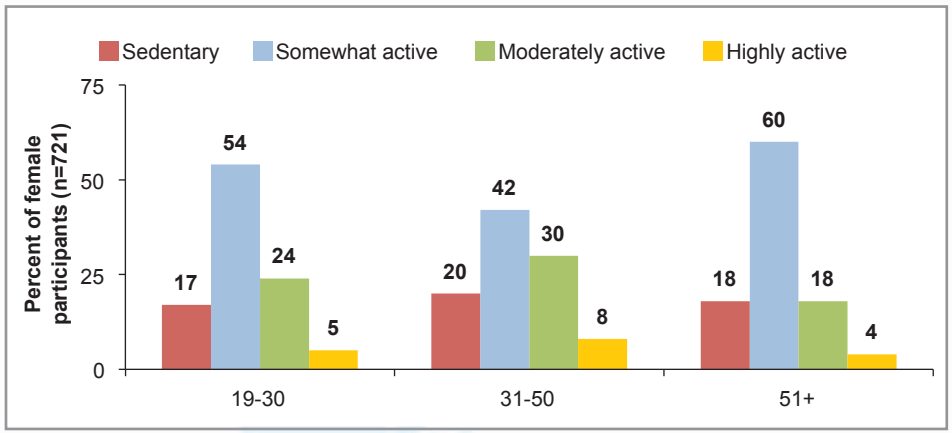


Figure 14b. Self-reported activity level in First Nations women in Saskatchewan, by age group



+Due to rounding, the percentage equals 99%

Figure 14c. Self-reported activity level in First Nations men in Saskatchewan, by age group

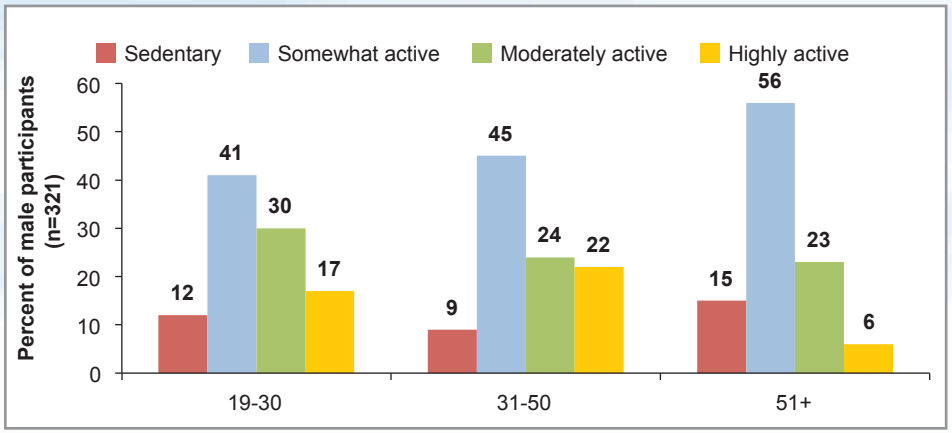


Figure 15a. Self-perceived health in First Nations adults in Saskatchewan

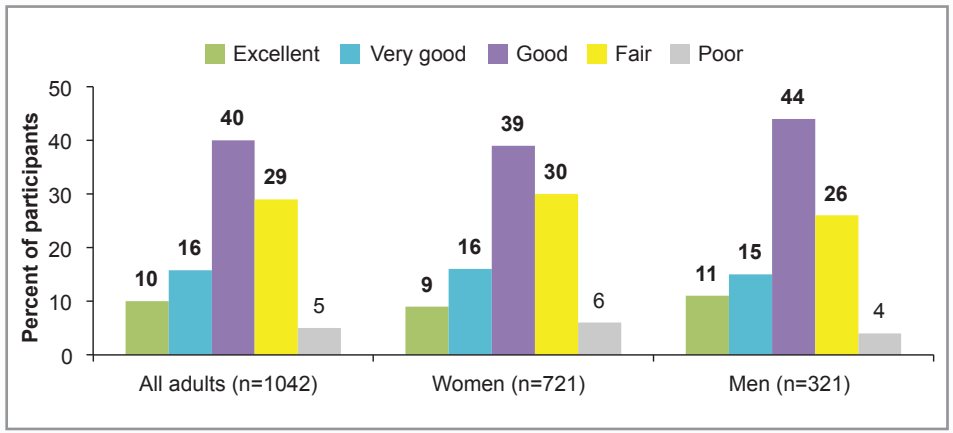


Figure 15b. Self-perceived health in First Nations women in Saskatchewan, by age group

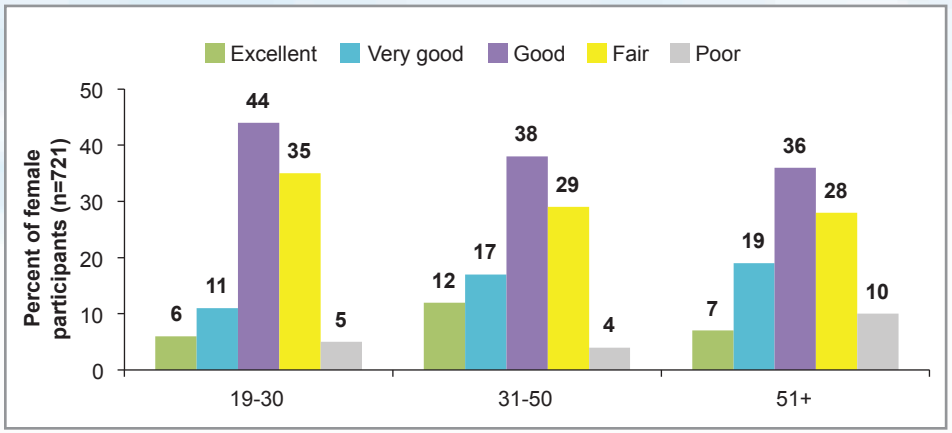


Figure 15c. Self-perceived health in First Nations men in Saskatchewan, by age group

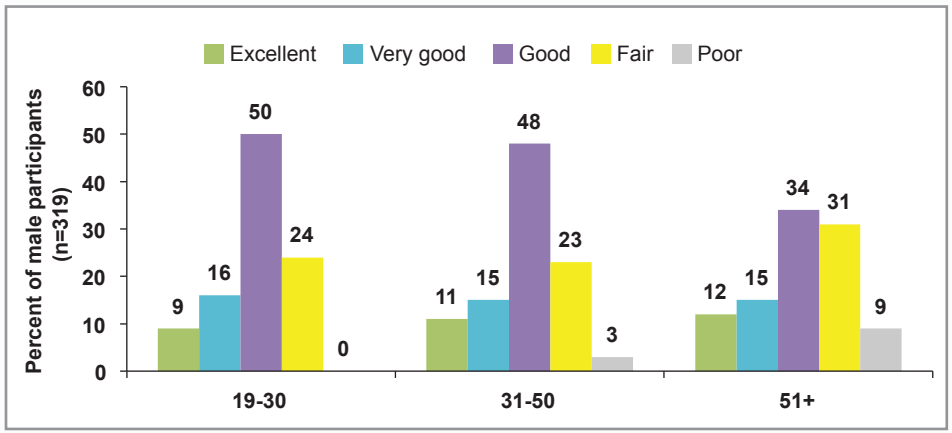


Table 6. Percentage of First Nations adults in Saskatchewan consuming traditional foods in the past year, by ecozone area and for all First Nations in Saskatchewan (n=1042)

Traditional food	Percentage of adults consuming traditional food			
	Boreal Shield (n=163)	Boreal Plains (n=513)	Prairies (n=274)	First Nations in Saskatchewan (n=1042)
FISH	**98**	**49**	**41**	**51**
Walleye	92	35	21	35
Northern pike	71	31	17	30
Lake whitefish	85	21	15	26
Trout (all combined)	69	15	7	18
Lake trout	68	11	3	14
Sucker (longnose, white, redhorse, quillback)	37	4	1	6
Rainbow trout	4	2	2	2
Round whitefish	11	0	1	2
Arctic grayling	19	0	0	2
Yellow perch	4	2	2	2
Brook trout (speckle)	2	0	1	1
Goldeye	0	1	2	1
Mooneye	6	0	0	1
Sauger	2	1	0	1
Burbot (ling)	4	1	0	1
Sturgeon	0	0	1	1
Brown trout	1	0	0	0
Bullhead (black, brown)	1	0	0	0
LAND MAMMALS	**99**	**85**	**78**	**83**
Moose meat	95	78	57	71
Deer meat	25	48	62	50
Elk meat	8	28	46	33
Rabbit meat	45	19	21	22

Table 6. Percentage of First Nations adults in Saskatchewan consuming traditional foods in the past year, by ecozone area and for all First Nations in Saskatchewan (n=1042)

Traditional food	Percentage of adults consuming traditional food			
	Boreal Shield (n=163)	Boreal Plains (n=513)	Prairies (n=274)	First Nations in Saskatchewan (n=1042)
Moose kidney	49	12	3	12
Caribou meat	56	4	4	11
Moose liver	40	12	3	11
Beaver meat	47	5	1	8
Bison meat	3	4	10	6
Caribou kidney	31	1	1	5
Deer kidney	2	5	4	4
Deer liver	1	4	3	3
Elk kidney	1	2	4	3
Caribou liver	26	0	0	3
Jackrabbit/snowshoe hare meat	6	1	6	3
Muskrat meat	8	3	0	3
Black bear meat	7	1	1	2
Elk liver	1	0	3	1
Black bear fat	2	1	1	1
Porcupine meat	10	0	0	1
Moose blood	3	0	0	0
Prairie dog	1	0	0	0
WILD BIRDS	**86**	**49**	**30**	**46**
Ducks (all combined)	62	46	29	41
Mallard	56	45	27	39
Grouse (blue, ruffed, sharp-tailed/prairie chicken)	48	11	4	13
Goose (Canada, brant)	29	13	6	12
Northern pintail	3	3	1	2
Gadwall	9	2	0	2
Teal	2	3	1	2
Long-tailed duck	0	1	1	1

Table 6. Percentage of First Nations adults in Saskatchewan consuming traditional foods in the past year, by ecozone area and for all First Nations in Saskatchewan (n=1042)

Traditional food	Percentage of adults consuming traditional food			
	Boreal Shield (n=163)	Boreal Plains (n=513)	Prairies (n=274)	First Nations in Saskatchewan (n=1042)
Wood duck	5	0	0	1
American wigeon	0	1	0	1
Northern shoveler	3	1	1	1
Canvasback	1	2	0	1
Redhead	0	2	0	1
Snow goose (blue goose)	5	0	1	1
Loon	6	0	0	1
Ptarmigan (willow, rock)	7	0	0	1
Ruddy duck	2	0	0	0
Golden eye	2	0	0	0
Greater white-fronted goose (speckle belly)	0	1	0	0
Swan (tundra)	1	0	0	0
Scaup	0	1	0	0
BIRD EGGS	**18**	**4**	**2**	**5**
Seagull eggs	12	1	0	2
Duck eggs	6	2	1	2
Mudhen/coot eggs	4	1	0	1
Grouse eggs	1	0	0	0
WILD BERRIES OR NUTS	**95**	**71**	**83**	**78**
Blueberry (bilberry, huckleberry)	90	55	44	54
Saskatoon berries	27	42	71	52
Raspberry (tall)	35	31	45	37
Cherry (pin, chokecherry)	11	17	48	28
Wild strawberry	36	20	23	23
Crabapple	12	9	23	15
Cranberry, bog, swamp (mossberry)	29	10	7	11
High bush cranberry (pembina)	6	5	6	6

Table 6. Percentage of First Nations adults in Saskatchewan consuming traditional foods in the past year, by ecozone area and for all First Nations in Saskatchewan (n=1042)

Traditional food	Percentage of adults consuming traditional food			
	Boreal Shield (n=163)	Boreal Plains (n=513)	Prairies (n=274)	First Nations in Saskatchewan (n=1042)
Sunflower seeds	0	2	7	4
Dewberry (dwarf raspberry, trailing)	0	1	6	3
Rosehips	8	2	3	3
Cranberry, mountain (lingonberry, partridge berry)	21	1	1	3
Mooseberry, squashberry (low bush cranberry)	6	3	1	2
Gooseberry	2	0	4	2
Black currant	0	0	2	1
Cloudberries (bakeapple)	2	0	0	0
Bunchberries	1	0	1	0
Bearberry (Kinnickinnick)	0	0	1	0
Red currant	1	0	0	0
WILD PLANTS	**68**	**44**	**37**	**43**
Rat root (wihkes, sweet flag)	49	26	19	25
Mint	55	21	11	20
Labrador tea	9	20	10	15
Sweetgrass	7	10	12	10
Wild rice	15	11	6	9
Sage	7	6	14	9
Rhubarb	4	7	10	8
Wild onion/chives	2	1	3	2
Dandelions	1	1	2	1
Raspberry leaves	1	0	1	1
Yarrow	1	1	2	1
Other wild plants (lily root, wild carrot, wild rose petals, bitter root, Canadian thistle)	4	0	0	1
Wild asparagus	0	0	1	0

Table 6. Percentage of First Nations adults in Saskatchewan consuming traditional foods in the past year, by ecozone area and for all First Nations in Saskatchewan (n=1042)

Traditional food	Percentage of adults consuming traditional food			
	Boreal Shield (n=163)	Boreal Plains (n=513)	Prairies (n=274)	First Nations in Saskatchewan (n=1042)
TREE FOODS	**14**	**5**	**5**	**6**
Maple syrup	7	2	3	3
Beaked hazelnuts	0	2	2	2
Birch syrup	5	0	0	1
Spruce pitch/gum	4	1	0	1
Tamarack gum	2	0	0	0
Birch twig tea	0	1	0	0
Juniper (stem, root) tea	1	0	0	0
Tamarack bark tea	1	0	0	0
Balsam poplar bark	1	0	0	0
MUSHROOMS	**9**	**4**	**1**	**3**
Chanterelle	9	3	0	3
Morel	1	0	0	0
Shaggy mane	0	0	1	0
CULTIVATED TRADITIONAL FOOD	**0**	**11**	**28**	**16**
Corn/hominy	0	9	24	14
Beans	0	4	13	7
Squash	0	2	6	3

Table 7a. Yearly and seasonal frequency of use of top ten traditional food items, First Nations adults in Saskatchewan

Traditional food	Participants	Percentage of participants*	Days per year and season - Average (95th percentile)				
			Year total	Summer	Spring	Winter	Fall
Moose meat	Total participants	100	20 (120)	5 (30)	4 (30)	5 (30)	6 (30)
	Consumers only	71	28 (120)	7 (30)	6 (30)	7 (30)	8 (54)
Blueberry (bilberry, huckleberry)	Total participants	100	8 (40)	3 (12)	1 (6)	1 (6)	2 (10)
	Consumers only	54	15 (57)	6 (30)	3 (12)	3 (12)	4 (12)
Deer meat	Total participants	100	8 (32)	2 (8)	2 (6)	2 (10)	2 (12)
	Consumers only	50	15 (72)	4 (26)	3 (24)	4 (20)	4 (24)
Caribou meat	Total participants	100	7 (8)	2 (2)	2 (1)	2 (4)	1 (2)
	Consumers only	11	61 (360)	14 (90)	15 (90)	18 (90)	14 (90)
Elk meat	Total participants	100	6 (26)	1 (6)	1 (6)	2 (9)	2 (9)
	Consumers only	33	18 (100)	4 (15)	4 (15)	5 (25)	5 (25)
Mint	Total participants	100	6 (24)	2 (10)	1 (3)	1 (4)	1 (5)
	Consumers only	20	29 (180)	8 (54)	6 (54)	6 (52)	7 (50)
Saskatoon berries	Total participants	100	6 (30)	3 (12)	1 (6)	1 (4)	1 (6)
	Consumers only	52	11 (48)	5 (24)	2 (10)	2 (10)	2 (12)
Labrador tea	Total participants	100	5 (20)	1 (5)	1 (5)	1 (4)	1 (5)
	Consumers only	15	36 (256)	10 (72)	8 (40)	9 (72)	9 (72)
Walleye	Total participants	100	5 (24)	2 (10)	1 (6)	1 (6)	1 (6)
	Consumers only	35	15 (70)	5 (24)	3 (18)	3 (18)	3 (18)
Rat root (wihkes, sweet flag)	Total participants	100	5 (24)	1 (6)	1 (5)	1 (6)	1 (6)
	Consumers only	25	18 (60)	4 (15)	4 (15)	5 (30)	5 (24)

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, Boreal Shield

Traditional food	Participants	Percentage of participants*	Days per year and season - Average (95th percentile)				
			Year total	Summer	Spring	Winter	Fall
Caribou meat	Total participants	100	44 (360)	10 (90)	11 (90)	13 (90)	9 (90)
	Consumers only	56	78 (360)	17 (90)	20 (90)	24 (90)	17 (90)
Walleye	Total participants	100	32 (120)	10 (30)	8 (30)	7 (30)	8 (30)
	Consumers only	92	35 (120)	11 (30)	8 (30)	8 (30)	9 (30)
Moose meat	Total participants	100	30 (120)	9 (30)	6 (30)	7 (30)	8 (30)
	Consumers only	95	31 (120)	10 (50)	6 (30)	7 (30)	8 (30)
Mint	Total participants	100	25 (120)	10 (54)	4 (30)	4 (30)	6 (30)
	Consumers only	55	45 (168)	19 (54)	7 (54)	7 (52)	11 (54)
Blueberry (bilberry, huckleberry)	Total participants	100	24 (120)	8 (30)	5 (30)	5 (30)	7 (30)
	Consumers only	90	27 (120)	9 (30)	5 (30)	6 (30)	8 (30)
Lake whitefish	Total participants	100	21 (100)	6 (30)	5 (25)	4 (25)	6 (30)
	Consumers only	85	24 (100)	7 (30)	5 (25)	5 (25)	7 (30)
Northern pike	Total participants	100	17 (72)	5 (25)	4 (18)	4 (18)	4 (25)
	Consumers only	71	24 (85)	8 (25)	5 (20)	5 (20)	6 (25)
Rat root (wihkes, sweet flag)	Total participants	100	13 (48)	3 (12)	3 (12)	3 (30)	3 (30)
	Consumers only	49	26 (120)	6 (30)	6 (30)	7 (30)	7 (30)
Trout, all	Total participants	100	10 (56)	3 (14)	2 (12)	2 (12)	3 (14)
	Consumers only	69	15 (57)	5 (20)	3 (14)	3 (14)	4 (20)
Ducks, all	Total participants	100	9 (45)	3 (15)	2 (12)	1 (2)	3 (15)
	Consumers only	62	14 (60)	4 (18)	4 (12)	1 (6)	5 (30)

Table 7c. Yearly and seasonal frequency of use of top ten traditional food items, Boreal Plains

Traditional food	Participants	Percentage of participants*	Days per year and season - Average (95th percentile)				
			Year total	Summer	Spring	Winter	Fall
Moose meat	Total participants	100	25 (144)	7 (45)	6 (30)	6 (30)	7 (50)
	Consumers only	78	33 (200)	8 (54)	7 (54)	8 (50)	9 (54)
Deer meat	Total participants	100	10 (57)	2 (12)	2 (12)	2 (12)	3 (24)
	Consumers only	48	20 (120)	5 (30)	4 (30)	5 (30)	6 (30)
Labrador tea	Total participants	100	7 (30)	2 (10)	2 (6)	2 (9)	2 (9)
	Consumers only	20	37 (240)	10 (60)	9 (60)	9 (60)	9 (60)
Blueberry (bilberry, huckleberry)	Total participants	100	6 (24)	3 (10)	1 (4)	1 (5)	1 (6)
	Consumers only	55	11 (40)	5 (20)	2 (6)	2 (6)	2 (10)
Elk meat	Total participants	100	5 (24)	1 (6)	1 (5)	1 (8)	1 (10)
	Consumers only	28	18 (80)	5 (20)	3 (15)	5 (24)	5 (25)
Rat root (wihkes, sweet flag)	Total participants	100	5 (16)	1 (4)	1 (3)	1 (6)	1 (6)
	Consumers only	26	17 (60)	4 (15)	4 (18)	5 (24)	4 (15)
Sweetgrass	Total participants	100	4 (4)	1 (2)	1 (1)	1 (2)	1 (2)
	Consumers only	10	46 (288)	12 (72)	11 (72)	12 (72)	11 (72)
Mint	Total participants	100	4 (15)	1 (4)	1 (3)	1 (4)	1 (4)
	Consumers only	21	20 (120)	5 (30)	5 (30)	5 (30)	5 (30)
Ducks, all	Total participants	100	4 (19)	1 (5)	1 (6)	0.4 (2)	1 (6)
	Consumers only	46	8 (28)	2 (8)	3 (12)	1 (6)	3 (12)
Northern pike	Total participants	100	3 (12)	1 (4)	1 (3)	1 (2)	1 (3)
	Consumers only	31	11 (48)	4 (12)	3 (12)	2 (12)	3 (12)

Table 7d. Yearly and seasonal frequency of use of top ten traditional food items, Prairies

Traditional food	Participants	Percentage of participants*	Days per year and season - Average (95th percentile)				
			Year total	Summer	Spring	Winter	Fall
Moose meat	Total participants	100	11 (60)	2 (10)	2 (6)	3 (12)	4 (12)
	Consumers only	57	19 (78)	4 (12)	3 (12)	5 (30)	7 (30)
Saskatoon berries	Total participants	100	10 (48)	5 (24)	2 (10)	2 (12)	2 (12)
	Consumers only	71	14 (48)	7 (30)	2 (12)	2 (12)	3 (12)
Elk meat	Total participants	100	9 (48)	2 (9)	2 (6)	3 (12)	2 (12)
	Consumers only	46	19 (100)	4 (25)	4 (25)	5 (30)	5 (25)
Deer meat	Total participants	100	7 (24)	2 (6)	1 (6)	2 (6)	2 (10)
	Consumers only	62	11 (48)	3 (10)	2 (12)	3 (12)	3 (12)
Blueberry (bilberry, huckleberry)	Total participants	100	7 (40)	2 (12)	1 (9)	1 (9)	2 (9)
	Consumers only	44	15 (57)	5 (24)	3 (12)	3 (12)	4 (12)
Raspberry	Total participants	100	6 (36)	2 (12)	1 (6)	1 (6)	1 (6)
	Consumers only	45	12 (48)	5 (16)	2 (12)	2 (12)	2 (12)
Cherry (pin, chokecherry)	Total participants	100	5 (20)	2 (12)	1 (3)	1 (4)	1 (4)
	Consumers only	48	10 (48)	4 (12)	2 (12)	2 (9)	2 (10)
Corn/hominy	Total participants	100	4 (24)	1 (6)	1 (6)	1 (6)	1 (6)
	Consumers only	24	16 (46)	5 (21)	4 (21)	3 (9)	4 (20)
Labrador tea	Total participants	100	4 (8)	1 (3)	1 (2)	1 (2)	1 (2)
	Consumers only	10	36 (256)	10 (72)	6 (40)	10 (72)	10 (72)
Sage	Total participants	100	4 (36)	1 (9)	1 (9)	1 (9)	1 (9)
	Consumers only	14	25 (72)	6 (18)	6 (18)	6 (18)	6 (18)

Table 8. Mean portion size of traditional food categories, by gender and age group, as reported from 24-hr recalls, First Nations adults in Saskatchewan, 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[a]	200	271	221	284	186	249
Land mammals meat[a]	156	126	147	190	190	194
Land mammals, organs[b]	101	101	101	101	101	101
Land mammal fat[b]	36	36	36	36	36	36
Wild birds[c]	139	139	139	170	170	170
Bird egg[d]	144	144	144	144	144	144
Wild berries[b]	36	36	36	36	36	36
Wild plants, roots, or greens[b]	106	106	106	106	106	106
Teas from plants and trees[b]	5	5	5	5	5	5
Mushrooms[e]	48	48	48	48	48	48

Notes:

Only 22% of the 24-hr recalls contained traditional food. Therefore, portion sizes are based on the number of occasions of consumption in the sample.

[a]portion sizes calculated by gender and age groups of consumers, with the exception of age 71+ which were based on values by gender due to low number of observations for this age group

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

[c]portion size calculated by gender due to low number of observations by age group

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

[e]none reported consumed on 24-hr recalls therefore used portion size values from Chan et al, 2011.

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

Food category	Level of consumption	Women (n=670)		Men (n=355)		First Nations in Saskatchewan (n=1040*)
		Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
TOTAL TRADITIONAL FOOD	Total participants (average)	34.4	32.9	47.5	45.4	37.3
	Total participants (95th pctile)	157.3	153.0	215.2	150.8	174.8
	Consumers only (average)	37.2	34.3	50.6	46.4	39.6
	Consumers only (95th pctile)	165.1	153.0	215.2	150.8	177.4
FISH	Total participants (average)	8.2	12.4	13.2	12.1	10.4
	Total participants (95th pctile)	46.6	52.0	57.6	31.6	52.1
	Consumers only (average)	17.0	22.2	24.6	24.7	20.4
	Consumers only (95th pctile)	77.8	127.7	114.4	226.5	106.9
GAME MEAT	Total participants (average)	19.0	12.6	26.4	20.7	18.8
	Total participants (95th pctile)	100.4	62.8	144.7	92.7	100.4
	Consumers only (average)	23.3	15.4	30.6	22.6	22.7
	Consumers only (95th pctile)	102.6	72.1	159.8	92.7	106.7
GAME ORGANS	Total participants (average)	1.2	1.6	1.3	4.3	1.6
	Total participants (95th pctile)	5.0	6.1	6.6	18.0	6.1
	Consumers only (average)	5.2	9.5	5.3	19.5	7.4
	Consumers only (95th pctile)	23.2	53.1	16.6	127.3	39.9
BIRDS	Total participants (average)	1.6	1.7	3.1	4.3	2.1
	Total participants (95th pctile)	9.1	9.5	14.4	14.0	9.9
	Consumers only (average)	4.0	3.3	6.4	8.1	4.7
	Consumers only (95th pctile)	17.5	15.3	22.5	22.4	17.9
BERRIES/ PLANTS	Total participants (average)	4.4	4.6	3.5	3.7	4.2
	Total participants (95th pctile)	23.4	19.9	15.9	17.4	18.5
	Consumers only (average)	5.4	5.0	4.5	4.4	5.1
	Consumers only (95th pctile)	25.6	19.9	17.5	18.5	22.9

*n=2 missing age values.

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), consumers only

Food category		Gender		Total
		Women	Men	
TOTAL TRADITIONAL FOOD	Average consumer	36.2	49.2	39.7
	High consumer	159.9	215.2	177.4
FISH	Average consumer	18.9	24.7	20.4
	High consumer	100.2	114.4	101.9
Walleye	Average consumer	7.9	12.9	9.2
	High consumer	37.1	85.6	39.5
Lake whitefish	Average consumer	7.7	11.2	8.7
	High consumer	35.6	37.4	37.4
Northern pike	Average consumer	8.2	10.7	8.7
	High consumer	35.6	37.4	36.2
GAME MEAT	Average consumer	20.7	27.8	22.7
	High consumer	100.4	144.7	106.7
Moose meat	Average consumer	11.6	13.5	12.1
	High consumer	51.3	62.5	62.5
Deer meat	Average consumer	5.9	8.3	6.7
	High consumer	20.5	50.0	32.3
Elk meat	Average consumer	7.8	7.9	7.9
	High consumer	42.7	31.2	42.7
GAME ORGANS	Average consumer	6.4	9.8	7.4
	High consumer	30.4	46.5	39.9
Moose kidney	Average consumer	2.4	2.4	2.4
	High consumer	11.1	9.7	10.0
Moose liver	Average consumer	2.6	5.2	3.3
	High consumer	11.1	53.1	13.3
Caribou kidney	Average consumer	2.1	5.6	2.9
	High consumer	7.5	29.6	8.3

Food category		Gender		Total
		Women	Men	
BIRDS	Average consumer	3.7	7.0	4.7
	High consumer	15.6	22.4	17.9
Mallard	Average consumer	2.4	3.1	2.6
	High consumer	9.1	11.2	9.1
Goose (Canada, brant)	Average consumer	1.1	3.0	1.7
	High consumer	4.6	22.4	4.6
Grouse	Average consumer	2.8	3.7	3.1
	High consumer	11.4	18.6	11.4
BERRIES/PLANTS	Average consumer	5.3	4.5	5.1
	High consumer	25.0	17.5	22.9
Blueberry (bilberry, huckleberry)	Average consumer	1.5	1.3	1.5
	High consumer	6.0	4.7	5.6
Mint Saskatoon berries	Average consumer	1.1	1.1	1.1
	High consumer	4.7	4.1	4.7
Raspberry	Average consumer	0.8	0.9	0.9
	High consumer	4.7	3.2	4.7

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

Food category	Level of consumption	All First Nations in Saskatchewan	Boreal Shield	Boreal Plains	Prairies
TOTAL TRADITIONAL FOOD	Average consumer	39.7	116.4	32.4	26.2
	High consumer	177.4	356.6	152.2	116.3
FISH	Average consumer	20.4	59.9	12.8	8.2
	High consumer	101.9	242.2	57.5	28.2
GAME MEAT	Average consumer	22.7	38.4	21.8	16.9
	High consumer	106.7	149.0	100.9	100.0
GAME ORGANS	Average consumer	7.4	7.5	6.6	10.4
	High consumer	39.9	36.0	26.6	39.9
BIRDS	Average consumer	4.7	9.4	3.9	2.9
	High consumer	17.9	30.4	15.6	11.2
BERRIES/PLANTS	Average consumer	5.1	5.2	3.2	7.2
	High consumer	22.9	21.8	11.7	29.6

Photo by Rebecca Hare

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, Boreal Shield

Boreal Shield		Gender		Total
		Women	Men	
TOTAL TRADITIONAL FOOD	Average consumer	97.0	171.7	116.4
	High consumer	290.0	539.9	356.6
FISH	Average consumer	50.7	86.1	59.9
	High consumer	165.6	256.8	242.2
Walleye	Average consumer	18.1	32.6	22.0
	High consumer	65.8	110.1	90.3
Lake whitefish	Average consumer	14.0	18.5	15.2
	High consumer	65.8	68.2	68.2
Northern pike	Average consumer	10.6	27.8	15.2
	High consumer	53.5	110.1	63.1
GAME MEAT	Average consumer	32.3	55.8	38.4
	High consumer	128.4	203.8	149.0
Moose meat	Average consumer	12.7	17.0	13.8
	High consumer	51.3	62.5	58.5
Beaver meat	Average consumer	28.7	50.3	34.3
	High consumer	145.0	191.3	153.9
Rabbit meat	Average consumer	1.8	3.9	2.5
	High consumer	6.2	21.3	7.8
GAME ORGANS	Average consumer	5.9	13.1	7.5
	High consumer	22.1	84.4	36.0
Moose kidney	Average consumer	1.3	3.4	1.7
	High consumer	2.2	9.7	6.6
Moose liver	Average consumer	2.0	2.8	2.2
	High consumer	3.3	8.3	8.3
Caribou kidney	Average consumer	2.6	7.7	3.7
	High consumer	7.8	29.6	11.1

Boreal Shield		Gender		Total
		Women	Men	
BIRDS	Average consumer	6.3	18.4	9.4
	High consumer	19.9	99.8	30.4
Mallard	Average consumer	3.7	6.1	4.3
	High consumer	10.7	16.8	11.6
Grouse	Average consumer	3.5	7.7	4.8
	High consumer	11.4	41.9	16.0
Goose (Canada, brant)	Average consumer	1.0	13.5	3.5
	High consumer	3.1	46.6	25.2
BERRIES/PLANTS	Average consumer	4.6	6.9	5.2
	High consumer	15.7	33.7	21.8
Blueberry (bilberry, huckleberry)	Average consumer	2.4	3.4	2.7
	High consumer	11.8	21.3	11.8
Mint	Average consumer	0.6	0.8	0.6
	High consumer	3.0	1.6	2.3
Rat root (wihkes, sweet flag)	Average consumer	0.3	0.5	0.4
	High consumer	1.6	3.0	1.6

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 Plains

Boreal Plains		Gender		Total
		Women	Men	
TOTAL TRADITIONAL FOOD	Average consumer	32.0	33.3	32.4
	High consumer	153.1	145.6	152.2
FISH	Average consumer	14.2	9.3	12.8
	High consumer	81.1	27.2	57.5
Walleye	Average consumer	4.9	5.7	5.1
	High consumer	26.7	18.7	19.2
Northern pike	Average consumer	7.8	4.9	6.9
	High consumer	35.6	15.3	26.7
Lake whitefish	Average consumer	6.2	3.6	5.7
		35.6	10.9	26.7
GAME MEAT	Average consumer	20.9	24.1	21.8
	High consumer	95.7	124.9	100.9
Moose meat	Average consumer	14.4	13.5	14.2
	High consumer	92.3	62.5	82.9
Deer meat	Average consumer	8.3	11.2	9.1
	High consumer	51.3	62.5	51.3
Elk meat	Average consumer	7.7	8.0	7.8
	High consumer	38.7	31.2	38.7
GAME ORGANS	Average consumer	5.0	9.7	6.6
	High consumer	22.1	127.3	26.6
Moose liver	Average consumer	2.6	7.8	3.9
	High y consumer	13.3	53.1	13.3
Moose kidney	Average consumer	2.8	2.3	2.6
	High consumer	13.3	6.6	13.3
Deer kidney	Average consumer	3.1	5.2	4.2
	High consumer	13.3	33.2	33.2

Boreal Plains		Gender		Total
		Women	Men	
BIRDS	Average consumer	3.5	4.9	3.9
	High consumer	14.9	22.4	15.6
Mallard	Average consumer	2.4	2.5	2.5
	High consumer	9.1	11.2	9.1
Goose (Canada, brant)	Average consumer	1.0	1.2	1.0
	High consumer	3.1	3.7	3.4
Grouse	Average consumer	2.3	1.7	2.1
	High consumer	9.1	3.7	9.1
BERRIES/PLANTS	Average consumer	3.2	3.1	3.2
	High consumer	14.4	8.0	11.7
Blueberry (bilberry, huckleberry)	Average consumer	1.2	0.8	1.1
	High consumer	5.3	3.0	4.0
Saskatoon berries	Average consumer	0.8	0.6	0.7
	High consumer	2.7	2.0	2.4
Raspberry (tall)	Average consumer	0.5	0.6	0.6
	High consumer	1.6	2.0	1.6

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, Prairies

Prairies		Gender		Total
		Women	Men	
TOTAL TRADITIONAL FOOD	Average consumer	24.2	31.7	26.2
	High consumer	116.3	150.8	116.3
FISH	Average consumer	7.4	10.6	8.2
	High consumer	26.3	42.0	28.2
Walleye	Average consumer	4.0	6.4	4.6
	High consumer	13.2	12.2	12.2
Northern pike	Average consumer	5.1	9.6	6.3
	High consumer	13.2	35.8	35.8
Lake whitefish	Average consumer	4.7	4.4	4.7
	High consumer	17.8	9.3	17.8
GAME MEAT	Average consumer	15.3	20.4	16.9
	High consumer	70.4	100.0	100.0
Deer meat	Average consumer	3.8	6.7	4.8
	High consumer	10.3	25.0	16.6
Moose meat	Average consumer	6.7	12.7	8.5
	High consumer	32.1	93.2	32.1
Elk meat	Average consumer	8.1	8.1	8.1
	High consumer	42.7	25.0	42.7
GAME ORGANS	Average consumer	12.3	6.7	10.4
	High consumer	39.9	46.5	39.9
Elk kidney	Average consumer	4.0	0.7	3.3
	High consumer	10.0	1.1	10.0
Deer kidney	Average consumer	3.8	3.0	3.8
	High consumer	19.9	3.3	19.9
Deer liver	Average consumer	4.6	16.0	5.8
	High consumer	19.9	23.2	23.2

Prairies		Gender		Total
		Women	Men	
BIRDS	Average consumer	2.3	4.0	2.9
	High consumer	4.6	18.2	11.2
Mallard	Average consumer	1.8	3.0	2.2
	High consumer	4.6	7.0	5.6
Goose (Canada, brant)	Average consumer	1.4	1.2	1.4
	High consumer	4.6	3.7	4.6
Grouse	Average consumer	2.5	0.9	1.4
	High consumer	4.6	1.4	4.6
BERRIES/PLANTS	Average consumer	7.9	5.2	7.2
	High consumer	34.9	17.5	29.6
Saskatoon berries	Average consumer	1.4	1.5	1.4
	High consumer	4.7	4.7	4.7
Cherry (pin, chokecherry)	Average consumer	1.1	0.7	1.0
	High consumer	4.7	2.0	4.7
Raspberry	Average consumer	1.2	1.2	1.2
		4.7	4.7	4.7

Figure 16a. Participation in traditional food harvest and cultivation practices across Saskatchewan and by ecozone (n=1042)

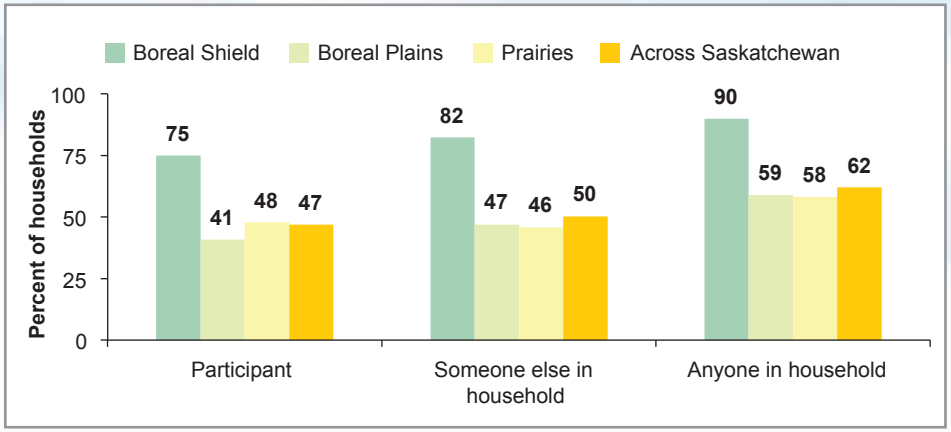


Figure 16b. Types of traditional food harvesting and cultivation practices reported by participants across Saskatchewan and by ecozone (n=1042)

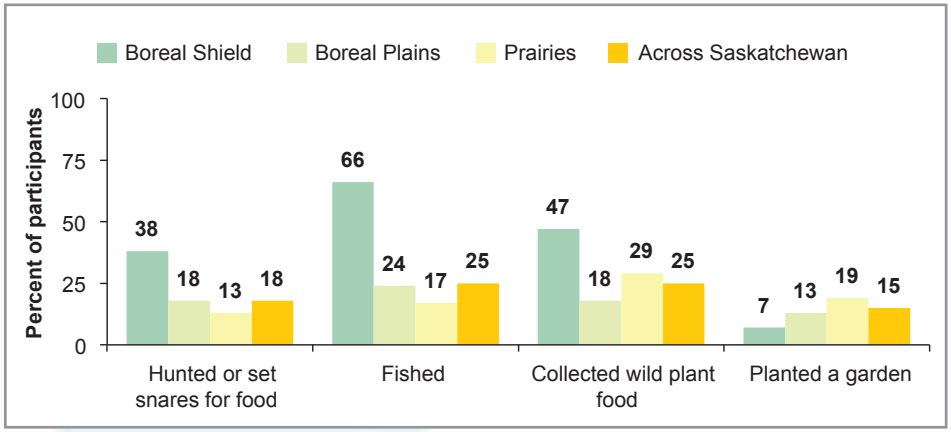


Figure 16c. Types of food harvesting and production practices reported at the household level across Saskatchewan and by ecozone (n=1042)

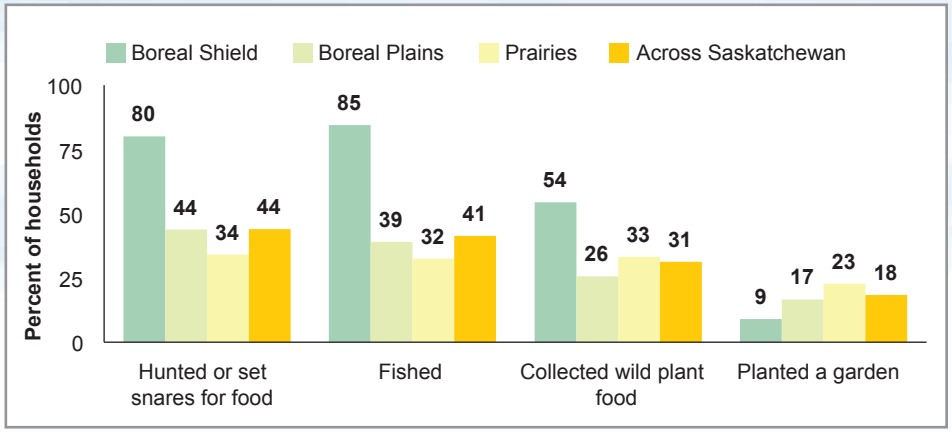


Figure 17. Percent of First Nations adults who ate vegetables or fruit grown from a private and/or community garden, across Saskatchewan and by ecozone (n=1042)

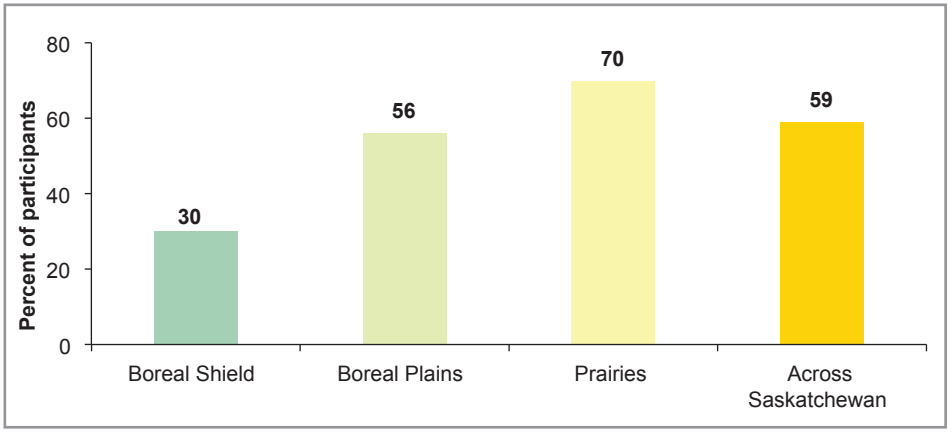


Figure 18. Percent of First Nations adults whose households would like more traditional food across Saskatchewan and by ecozone (n=1041)

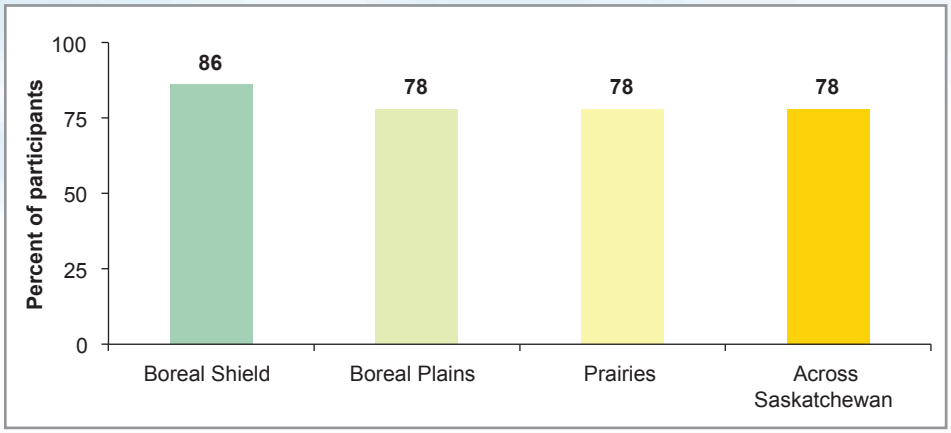
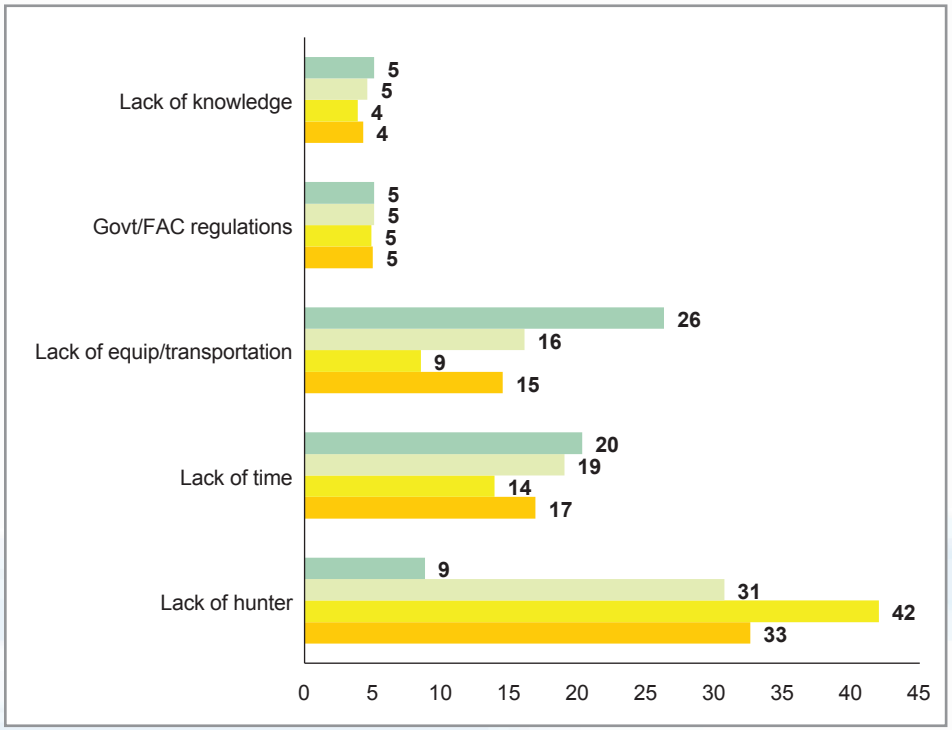
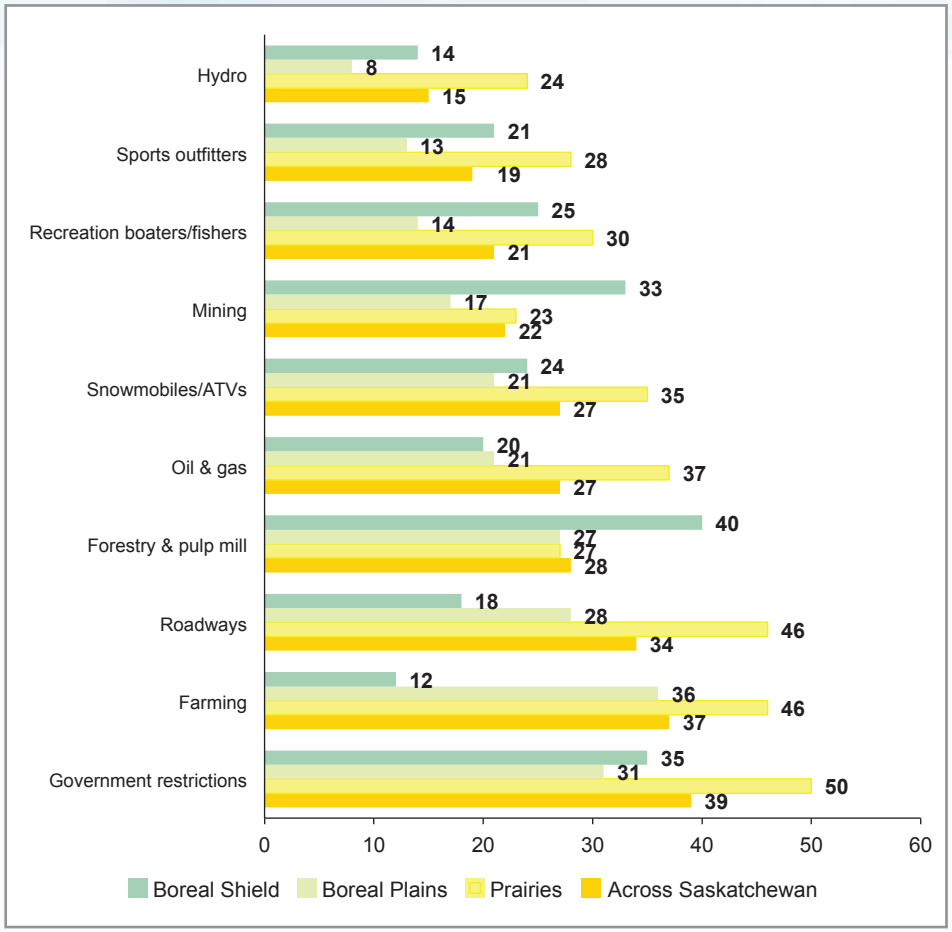


Figure 19. Top 5 barriers preventing First Nations households in Saskatchewan from using more traditional food



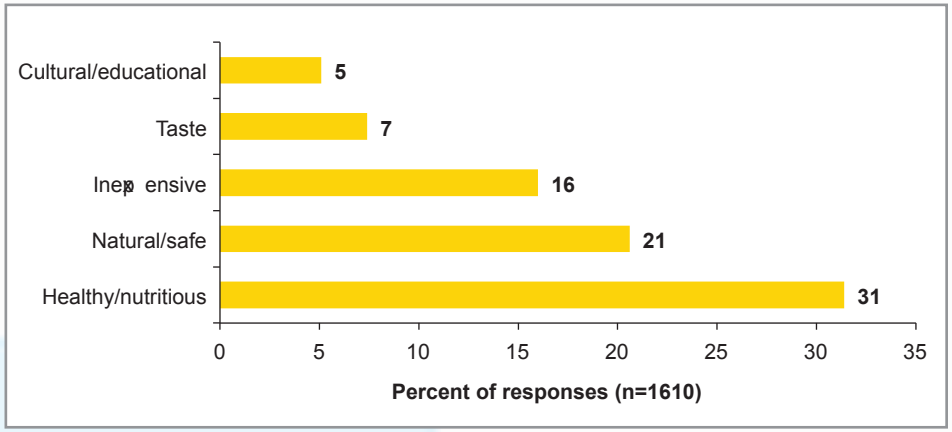
Note: verbatim comments to this open-ended question were grouped according to similar categories
FAC = firearms certificate

Figure 20. Percent of First Nations adults that agreed that the listed factors affected (or limited) where they could hunt, fish or collect berries across Saskatchewan and by ecozone (n=1025)



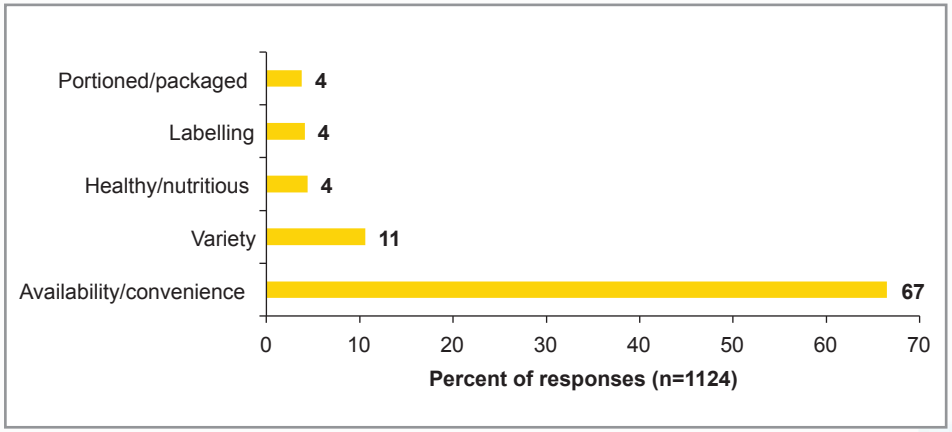
Traditional plants. Photo by Rebecca Hare

Figure 21. Top 5 benefits of traditional food reported by First Nations adults in Saskatchewan



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

Figure 22. Top 5 benefits of market food reported by First Nations adults in Saskatchewan



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[1]

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	206	2386 (176)	1355 (206)	1535 (203)	1870 (200)	2294 (203)	2777 (218)	3266 (243)	3583 (266)
	51-70	98	1801 (186)	1001 (202)	1130 (192)	1373 (180)	1692 (187)	2083 (236)	2524 (326)	2839 (405)
Female	19-50	448	1794 (115)	1153 (161)	1265 (143)	1469 (117)	1723 (118)	2014 (177)	2316 (271)	2517 (342)
	51-70	199	1533 (116)	789 (117)	903 (115)	1127 (111)	1433 (118)	1811 (148)	2226 (202)	2513 (252)

Table 11.2 Protein (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	105 (7)	86 (8)	89 (8)	96 (8)	104 (9)	113 (9)	121 (10)	127 (10)
	51-70	98	95 (9)	59 (14)	66 (13)	78 (12)	94 (11)	113 (14)	132 (19)	145 (23)
Female	19-50	448	71 (4)	50 (8)	54 (7)	60 (6)	68 (5)	77 (6)	86 (9)	91 (11)
	51-70	199	64 (4)	32 (7)	37 (6)	47 (5)	60 (3)	75 (11)	92 (36)	104 (18)

Notes:

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

[1]The SIDE SAS sub-routine nutrient analyses were performed on data from a total of 951 participants (647 women and 304 men) to obtain the distribution (percentiles) of usual intake. Nutrient data for 91 individuals were excluded: 46 pregnant and/or lactating women due to different nutrient requirements for these groups; 39 participants aged 71 and over due to low sample size; 2 participants with both missing age and age group values; and 4 participants with zero kcal intake.

Table 11.3 Total carbohydrates (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	281 (21)	149 (20)	172 (20)	217 (21)	273 (23)	338 (27)	404 (35)	447 (41)	100	(-)
	51-70	98	194 (18)	134 (27)	145 (24)	166 (19)	190 (17)	217 (24)	245 (38)	264 (50)	100	(-)
Female	19-50	448	216 (13)	118 (16)	134 (14)	164 (12)	203 (13)	249 (21)	296 (32)	327 (39)	100	(-)
	51-70	199	180 (10)	94 (15)	108 (15)	134 (14)	170 (14)	212 (15)	258 (18)	289 (22)	100	(-)

Table 11.4 Total fats (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	96 (9)	45 (10)	53 (10)	68 (10)	89 (10)	112 (10)	136 (12)	152 (13)
	51-70	98	73 (10)	37 (8)	42 (8)	52 (9)	65 (10)	82 (14)	101 (19)	115 (23)
Female	19-50	448	75 (5)	49 (9)	54 (8)	62 (6)	73 (6)	85 (8)	97 (14)	105 (18)
	51-70	199	64 (8)	28 (6)	32 (6)	42 (6)	56 (6)	75 (8)	98 (14)	114 (19)

Table 11.5 Total saturated fats (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	29 (3)	17 (4)	19 (3)	22 (3)	27 (3)	32 (3)	37 (4)	40 (5)
	51-70	98	23 (3)	19 (4)	19 (4)	20 (3)	22 (3)	23 (4)	24 (5)	25 (6)
Female	19-50	448	23 (1)	13 (2)	15 (2)	18 (2)	22 (2)	26 (2)	31 (4)	35 (5)
	51-70	199	20 (2)	8 (2)	10 (2)	13 (2)	17 (1)	23 (2)	30 (4)	35 (6)

Table 11.6 Total monounsaturated fats (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	39 (4)	17 (4)	20 (5)	27 (4)	36 (5)	46 (5)	57 (5)	64 (6)
	51-70	98	29 (4)	15 (4)	17 (4)	21 (4)	26 (4)	33 (6)	41 (8)	46 (10)
Female	19-50	448	29 (2)	21 (4)	23 (3)	25 (3)	29 (2)	33 (3)	36 (5)	39 (6)
	51-70	199	25 (3)	11 (3)	13 (3)	17 (2)	22 (2)	29 (3)	37 (5)	42 (7)

Table 11.7 Total polyunsaturated fats (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	19 (2)	8 (2)	9 (2)	13 (2)	17 (2)	23 (2)	29 (2)	32 (3)
	51-70	98	15 (2)	5 (1)	6 (1)	9 (2)	12 (2)	17 (3)	23 (5)	27 (6)
Female	19-50	448	16 (2)	13 (2)	13 (2)	14 (2)	16 (2)	17 (2)	19 (3)	20 (4)
	51-70	199	14 (2)	7 (2)	8 (2)	9 (2)	12 (2)	16 (2)	20 (3)	24 (4)

Table 11.8 Linoleic acid (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	15.2 (1.4)	6.1 (1.8)	7.4 (1.7)	10.1 (1.6)	13.8 (1.4)	18.4 (1.6)	23.5 (2.1)	27 (2.5)	17	31.5 (13.3-50.1)
	51-70	98	11.8 (1.8)	(-)	4.9 (1.4)	6.7 (1.4)	9.4 (1.5)	13.2 (2.3)	17.8 (3.9)	21.4 (5.4)	14	(-)
Female	19-50	448	12.7 (1.3)	8.6 (1.7)	9.4 (1.6)	10.8 (1.4)	12.5 (1.4)	14.4 (1.8)	16.4 (2.7)	17.7 (3.4)	12	56.9 (21.8-96.2)
	51-70	199	11.3 (1.7)	4.8 (1.6)	5.6 (1.6)	7.3 (1.6)	9.9 (1.7)	13.5 (1.9)	18.1 (2.8)	21.5 (3.7)	11	40.7 (16.3-81)

Table 11.9 Linolenic acid (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	2.1 (0.3)	0.6 (0.1)	0.8 (0.1)	1.1 (0.2)	1.7 (0.3)	2.6 (0.4)	3.7 (0.6)	4.5 (0.8)	1.6	55 (31.1-73.3)
	51-70	98	2.1 (0.4)	(-)	0.9 (0.3)	1.2 (0.3)	1.7 (0.3)	2.4 (0.5)	3.2 (0.9)	3.8 (1.2)	1.6	53.9 (23.4-94.7)
Female	19-50	448	1.6 (0.2)	0.9 (0.3)	1 (0.3)	1.2 (0.3)	1.5 (0.2)	1.9 (0.3)	2.3 (0.5)	2.5 (0.7)	1.1	83 (49.8-100)
	51-70	199	1.6 (0.2)	0.6 (0.2)	0.7 (0.2)	0.9 (0.2)	1.3 (0.2)	1.8 (0.2)	2.5 (0.4)	3 (0.5)	1.1	63.7 (43.7-95.1)

Table 11.10 Cholesterol (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	400 (36)	123 (35)	160 (36)	237 (37)	347 (38)	479 (44)	614 (58)	701 (70)
	51-70	98	332 (38)	257 (54)	271 (51)	295 (46)	323 (47)	353 (62)	382 (92)	399 (118)
Female	19-50	448	255 (17)	157 (38)	172 (36)	200 (30)	237 (24)	278 (27)	320 (41)	347 (53)
	51-70	199	271 (15)	(-)	122 (34)	171 (27)	238 (18)	319 (23)	404 (48)	459 (71)

Table 11.11 Total sugars (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	91 (7)	42 (13)	49 (13)	64 (11)	86 (9)	111 (10)	137 (16)	154 (20)
	51-70	98	46 (5)	24 (7)	27 (7)	33 (6)	41 (6)	51 (7)	62 (12)	69 (17)
Female	19-50	448	75 (4)	28 (4)	35 (4)	48 (4)	67 (5)	91 (7)	115 (10)	132 (12)
	51-70	199	62 (4)	(-)	25 (7)	36 (7)	53 (7)	77 (7)	105 (9)	126 (12)

Table 11.12 Total dietary fibre (g/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	14.5 (1.1)	8.4 (1.8)	9.4 (1.7)	11.3 (1.4)	13.7 (1.1)	16.4 (1.3)	19.1 (1.9)	20.8 (2.4)	38	0 (0-0.1)
	51-70	98	12.8 (1.1)	6.8 (1.9)	7.7 (1.7)	9.4 (1.4)	11.6 (1.1)	14.3 (1.5)	17.1 (2.6)	18.9 (3.5)	30	0 (0-1.9)
Female	19-50	448	11.3 (0.9)	6.2 (1.3)	7.1 (1.2)	8.7 (1)	10.8 (1)	13.3 (1.5)	15.8 (2.4)	17.6 (3.2)	25	(-)
	51-70	199	10.8 (1)	4.3 (1.3)	5.2 (1.3)	7.2 (1.3)	10 (1.3)	13.6 (1.4)	17.8 (1.7)	20.7 (2)	21	0 (0-0.3)

Table 11.13 Vitamin A (RAE/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	450 (36)	108 (32)	148 (33)	234 (33)	364 (37)	549 (50)	784 (79)	967 (114)	625	81 (74-91)
	51-70	98	482 (56)	320 (99)	359 (97)	431 (91)	522 (92)	630 (126)	743 (204)	(-)	625	74 (46-99)
Female	19-50	448	369 (45)	166 (51)	199 (48)	262 (43)	345 (47)	448 (72)	561 (112)	640 (143)	500	83 (61-100)
	51-70	199	385 (45)	164 (53)	197 (52)	261 (50)	350 (53)	464 (72)	593 (135)	(-)	500	81 (57-99)

Table 11.14 Vitamin C (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	90 (16)	(-)	30 (17)	(-)	74 (20)	117 (27)	175 (47)	222 (70)	75	(-)	2000	0 (0-0)
	51-70	98	42 (7)	17 (2)	21 (3)	28 (4)	39 (6)	53 (9)	69 (13)	81 (16)	75	93 (79-100)	2000	0 (0-0)
Female	19-50	448	66 (9)	45 (11)	49 (11)	57 (10)	67 (10)	(-)	91 (18)	98 (23)	60	(-)	2000	0 (0-0)
	51-70	199	51 (9)	(-)	(-)	25 (7)	41 (8)	64 (14)	(-)	(-)	60	72 (54-98)	2000	0 (0-0)

Table 11.15 Vitamin C (mg/d): Usual intakes from food (by smoking status)[1]

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	104	82 (21)	42 (13)	47 (14)	58 (15)	73 (18)	91 (29)	(-)	(-)	75	(-)	2000	0 (0-0)
	Smoker	202	70 (10)	(-)	(-)	(-)	65 (16)	96 (23)	135 (44)	(-)	110	82 (57-100)	2000	0 (0-0)
Female	Non-smoker	185	62 (10)	43 (14)	46 (13)	53 (13)	62 (12)	72 (20)	82 (26)	(-)	60	(-)	2000	0 (0-0)
	Smoker	462	61 (8)	32 (11)	37 (10)	47 (9)	60 (8)	76 (10)	94 (16)	107 (22)	95	90 (76-100)	2000	0 (0-0)

Table 11.16 Vitamin D (µg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	4.9 (0.5)	(-)	1.4 (0.4)	2.3 (0.4)	3.9 (0.5)	6.2 (0.7)	9.2 (1.3)	11.6 (2)	10	92.1 (85.8-98.2)	100	0 (0-0)
	51-70	98	3.5 (0.5)	1.3 (0.2)	1.5 (0.3)	2.1 (0.4)	2.8 (0.6)	3.8 (0.8)	4.9 (1.2)	5.7 (1.5)	10	99.9 (97.1-100)	100	0 (0-0)
Female	19-50	448	3.2 (0.7)	(-)	(-)	2.7 (0.9)	3.3 (1)	4 (1.3)	(-)	(-)	10	100 (91.4-100)	100	0 (0-0)
	51-70	199	2.6 (0.3)	1.4 (0.4)	1.5 (0.4)	1.8 (0.3)	2.1 (0.2)	2.5 (0.3)	3 (0.5)	3.2 (0.7)	10	100 (99.8-100)	100	0 (0-0)

Table 11.17 Folate (DFE/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	371 (30)	285 (51)	300 (46)	326 (37)	357 (31)	390 (37)	421 (52)	441 (65)	320	(-)
	51-70	98	324 (44)	241 (33)	255 (35)	280 (38)	310 (42)	343 (48)	376 (53)	396 (57)	320	(-)
Female	19-50	448	285 (17)	147 (26)	169 (23)	211 (18)	267 (17)	332 (28)	400 (46)	445 (60)	320	71 (56-91)
	51-70	199	264 (11)	165 (24)	183 (21)	215 (16)	255 (13)	301 (21)	348 (35)	379 (45)	320	82 (69-100)

Table 11.18 Vitamin B6 (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	1.7 (0.1)	1.2 (0.2)	1.3 (0.2)	1.4 (0.2)	1.6 (0.1)	1.8 (0.1)	2 (0.2)	2.1 (0.2)	1.1	(-)	100	0 (0-0)
	51-70	98	1.5 (0.1)	1.2 (0.2)	1.3 (0.2)	1.4 (0.2)	1.5 (0.1)	1.5 (0.1)	1.6 (0.2)	1.7 (0.2)	1.4	(-)	100	0 (0-0)
Female	19-50	448	1.3 (0.1)	1.1 (0.1)	1.2 (0.1)	1.2 (0.1)	1.3 (0.1)	1.4 (0.1)	1.4 (0.1)	1.5 (0.1)	1.1	(-)	100	0 (0-0)
	51-70	199	1.1 (0.1)	0.7 (0.1)	0.7 (0.1)	0.9 (0.1)	1.1 (0.1)	1.3 (0.4)	1.5 (0.2)	1.7 (0.3)	1.3	73 (58-100)	100	0 (0-0)

Table 11.19 Vitamin B12 (µg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	6.9 (0.6)	3.6 (1.2)	4.1 (1.2)	5.2 (1)	6.7 (0.9)	8.5 (0.9)	10.6 (1.5)	12.0 (2.1)	2.0	(-)
	51-70	98	6.5 (1)	(-)	(-)	3.4 (1.1)	5.2 (1.2)	8 (1.6)	11.7 (2.4)	14.7 (3.1)	2.0	(-)
Female	19-50	448	4 (0.3)	2.4 (0.6)	2.6 (0.5)	3.1 (0.4)	3.8 (0.4)	4.6 (0.4)	5.4 (0.7)	6.0 (0.9)	2.0	(-)
	51-70	199	3.7 (0.4)	2.5 (0.6)	2.7 (0.5)	3 (0.4)	3.5 (0.3)	4.0 (0.6)	(-)	4.9 (2.6)	2.0	(-)

Table 11.20 Thiamin (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	2.1 (0.2)	1.5 (0.2)	1.6 (0.2)	1.8 (0.2)	2.1 (0.2)	2.4 (0.2)	2.7 (0.3)	2.9 (0.3)	1.0	0 (0-0.4)
	51-70	98	1.7 (0.2)	0.8 (0.2)	0.9 (0.2)	1.2 (0.2)	1.6 (0.2)	2.1 (0.3)	2.6 (0.4)	3 (0.5)	1.0	(-)
Female	19-50	448	1.5 (0.1)	0.8 (0.1)	0.9 (0.1)	1.1 (0.1)	1.4 (0.1)	1.7 (0.2)	2.1 (0.3)	2.4 (0.4)	0.9	(-)
	51-70	199	1.4 (0.1)	0.7 (0.1)	0.8 (0.1)	1 (0.1)	1.3 (0.1)	1.6 (0.1)	2 (0.2)	2.2 (0.3)	0.9	(-)

Table 11.21 Riboflavin (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	2.4 (0.2)	1.6 (0.3)	1.8 (0.3)	2 (0.2)	2.4 (0.2)	2.8 (0.2)	3.2 (0.3)	3.4 (0.4)	1.1	(-)
	51-70	98	2.2 (0.2)	1.1 (0.2)	1.3 (0.2)	1.6 (0.2)	2 (0.2)	2.6 (0.3)	3.2 (0.4)	3.7 (0.5)	1.1	(-)
Female	19-50	448	1.7 (0.1)	1 (0.1)	1.1 (0.1)	1.4 (0.1)	1.6 (0.1)	2 (0.2)	2.3 (0.3)	2.5 (0.4)	0.9	(-)
	51-70	199	1.7 (0.1)	1 (0.1)	1.1 (0.1)	1.3 (0.1)	1.7 (0.1)	2 (0.1)	2.5 (0.2)	2.7 (0.3)	0.9	(-)

Table 11.22 Niacin (NE/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	48 (3)	41 (5)	42 (5)	45 (4)	48 (4)	50 (4)	53 (6)	55 (7)	12	0 (0-0)
	51-70	98	42 (4)	27 (6)	30 (5)	35 (5)	42 (5)	50 (5)	57 (7)	62 (8)	12	0 (0-0.5)
Female	19-50	448	33 (2)	25 (3)	26 (3)	29 (3)	32 (2)	36 (3)	40 (4)	42 (5)	11	0 (0-0.1)
	51-70	199	30 (2)	16 (3)	19 (3)	23 (2)	28 (2)	35 (2)	42 (4)	47 (5)	11	(-)

Table 11.23 Calcium (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	676 (52)	347 (78)	401 (76)	505 (71)	644 (67)	811 (75)	988 (102)	1107 (131)	800	74 (57-93)	2500	0 (0-0)
	51-70	98	467 (62)	222 (65)	256 (65)	324 (66)	417 (68)	534 (87)	663 (133)	753 (180)	800	97 (86-100)	2000	0 (0-0)
Female	19-50	448	492 (48)	289 (64)	322 (61)	385 (56)	467 (54)	566 (63)	670 (86)	740 (106)	800	97 (88-100)	2500	0 (0-0)
	51-70	199	408 (21)	223 (21)	250 (20)	302 (19)	374 (21)	463 (32)	558 (52)	623 (68)	1000	100 (99-100)	2000	0 (0-0)

Table 11.24 Iron (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	18 (1)	13 (3)	14 (3)	16 (2)	18 (2)	20 (2)	23 (3)	24 (3)	6.0	0 (0-2.3)	45	0 (0-0.3)
	51-70	98	16 (2)	9 (2)	10 (2)	12 (2)	15 (2)	18 (3)	22 (4)	25 (4)	6.0	(-)	45	0 (0-1)
Female	19-50	448	12 (1)	6 (1)	7 (1)	9 (1)	11 (1)	14 (1)	18 (2)	20 (2)	8.1	18 (3-27)	45	0 (0-0)
	51-70	199	12 (1)	7 (1)	7 (1)	9 (1)	11 (1)	13 (1)	16 (2)	18 (3)	5.0	(-)	45	0 (0-0.1)

Table 11.25 Potassium (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	2692 (144)	1984 (273)	2124 (239)	2372 (185)	2665 (155)	2979 (192)	3282 (274)	3476 (340)	4700	0 (0-1.2)
	51-70	98	2575 (200)	1818 (316)	1956 (291)	2205 (250)	2507 (230)	2838 (276)	3162 (390)	3368 (489)	4700	0 (0-4.4)
Female	19-50	448	2094 (107)	1440 (173)	1558 (147)	1771 (109)	2040 (112)	2351 (193)	2671 (314)	2882 (404)	4700	0 (0-0.6)
	51-70	199	1966 (127)	1129 (208)	1273 (190)	1540 (159)	1885 (137)	2291 (157)	2720 (219)	3011 (275)	4700	0 (0-0.3)

Table 11.26 Sodium (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	3810 (322)	2383 (482)	2639 (446)	3107 (390)	3688 (368)	4337 (438)	4982 (587)	5396 (707)	1500	100 (96-100)	2300	96 (77-100)
	51-70	98	2848 (422)	1558 (441)	1753 (422)	2127 (403)	2636 (436)	3287 (581)	4044 (847)	4598 (1083)	1300	99 (89-100)	2300	67 (11-100)
Female	19-50	448	2683 (177)	1591 (331)	1785 (295)	2138 (229)	2578 (192)	3074 (282)	3575 (462)	3903 (601)	1500	97 (83-100)	2300	66 (48-96)
	51-70	199	2283 (161)	1120 (164)	1301 (150)	1634 (133)	2067 (156)	2603 (248)	3219 (389)	3672 (508)	1300	90 (83-99)	2300	38 (17-55)

Table 11.27 Magnesium* (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	68	264 (18)	186 (23)	201 (26)	228 (32)	261 (46)	297 (74)	(-)	355 (158)	330	94 (43-100)
	31-70	236	258 (11)	163 (26)	181 (23)	213 (18)	252 (14)	295 (16)	338 (25)	366 (32)	350	92 (83-100)
Female	19-30	142	205 (11)	134 (22)	146 (20)	170 (16)	200 (14)	234 (24)	270 (43)	294 (57)	255	85 (65-100)
	31-70	505	203 (13)	117 (11)	132 (11)	160 (11)	195 (14)	237 (19)	282 (25)	312 (29)	265	86 (71-96)

*age-groups categorized differently from other SIDE tables due to different EAR values

Table 11.28 Phosphorus (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	1392 (85)	1060 (177)	1128 (160)	1249 (133)	1394 (112)	1550 (123)	1700 (169)	1795 (211)	580	0 (0-1.5)	4000	0 (0-0)
	51-70	98	1179 (117)	761 (158)	840 (149)	983 (136)	1159 (132)	1355 (150)	1549 (188)	1673 (219)	580	(-)	4000	0 (0-0)
Female	19-50	448	980 (67)	662 (100)	719 (90)	820 (77)	945 (75)	1086 (96)	1230 (136)	1325 (168)	580	(-)	4000	0 (0-0)
	51-70	199	865 (56)	479 (77)	548 (69)	672 (59)	824 (58)	999 (75)	1188 (107)	1319 (132)	580	13 (0-21)	4000	0 (0-0)

Table 11.29 Zinc (mg/d): Usual intakes from food, by DRI age-sex group, household population[1]

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	206	15 (1)	12 (1)	13 (1)	14 (2)	15 (2)	16 (2)	17 (2)	18 (2)	9.4	0 (0-3.3)	40	0 (0-0)
	51-70	98	14 (1)	7 (2)	8 (2)	10 (2)	13 (2)	17 (2)	21 (4)	24 (5)	9.4	(-)	40	(-)
Female	19-50	448	10 (1)	6 (1)	7 (1)	8 (1)	9 (1)	11 (1)	13 (1)	14 (1)	6.8	(-)	40	0 (0-0)
	51-70	199	9 (1)	6 (1)	6 (1)	7 (1)	9 (1)	10 (1)	11 (1)	12 (2)	6.8	(-)	40	0 (0-0)

Table 11.30 Percentage of total energy intake from protein, by DRI age-sex group, household population[1]

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	206	18 (1)	13 (1)	14 (1)	16 (1)	18 (1)	20 (1)	23 (2)	24 (2)	10-35	0 (0-2)	100 (97.4-100)	0 (0-1)
	51-70	98	22 (2)	18 (3)	19 (3)	21 (2)	23 (2)	26 (3)	28 (4)	30 (5)	10-35	0 (0-0.2)	99.7 (84.7-100)	(-)
Female	19-50	448	16 (0.3)	12 (1)	13 (1)	14 (1)	16 (0.4)	18 (1)	19 (1)	20 (1)	10-35	(-)	99.9 (98.1-100)	0 (0-0)
	51-70	199	22 (2)	18 (3)	19 (3)	21 (2)	23 (2)	26 (3)	28 (4)	30 (4)	10-35	0 (0-0.2)	99.5 (76.3-100)	0 (0-1.6)

Table 11.31 Percentage of total energy intake from carbohydrates, by DRI age-sex group, household population[1]

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	206	48 (1)	39 (3)	41 (2)	45 (2)	48 (1)	52 (2)	56 (3)	58 (3)	45-65	28 (8-47)	72 (52-93)	(-)
	51-70	98	43 (1)	39 (3)	40 (3)	41 (2)	43 (2)	45 (2)	46 (2)	47 (3)	45-65	80 (45-100)	(-)	0 (0-0)
Female	19-50	448	49 (1)	39 (3)	41 (2)	45 (2)	49 (1)	52 (2)	56 (2)	58 (3)	45-65	27 (1-42)	73 (57-99)	(-)
	51-70	199	49 (1)	38 (4)	41 (3)	45 (2)	50 (1)	54 (1)	58 (2)	61 (3)	45-65	24 (0.4-37)	74 (60-100)	(-)

Table 11.32 Percentage of total energy intake from fats, by DRI age-sex group, household population[1]

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	206	35.4 (1)	32 (2.5)	32.5 (2.1)	33.5 (1.4)	34.5 (1)	35.6 (1.3)	36.5 (1.9)	37.1 (2.4)	20-35	0 (0-1.4)	61.6 (30.3-91.3)	(-)
	51-70	98	35.5 (1.4)	32.3 (1.6)	32.8 (1.7)	33.5 (1.7)	34.3 (1.7)	35.1 (1.8)	35.8 (1.8)	36.2 (1.8)	20-35	0 (0-0)	73.1 (1-100)	(-)
Female	19-50	448	36.4 (0.5)	28.1 (2)	30 (1.6)	33.2 (1)	36.8 (0.6)	40.4 (0.9)	43.7 (1.4)	45.7 (1.8)	20-35	0 (0-0.6)	37.1 (17.4-44.4)	62.9 (55.3-82.6)
	51-70	199	34.6 (0.9)	24.8 (1.8)	26.7 (1.5)	29.9 (1)	33.6 (0.8)	37.5 (1.3)	41.4 (2.1)	44 (2.8)	20-35	(-)	59.3 (47.6-77.2)	40.1 (22.8-51.7)

Table 11.33 Percentage of total energy intake from saturated fats, by DRI age-sex group, household population[1]

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	206	10.8 (0.4)	9.1 (0.4)	9.4 (0.4)	9.9 (0.4)	10.5 (0.4)	11.1 (0.4)	11.7 (0.5)	12 (0.5)
	51-70	98	11.1 (0.5)	9.5 (0.6)	9.8 (0.6)	10.3 (0.6)	10.8 (0.6)	11.4 (0.7)	11.9 (0.7)	12.3 (0.7)
Female	19-50	448	11.1 (0.3)	8.4 (0.6)	9 (0.5)	10 (0.4)	11.1 (0.3)	12.3 (0.4)	13.4 (0.6)	14.1 (0.7)
	51-70	199	10.8 (0.2)	8.4 (0.8)	8.9 (0.7)	9.7 (0.4)	10.6 (0.2)	11.6 (0.4)	12.5 (0.7)	13.1 (1)

Table 11.34 Percentage of total energy intake from monounsaturated fats, by DRI age-sex group, household population[1]

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	206	14.2 (0.6)	11.6 (0.6)	12.1 (0.6)	12.9 (0.6)	13.9 (0.6)	14.8 (0.6)	15.7 (0.6)	16.2 (0.6)
	51-70	98	14.1 (0.6)	11.4 (0.7)	11.9 (0.7)	12.6 (0.7)	13.5 (0.8)	14.4 (0.8)	15.2 (0.9)	15.7 (0.9)
Female	19-50	448	14.2 (0.3)	11.6 (1)	12.2 (0.9)	13.2 (0.5)	14.3 (0.3)	15.5 (0.5)	16.6 (0.8)	17.2 (1.1)
	51-70	199	13.4 (0.5)	9.7 (1)	10.3 (0.8)	11.5 (0.6)	12.9 (0.5)	14.3 (0.8)	15.7 (1.1)	16.6 (1.4)

Table 11.35 Percentage of total energy intake from polyunsaturated fats, by DRI age-sex group, household population[1]

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	206	14.2 (0.6)	11.6 (0.6)	12.1 (0.6)	12.9 (0.6)	13.9 (0.6)	14.8 (0.6)	15.7 (0.6)	16.2 (0.6)
	51-70	98	14.1 (0.6)	11.4 (0.7)	11.9 (0.7)	12.6 (0.7)	13.5 (0.8)	14.4 (0.8)	15.2 (0.9)	15.7 (0.9)
Female	19-50	448	14.2 (0.3)	11.6 (1)	12.2 (0.9)	13.2 (0.5)	14.3 (0.3)	15.5 (0.5)	16.6 (0.8)	17.2 (1.1)
	51-70	199	13.4 (0.5)	9.7 (1)	10.3 (0.8)	11.5 (0.6)	12.9 (0.5)	14.3 (0.8)	15.7 (1.1)	16.6 (1.4)

Table 11.36 Percentage of energy from linoleic acid, by DRI age-sex group, household population[1]

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	206	5.7 (0.2)	4.0 (0.2)	4.3 (0.2)	4.9 (0.2)	5.5 (0.3)	6.2 (0.3)	6.9 (0.4)	7.3 (0.5)
	51-70	98	5.5 (0.3)	3.4 (0.7)	3.7 (0.6)	4.3 (0.5)	4.9 (0.4)	5.7 (0.5)	6.5 (0.7)	7 (0.9)
Female	19-50	448	6.3 (0.2)	5.2 (0.6)	5.5 (0.5)	5.9 (0.4)	6.3 (0.3)	6.8 (0.4)	7.2 (0.6)	7.5 (0.8)
	51-70	199	6 (0.2)	3.4 (0.5)	3.9 (0.4)	4.7 (0.3)	5.7 (0.2)	7 (0.4)	8.4 (0.7)	9.3 (0.9)

Table 11.37 Percentage of energy from linolenic acid, by DRI age-sex group, household population[1]

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	206	0.8 (0.1)	0.5 (0.1)	0.5 (0.1)	0.6 (0.1)	0.7 (0.1)	0.9 (0.1)	1 (0.1)	1.1 (0.2)
	51-70	98	1 (0.1)	0.5 (0.1)	0.6 (0.1)	0.7 (0.1)	0.9 (0.1)	1 (0.2)	1.2 (0.2)	1.3 (0.3)
Female	19-50	448	0.8 (0.1)	0.47 (0.05)	0.52 (0.05)	0.61 (0.06)	0.73 (0.07)	0.87 (0.08)	1.01 (0.08)	1.1 (0.09)
	51-70	199	0.9 (0.1)	0.37 (0.08)	0.44 (0.08)	0.57 (0.06)	0.76 (0.05)	1.03 (0.09)	1.34 (0.16)	1.54 (0.22)

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

Food Group	Gender	First Nations in Saskatchewan current intake	Canada's Food Guide Recommendations
		Servings per day	
Vegetables and Fruit	men	3.3	7-10
	women	3.1	7-8
Grain Products	men	6.3	7-8
	women	5.1	6-7
Milk and Alternatives	men	1	2-3
	women	0.8	2-3
Meat and Alternatives	men	4.3	3
	women	3.1	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 Saskatchewan (unweighted)

Gender	Canada's Food Guide Food Groups							
	Vegetables and Fruit	%	Meat and Alternatives	%	Grain Products	%	Milk and Alternatives	%
Women	Potatoes	30.3	Beef	20.4	White bread	22.2	Fluid milk	25.2
	Canned vegetables[a]	24.7	Wild meats[b]	16.2	Pasta/noodles	17.8	Cheese[d]	14.9
	Fresh/frozen vegetables	17.0	Chicken	21.3	Cereal[c]	11.7	Mashed potatoes with milk	8.0
	Fresh/frozen/dried fruit	8.6	Pork	12.9	Bannock	10.2	Cream soups	17.4
	Fruit/vegetable juice	7.1	Eggs	9.9	Whole wheat bread	10.0	Mixed dishes with cheese[e]	12.6
Men	Potatoes	33.5	Wild meats	20.7	White bread	22.9	Fluid milk	27.8
	Canned vegetables	26.9	Chicken	18.7	Pasta/noodles	20.7	Cream soups	19.0
	Fresh/frozen vegetables	16.3	Beef	17.4	Bannock	15.3	Mixed dishes with cheese	17.1
	Fruit/vegetable juice	6.8	Pork	14.7	Cereal	9.5	Cheese	10.8
	Fresh/frozen/dried fruit	5.8	Eggs	8.9	Rice	9.1	Mashed potatoes with milk	6.6

[a] includes canned vegetable soups
[b] includes caribou, moose, deer, elk, beaver, rabbit, muskrat and bear.
[c] includes both hot and cold cereal (approximately 60% hot and 40% cold for both women and men)
[d] includes cheddar, mozzarella, parmesan, Swiss, feta and cottage cheese
[e] includes macaroni and cheese, pizza and cheeseburgers

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

a) Energy		b) Protein		c) Fat		d) Carbohydrates	
Food	% of total	Food	% of total	Food	% of total	Food	% of total
Bread/buns, white	6.2	Wild meats[d]	14.4	Cold cuts/sausages	8.2	Bread/buns, white	9.7
Chicken[a]	5.3	Beef	11.2	Beef	7.7	Carbonated drinks, regular	8.7
Bannock	5.1	Chicken	10.7	Chicken	7.5	Jam/honey/syrup/sugar	6.6
Beef[b]	4.9	Pork	7.5	Margarine	6.7	Pasta/noodles	6.0
Pasta/noodles	4.2	Eggs	4.8	Pork	5.2	Bannock	5.9
Carbonated drinks, regular	4.1	Bread/buns, white	4.4	Salty snack food[e]	5.2	Cereal	5.7
Cold cuts/sausages	4.1	Cold cuts/sausages	4.3	Bannock	5.1	Potatoes, boiled/baked	5.3
Soup	3.8	Pasta/noodles	3.9	Eggs	5.1	Soup	4.4
Cereal	3.4	Soup	3.4	Vegetable oil	3.9	Grains[f]	4.1
Pork[c]	3.4	Bread/buns, whole wheat	3.2	French fries/ hash browns	3.5	Fruit drinks	4.0

e) Saturated Fat		f) Monounsaturated Fat		g) Polyunsaturated Fat		h) Cholesterol	
Food	% of total	Food	% of total	Food	% of total	Food	% of total
Beef	10.0	Cold cuts/sausages	9.6	Salty snack food	11.7	Eggs	38.8
Cold cuts/sausages	9.8	Beef	9.0	Margarine	10.8	Chicken	10.6
Chicken	6.0	Chicken	7.8	Chicken	8.6	Wild meats	9.9
Pork	5.8	Margarine	7.5	Bannock	7.0	Beef	8.7
Cheese	5.3	Bannock	7.1	Vegetable oil	5.2	Pork	6.1
Eggs	4.7	Vegetable oil	6.3	French fries/ hash browns	4.8	Cold cuts/sausages	4.8
Coffee whitener	4.4	Pork	5.5	Bread/buns, white	4.6	Cheese	2.1
Butter	4.1	Eggs	5.4	Eggs	4.4	Mixed dishes	1.9
Margarine	3.8	Salty snack food	4.3	Cold cuts/sausages	3.7	Fish	1.8
Pizza	3.7	French fries/ hash browns	3.2	Salad dressing/dips	3.5	Milk	1.6

[a]chicken= roasted, baked, fried and stewed
[b]beef= ground, steak, ribs and brisket
[c]pork= loin, chops and ribs
[d]wild meats= bear, beaver, caribou, deer, elk, moose, muskrat, rabbit, duck, ptarmigan, spruce grouse and goose
[e]salty snack food=potato chips, pretzels, popcorn
[f]grains= rice, barley, quinoa, couscous

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

i) Total Sugars		j) Fibre		k) Vitamin A		l) Vitamin C	
Food	% of total	Food	% of total	Food	% of total	Food	% of total
Carbonated drinks, regular	21.8	Bread/buns, whole wheat	11.4	Vegetables	27.5	Fruit drinks	39.6
Jam/honey/syrup/sugar	18.9	Cereal	10.5	Eggs	17.0	Fruit juice	16.0
Fruits	5.7	Vegetables	9.2	Margarine	13.1	Vegetables	8.7
Fruit drinks	4.7	Bread/buns, white	8.5	Milk	9.6	Fruits	7.9
Iced tea	4.7	Potatoes, boiled/baked	7.0	Soup	6.6	Potatoes, boiled/baked	6.9
Milk	4.6	French fries/ hash browns	6.2	Cheese	3.8	French fries/ hash browns	4.0
Fruit juice	3.8	Pasta/noodles	5.2	Butter	3.2	Soup	3.4
Cereal	3.1	Fruits	4.9	Pizza	2.3	Salty snack food	3.0
Cakes/pies/pastries	2.9	Salty snack food	4.6	Chicken	1.8	Wild meats	1.5
Soup	2.7	Soup	4.6	Cream	1.8	Milk	1.1

m) Vitamin D		n) Folate		o) Calcium		p) Iron	
Food	% of total	Food	% of total	Food	% of total	Food	% of total
Margarine	24.2	Bread/buns, white	22.7	Milk	14.6	Wild meats	13.9
Milk	17.9	Pasta/noodles	14.2	Bread/buns, white	10.5	Bread/buns, white	10.6
Fish	16.1	Eggs	5.7	Cheese	8.1	Cereal	10.5
Eggs	15.9	Soup	5.2	Bannock	6.6	Beef	6.5
Pork	5.3	Vegetables	5.0	Pizza	5.5	Bannock	5.9
Cold cuts/sausages	4.7	Pizza	4.5	Fruit drinks	4.2	Soup	5.8
Pasta/noodles	3.2	Cereal	4.2	Bread/buns, whole wheat	3.9	Pasta/noodles	4.4
Chicken	2.4	Bread/buns, whole wheat	3.6	Pasta/noodles	3.4	Bread/buns, whole wheat	3.5
Beef	1.4	Coffee	3.2	Eggs	3.1	Chicken	3.4
Potatoes, boiled/baked	1.1	Tea	2.8	Vegetables	2.9	Eggs	2.9

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

q) Sodium		r) Zinc	
Food	% of total	Food	% of total
Soup	15.2	Beef	18.0
Bread/buns, white	9.3	Wild meats	17.7
Cold cuts/sausages	7.8	Pork	5.5
Pork	5.5	Chicken	4.8
Chicken	4.6	Cereal	4.7
Bannock	4.3	Cold cuts/sausages	4.3
Pizza	3.8	Eggs	3.4
Bread/buns, whole wheat	3.3	Soup	3.2
Pasta/noodles	3.3	Bread/buns, whole wheat	3.1
Salty snack food	3.0	Pasta/noodles	3.0

Figure 23. Percent of 24 hour recalls that included traditional food

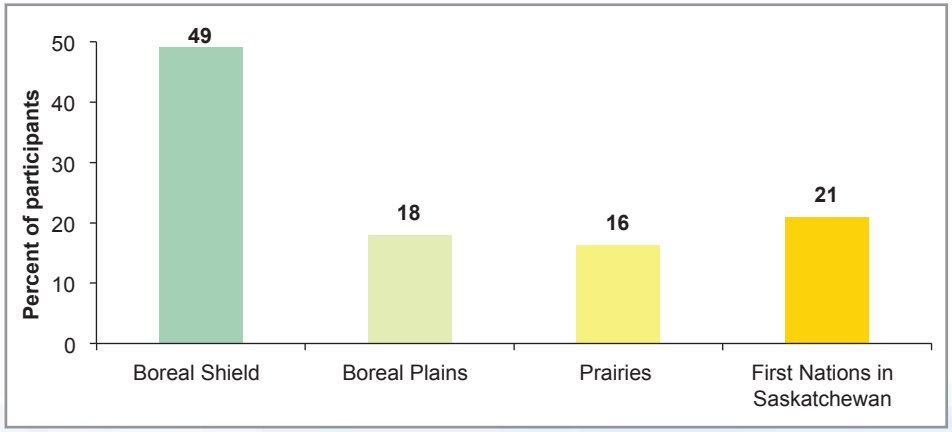


Table 15. Comparison of nutrient intake (mean ± SE) on days with and without traditional food (TF), First Nations adults in Saskatchewan

Nutrient	Days with TF (n=271 recalls)	Days without TF (n=771 recalls)
	mean ± SE	
Energy (kcals)	1928 ± 67.1	1813 ± 35.5
Protein (g)***	112 ± 4.62	68.9 ± 1.48
Fat (g)	71.3 ± 3.13	76.6 ± 1.95
Carbohydrate (g)	215 ± 7.61	217 ± 4.47
Total sugars (g)***	58.9 ± 2.97	76.4 ± 2.27
Fibre (g)*	13.0 ± 0.57	11.6 ± 0.29
Cholesterol (mg)***	376 ± 20.3	274 ± 8.57
Total saturated fat (g)**	20.3 ± 0.89	24.1 ± 0.62
Total monounsaturated fat (g)	29.6 ± 1.40	29.8 ± 0.82
Total polyunsaturated fat (g)	16.1 ± 0.82	15.5 ± 0.49
Linoleic acid (g)	12.4 ± 0.67	12.7 ± 0.43
Linolenic acid (g)***	2.39 ± 0.16	1.51 ± 0.06
Calcium (mg)	491 ± 22.3	515 ± 14.7
Iron (mg)***	20.4 ± 0.90	11.8 ± 0.26
Zinc (mg) ***	16.5 ± 0.79	9.38 ± 0.23
Magnesium (mg) ***	262 ± 8.59	211 ± 4.65
Copper (mg) ***	1.63 ± 0.06	1.01 ± 0.02
Potassium (mg) ***	2792 ± 91.8	2069 ± 40.6
Sodium (mg)	2666 ± 113	2862 ± 69.0
Phosphorus (mg) ***	1331 ± 48.9	979 ± 20.3
Vitamin A (µg) *	446 ± 26.5	382 ± 13.2
Vitamin D (µg) ***	5.4 ± 0.64	2.92 ± 0.12
Vitamin C (mg)	70.9 ± 7.03	62.6 ± 3.94
Folate (µg)	309 ± 13.9	295 ± 7.54
Thiamin (mg)**	1.77 ± 0.08	1.54 ± 0.04
Riboflavin (mg)***	2.45 ± 0.10	1.75 ± 0.03
Niacin (mg)***	46.8 ± 1.82	33.0 ± 0.67
Vitamin B6 (mg)***	1.63 ± 0.06	1.25 ± 0.03
Vitamin B12 (µg) ***	10.2 ± 0.73	3.28 ± 0.10

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

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

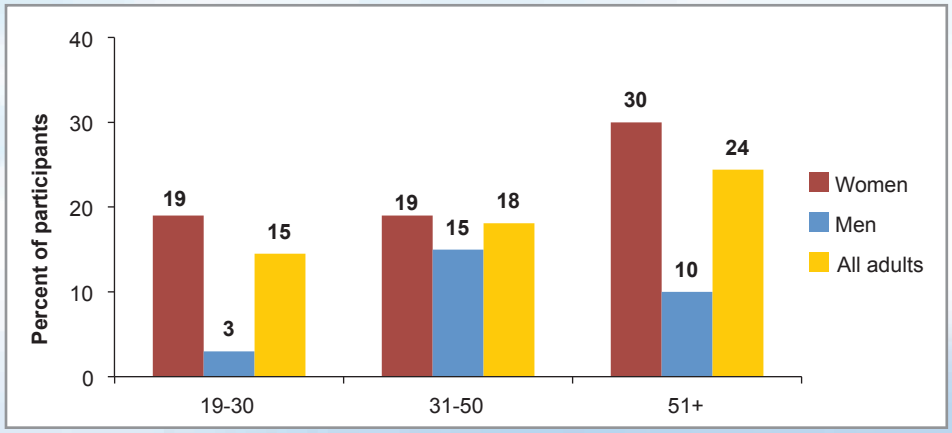
See Appendix K for a more complete list of market foods.

First Nations adults in SK		Boreal Shield		Boreal Plains		Prairies	
Beverages	grams/ person/ day	Beverages	grams/ person/ day	Beverages	grams/ person/ day	Beverages	grams/ person/ day
Coffee	478	Coffee	470	Water, tap	570	Coffee	411
Water, tap[a]	462	Water, tap	428	Coffee	528	Water, tap	340
Soft drinks, regular	194	Soft drinks, regular	250	Tea	167	Water, bottled	326
Water, bottled	179	Tea	205	Soft drinks, regular	148	Soft drinks, regular	236
Tea	167	Fruit drinks	160	Water, bottled	86	Tea	143
Fruit drinks[b]	84	Water, bottled	66	Fruit drinks	80	Milk	69
Milk[c]	59	Iced tea	59	Milk	56	Fruit drinks	68
Iced tea	38	Milk	46	Iced tea	40	Fruit juice	38
Fruit juice[d]	30	Fruit juice	32	Fruit juice	23	Iced tea	31
Sports drinks	7	Sports drinks	12	Soft drinks, diet	7	Flavoured water	8
Food	**grams/ person/ day**	**Food**	**grams/ person/ day**	**Food**	**grams/ person/ day**	**Food**	**grams/ person/ day**
Soup[e]	136	Soup	128	Soup	137	Soup	136
Potatoes[f]	59	Potatoes	65	Potatoes	58	Vegetables	60
Vegetables[g]	53	Cereal	62	Vegetables	47	Potatoes	57
Pasta/noodles	50	Vegetables	58	Pasta/noodles	44	Pasta/noodles	56
Cereal	49	Pasta/noodles	51	Cereal	41	Cereal	55
Bread/buns, white	41	Eggs	44	Chicken	41	Bread/buns, white	51
Chicken[h]	38	Chicken	40	Bread/buns, white	34	Fruits	49
Bannock	34	Beef	38	Grains	32	Bannock	44
Beef[i]	34	Mixed dish	36	Eggs	32	Beef	39
Fruits	34	Bread/buns, white	33	Beef	29	Grains (rice/barley)	34

[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] Milk = fluid milk, evaporated, powdered
[d] fruit juice = pure fruit juice, fresh/frozen/canned
[e] soups = canned soups and ramen noodles
[f] potatoes = boiled, baked, mashed (excludes French fries)
[g] vegetables = fresh, frozen, canned (excludes potatoes)
[h] chicken = roasted, baked, fried and stewed
[i] beef = ground, steak, ribs and brisket

Figure 24. Use of nutritional supplements by First Nations adults in Saskatchewan by gender and age group (n=1040)*

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



*n=2 missing age values

Stanley Mission, Lac La Ronge. Photo by Rebecca Hare

Food Security

Figure 25. Percent of households that worried that their traditional food would run out before they could get more, in the previous 12 months (n=1042)

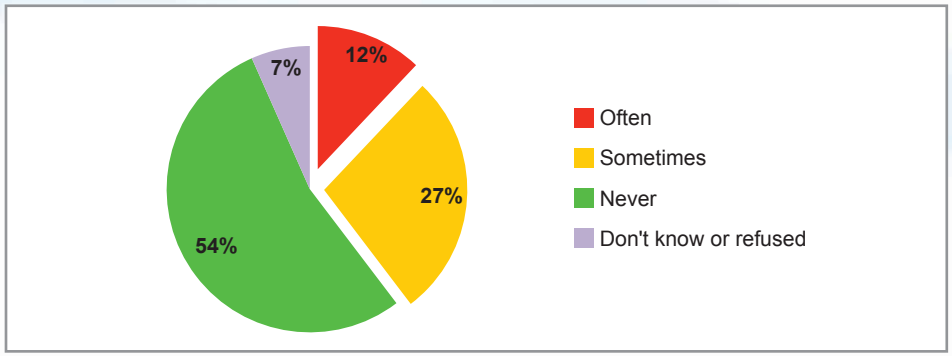


Figure 26. Percent of households that worried that their traditional food would not last and they couldn't get more in the previous 12 months (n=1042)

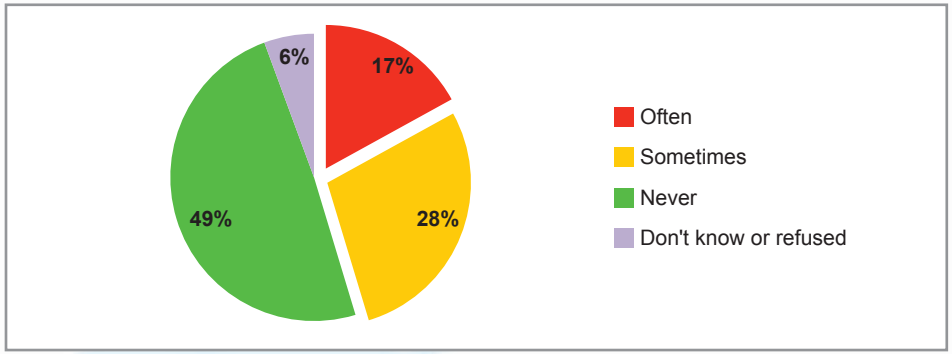


Table 17. Percent of First Nations adults in Saskatchewan that responded affirmatively to food insecurity questions (in the previous 12 months)

	Households affirming item		
	All Households (n=1008)	Households with children (n=699)	Households without children (n=309)
Adult Food Security Scale			
You and other household members worried food would run out before you got money to buy more	39.0	44.4	24.4
Food you and other household members bought didn't last and there wasn't any money to get more	31.8	35.3	22.2
You and other household members couldn't afford to eat balanced meals	33.0	36.4	23.7
You or other adults in your household ever cut size of meals or skipped meals	12.6	14.1	8.5
You or other adults in your household ever cut size of meals or skipped meals in 3 or more months	9.1	9.8	6.9
You (personally) ever ate less than you felt you should	14.1	15.8	9.4
You (personally) were ever hungry but did not eat	8.3	9.9	4.0
You (personally) lost weight	5.0	5.9	2.5
You or other adults in your household ever did not eat for a whole day	2.9	3.7	0.8
You or other adults in your household ever did not eat for a whole day in 3 or more months	2.0	2.5	0.7
Child Food Security Scale			
You or other adults in your household relied on less expensive foods to feed children	28.4	38.7	-
You or other adults in your household couldn't feed children a balanced meal	15.8	21.5	-
Children were not eating enough	11.2	15.3	-
You or other adults in your household ever cut size of any of the children's meals	2.1	2.9	-
Any of the children were ever hungry	2.1	2.8	-
Any of the children ever skipped meals	1.8	2.5	-
Any of the children ever skipped meals in 3 or more months	0.9	1.3	-
Any of the children ever did not eat for a whole day	0.7	0.9	-

(-) denotes not applicable

Table 18. Income-related household food security status for First Nations in Saskatchewan, 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	643	63	60-67	365	37	33-40	270	27	24-30	95	10	8-12
	Adult status	656	64	61-68	352	36	32-39	261	26	24-29	91	9	7-11
	Child status	527	76	73-79	172	24	21-27	156	21	18-25	16	2	1-3
Households with children	Household status	415	59	55-63	284	41	37-45	213	31	27-34	71	10	8-13
	Adult status	428	60	57-64	271	60	36-43	204	30	26-33	67	10	7-12
	Child status	527	76	73-79	172	24	21-27	156	21	18-25	16	2	1-3
Households without children	Household status	228	75	70-81	81	25	19-30	57	17	12-21	24	8	5-11

Figure 27. Income-related household food insecurity in First Nations households in Saskatchewan (n=1008)*

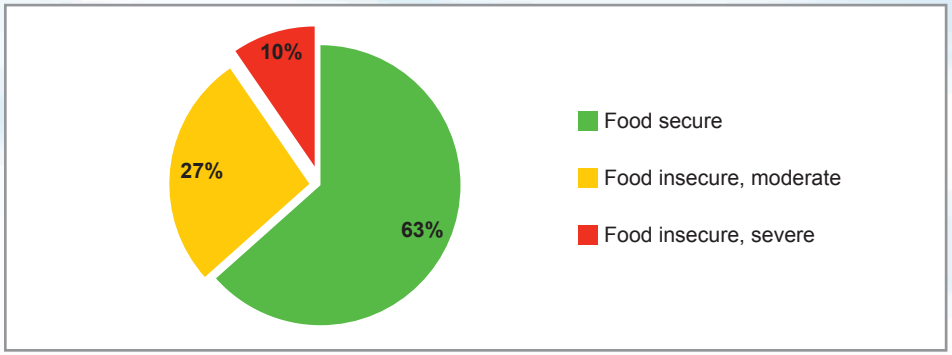
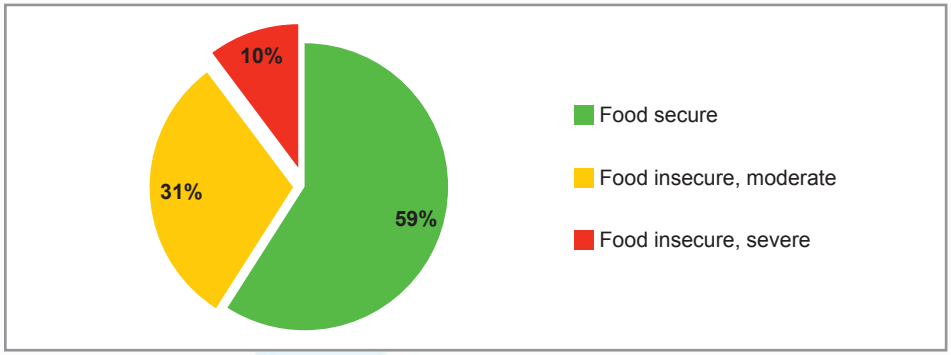
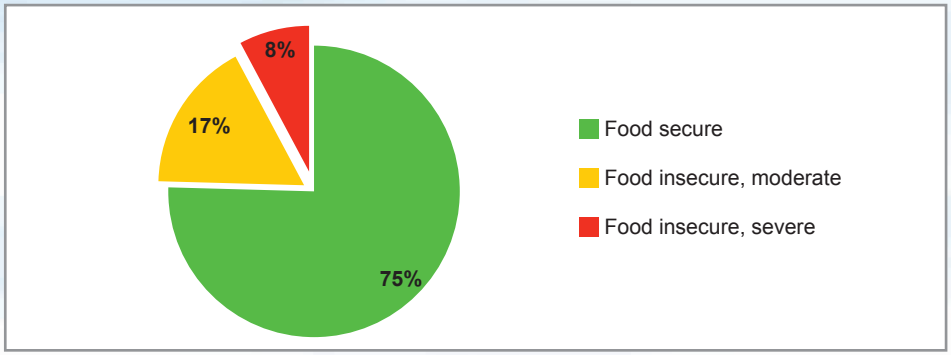


Figure 28. Income-related household food insecurity in First Nations households with children in Saskatchewan (n=699)*



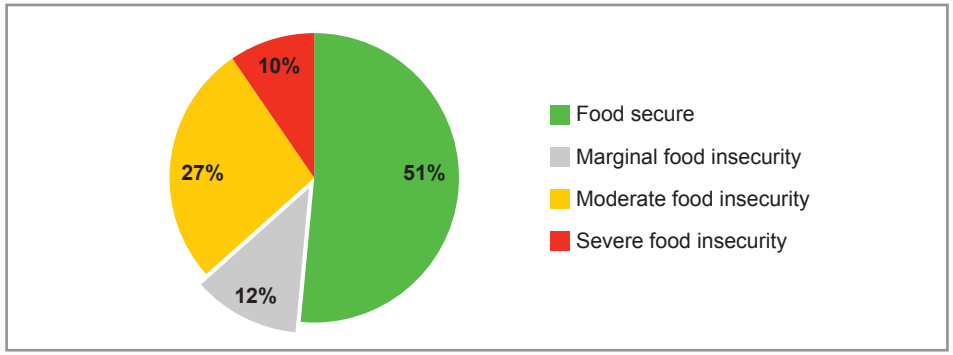
*Classification as per food security category scale from the Canadian Community Health Survey Cycle 2.2, Nutrition (2004), Income-Related Household Food Security in Canada. Health Canada. 2007, Her Majesty the Queen in Right of Canada: Ottawa.

Figure 29. Income-related household food insecurity in First Nations households without children in Saskatchewan (n=309)*



*Classification as per food security category scale from the 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 30. Income-related marginal food insecurity in First Nations households in Saskatchewan (n=1008)*



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

Figure 31. Income-related household food insecurity in First Nations communities in Saskatchewan, by ecozone and region

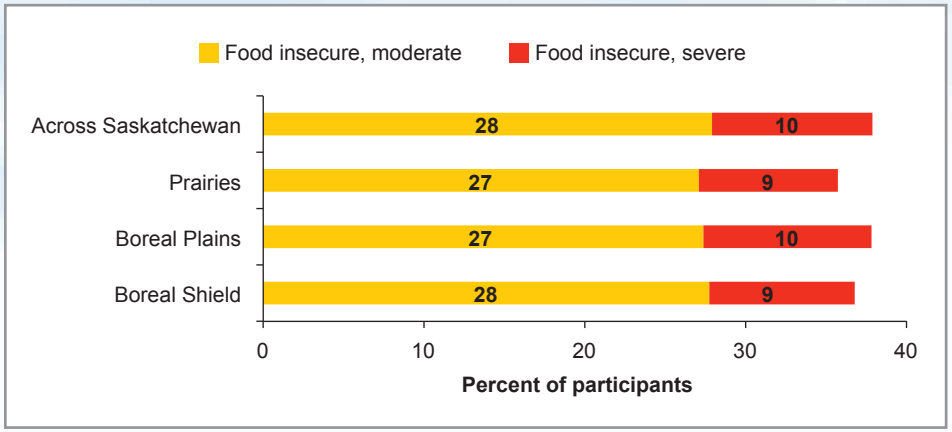
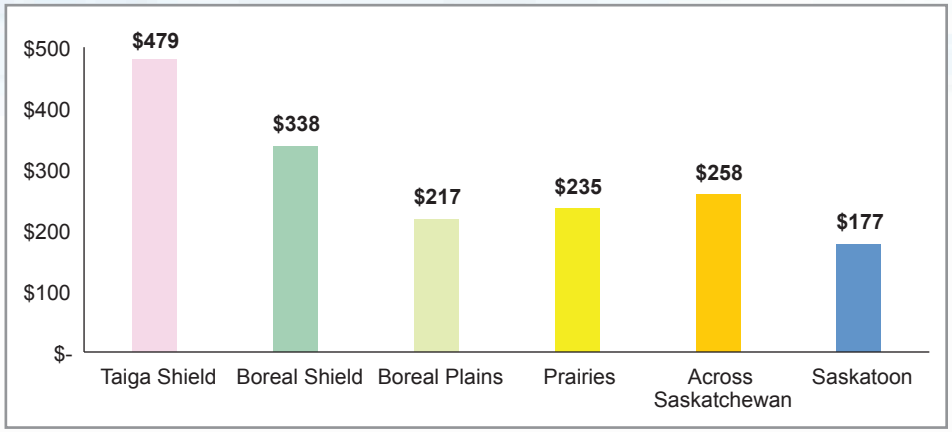
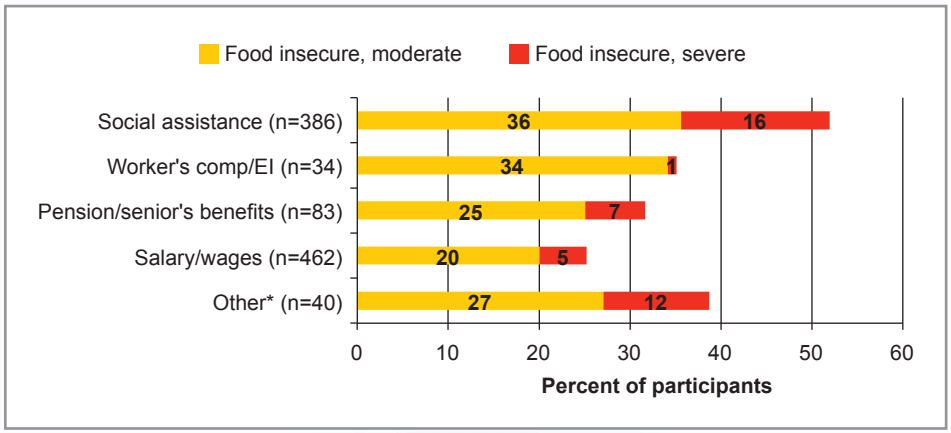


Figure 33. Comparison of healthy food basket cost for a family of four*



* 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 2014.

Figure 32. Income-related household food insecurity in First Nations communities in Saskatchewan, by income sources



*Other = education allowance, spousal/parental support, savings, residential school claim, none

Concerns about Climate Change

Figure 34. Percent of First Nations adults in Saskatchewan that noticed any significant climate change in their traditional territory in the last 10 years (n=1042)

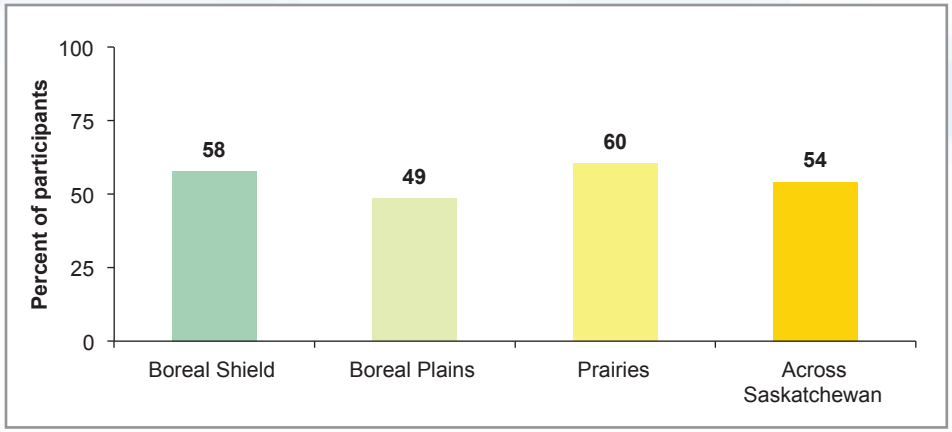
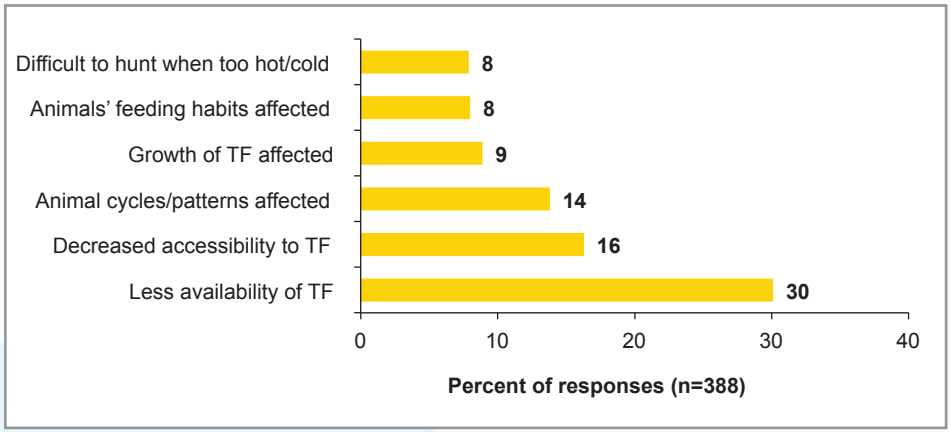


Figure 35. How climate change has affected traditional food availability among First Nations in Saskatchewan



*TF=traditional food

Tap Water Analyses

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

Characteristic	Answer
Average year home was built (range) (n=695)	1994 (1950, 2015)
Percent of households (HH) with upgraded plumbing (n=1031)	26
Average year plumbing upgraded (range) (n= 194)	2011 (1984, 2015)
Percent of HH that treat water (e.g. boiling, with filters, etc.) (n=1033)	21
Percent of HH with a water storage system (n=1042)	26
Location of water storage system (n=286):	
% Inside	37
% Outside	63
Type of water storage system (n=286):	
% Able to be carried (bucket)	35
% Fixed in place	65
Percent of type of pipes under kitchen sink (n=920)	
Plastic	56
Plastic with metal fittings	14
Metal attached to PEX/flex line	12
Metal only	9
Braided flex line	7
Steel flex line	2

Figure 36. Household (HH) water source and use, First Nations in Saskatchewan

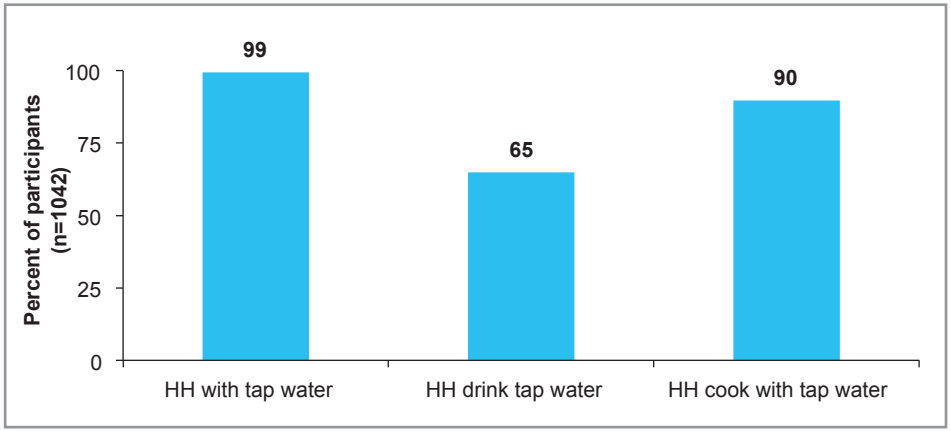
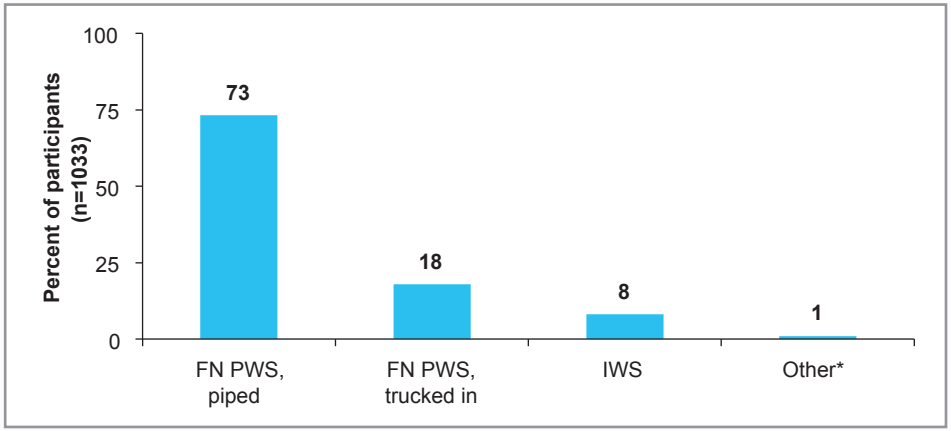


Figure 37. Source of tap water, First Nations households in Saskatchewan



Note:

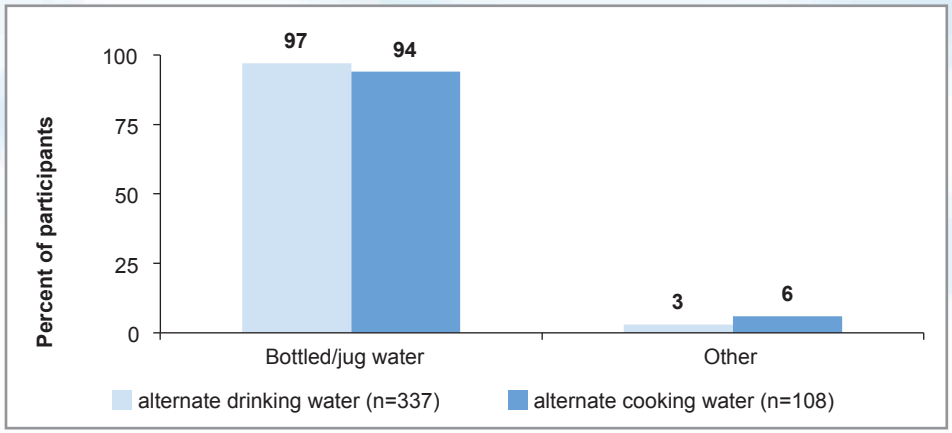
FN PWS, piped in: FN operated public water system (PWS) with piped distribution to households.

FN PWS, trucked in: FN PWS with reliance on water trucks for delivery to households

IWS: indicates the use of a private well to provide water to less than 5 households. The water may not be treated with chlorine

Other*: 4 respondents indicated water was obtained from a nearby municipality-piped in, nearby municipality- trucked in, commercial water source-trucked in or lake/pond

Figure 38. Source of drinking and cooking water in households that do not use tap water, First Nations in Saskatchewan



Other= well, lake/pond, stream/river

Figure 39. Deterrents to drinking the tap water

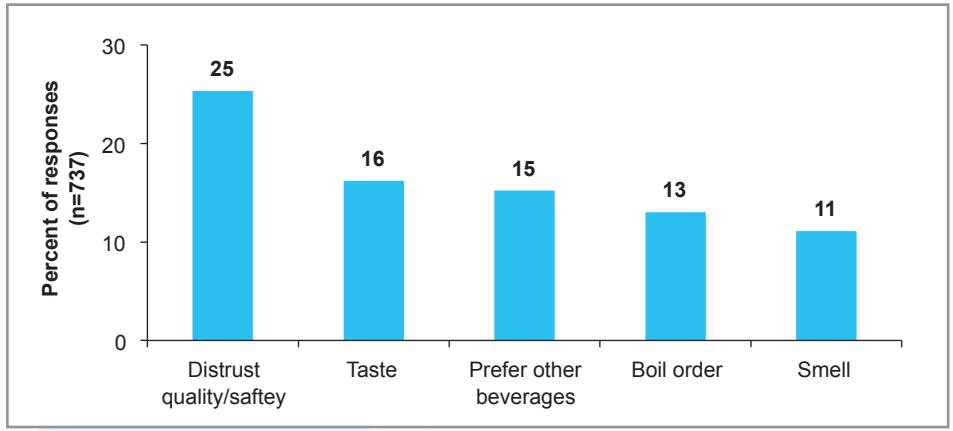


Figure 40. Types of water treatment methods for those who treat their drinking water

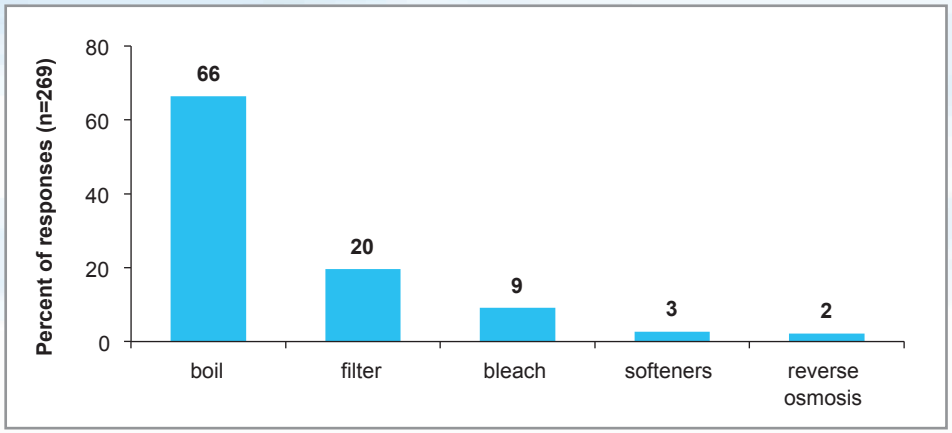


Figure 41. If tap water is used for drinking, from which tap is the water taken from?

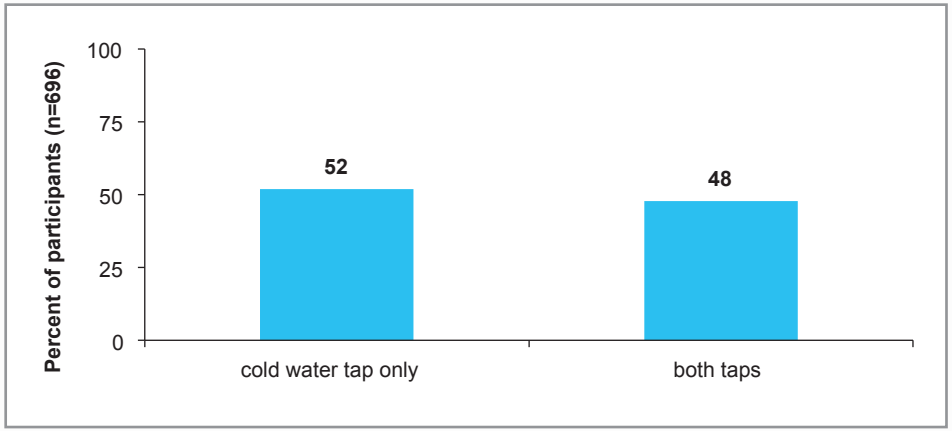


Figure 42. If tap water is used for cooking, from which tap is the water taken from?

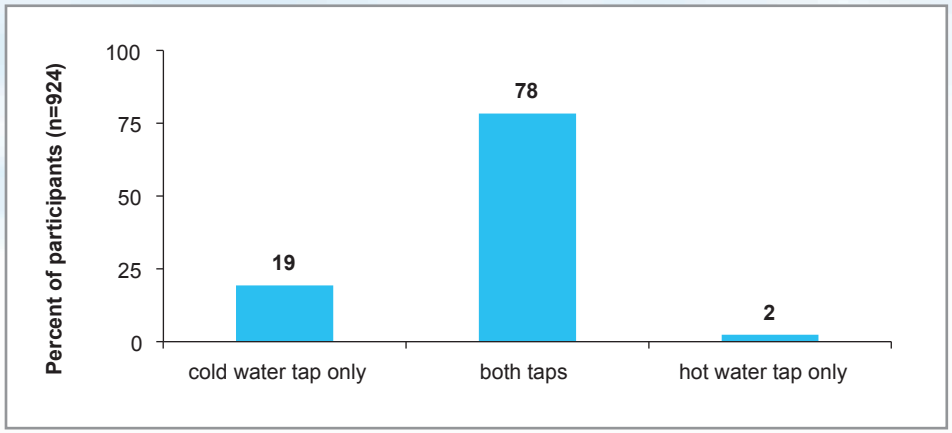


Table 20: Trace metals analysis results for parameters of health concern

Trace Metal Detected	Maximum Detected µg/L	Detection Limit µg/L	Maximum Allowable Concentration - (GCDWQ, 2017) µg/L	Number of communities exceeding the guideline value	Total Number of Samples in Excess			Comments
					First Draw	Flushed (5 Min)	Duplicate	
Saskatchewan								
Antimony, Sb	0.4	0.1	6	0	0	0	0	Below guideline value.
Arsenic, As	14	0.1	10	1	3	1	1	**Above guideline value in one community.**
Barium, Ba	273	2.0	1,000	0	0	0	0	Below guideline value.
Boron, B	1,500	10	5,000	0	0	0	0	Below guideline value.
Cadmium, Cd	0.2	0.01	5	0	0	0	0	Below guideline value.
Chromium, Cr	12	0.5	50	0	0	0	0	Below guideline value.
Lead, Pb	44	0.01	10	1	3	1	1	**Above guideline value in one community.**
Mercury, Hg	<0.01	0.01	1	0	0	0	0	Below guideline value.
Selenium, Se	79	0.05	50	1	1	1	0	**Above guideline value in one community.**
Uranium, U	46	0.01	20	1	2	2	0	**Above guideline value in one community.**

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 - (GCDWQ, 2017) µg/L	Number of communities exceeding the guideline value	Total Number of Samples in Excess			Comments
					First Draw	Flushed (5 Min)	Duplicate	
Boreal Shield								
Antimony, Sb	<0.1	0.1	6	0	0	0	0	Below guideline value.
Arsenic, As	0.5	0.1	10	0	0	0	0	Below guideline value.
Barium, Ba	28	2	1,000	0	0	0	0	Below guideline value.
Boron, B	22	10	5,000	0	0	0	0	Below guideline value.
Cadmium, Cd	0.02	0.01	5	0	0	0	0	Below guideline value.
Chromium, Cr	2.0	0.5	50	0	0	0	0	Below guideline value.
Lead, Pb	3.0	0.1	10	0	0	0	0	Below guideline value.
Mercury, Hg	<0.01	0.01	1	0	0	0	0	Below guideline value.
Selenium, Se	<0.05	0.05	50	0	0	0	0	Below guideline value.
Uranium, U	0.1	0.01	20	0	0	0	0	Below guideline value.
Prairies								
Antimony, Sb	0.2	0.1	6	0	0	0	0	Below guideline value.
Arsenic, As	14	0.1	10	1	2	1	1	**Above guideline value in one community.**
Barium, Ba	240	2	1,000	0	0	0	0	Below guideline value.
Boron, B	1,500	10	5,000	0	0	0	0	Below guideline value.
Cadmium, Cd	0.1	0.01	5	0	0	0	0	Below guideline value.
Chromium, Cr	0.9	0.5	50	0	0	0	0	Below guideline value.
Mercury, Hg	<0.01	0.01	1	0	0	0	0	Below guideline value.
Lead, Pb	9.9	0.1	10	0	0	0	0	Below guideline value.
Selenium, Se	1.8	0.05	50	1	1	1	0	**Above guideline value in one community.**
Uranium	46	0.01	20	1	2	2	0	**Above guideline value in one community.**

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 - (GCDWQ, 2017) µg/L	Number of communities exceeding the guideline value	Total Number of Samples in Excess			Comments
					First Draw	Flushed (5 Min)	Duplicate	
Saskatchewan								
Aluminum, Al	196	10	100/200*	3	9	9	0	Above guideline. Elevated levels pose no health concern.
Copper, Cu	5,130	1.0	1,000	1	6	1	0	Above guideline. Elevated levels pose no health concern.
Iron, Fe	2,910	50	300	2	3	2	1	Above guideline. Elevated levels pose no health concern.
Manganese, Mn	3,250	0.5	50	5	14	16	2	Above guideline. Elevated levels pose no health concern.
Sodium, Na	766,000	500	200,000	1	18	18	4	Above guideline. Elevated levels pose no health concern.
Zinc, Zn	24,290	3.0	5,000	0	0	0	0	Below guideline value.
Lead, Pb	3.0	0.1	10	0	0	0	0	Below guideline value.
Mercury, Hg	<0.01	0.01	1	0	0	0	0	Below guideline value.
Selenium, Se	<0.05	0.05	50	0	0	0	0	Below guideline value.
Uranium, U	0.1	0.01	20	0	0	0	0	Below guideline value.
Boreal Shield								
Aluminum, Al	144	10	100/200*	1	7	7	0	Above guideline. Elevated levels pose no health concern.
Copper, Cu	89	1.0	1,000	0	0	0	0	Below guideline value.
Iron, Fe	<50	50	300	0	0	0	0	Below guideline value.
Manganese, Mn	6	0.5	50	0	0	0	0	Below guideline value.
Sodium, Na	9,870	500	200,000	0	0	0	0	Below guideline value.
Zinc, Zn	150	3.0	5,000	0	0	0	0	Below guideline value.
Boreal Plains								
Aluminum, Al	196	10	100/200*	2	2	2	0	Above guideline. Elevated levels pose no health concern.
Copper, Cu	5,130	1.0	1,000	0	5	0	0	Below guideline value.
Iron, Fe	2,910	50	300	2	2	2	1	Above guideline. Elevated levels pose no health concern.

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 - (GCDWQ, 2017) µg/L	Number of communities exceeding the guideline value	Total Number of Samples in Excess			Comments
					First Draw	Flushed (5 Min)	Duplicate	
Manganese, Mn	175	0.5	50	3	5	4	0	Above guideline. Elevated levels pose no health concern.
Sodium, Na	153,000	500	200,000	0	0	0	0	Below guideline value.
Zinc, Zn	1,220	3.0	5,000	0	0	0	0	Below guideline value.
Prairies								
Aluminum, Al	23	10	100/200*	0	0	0	0	Below guideline value.
Copper, Cu	611	1.0	1,000	1	1	1	0	Above guideline. Elevated levels pose no health concern.
Iron, Fe	580	50	300	0	1	0	0	Flushed samples below guideline value.
Manganese, Mn	3,250	0.5	50	2	9	12	2	Above guideline. Elevated levels pose no health concern.
Sodium, Na	766,000	500	200,000	1	18	18	4	Above guideline. Elevated levels pose no health concern.
Zinc, Zn	24290	3.0	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 Saskatchewan

Pharmaceutical	Areas of use			Detected Surface water	Detected Wastewater
	Human	Veterinary	Aquaculture		
Analgesic					
Codeine	X			**Yes**	**Yes**
Analgesic/Anti-Inflammatory					
Acetaminophen	X			**Yes**	**Yes**
Diclofenac	X			No	**Yes**
Ibuprofen	X			No	**Yes**
Indomethacin	X			No	No
Ketoprofen	X	X		**Yes**	**Yes**
Naproxen	X			**Yes**	**Yes**
Antacid					
Cimetidine	X			**Yes**	**Yes**
Ranitidine	X			No	**Yes**
Antibiotic					
Chlortetracycline		X		No	No
Ciprofloxacin	X			No	**Yes**
Clarithromycin	X			**Yes**	**Yes**
Erythromycin	X	X		No	**Yes**
Isochlortetracycline		X		No	No
Lincomycin		X		No	No
Monensin		X		No	No
Oxytetracycline		X	X	No	No
Roxithromycin	X			No	No
Sulfamethazine		X		No	No

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

Pharmaceutical	Areas of use			Detected Surface water	Detected Wastewater
	Human	Veterinary	Aquaculture		
Sulfamethoxazole	X			**Yes**	**Yes**
Tetracycline	X	X		No	No
Trimethoprim	X	X	X	**Yes**	**Yes**
Anticoagulant					
Warfarin	X	X		No	**Yes**
Anticonvulsant					
Carbamazepine	X			**Yes**	**Yes**
Antidiabetic					
Metformin	X			**Yes**	**Yes**
Pentoxifylline	X	X		No	No
Antihistamine					
Diphenhydramine	X			No	**Yes**
Antihypertensive					
Diltiazem	X			No	**Yes**
Antihypertensive (Beta-blocker)					
Atenolol	X			**Yes**	**Yes**
Metoprolol	X			**Yes**	**Yes**
Antianginal metabolite					
Dehydronifedipine	X			No	**Yes**
Antidepressant					
Fluoxetine	X	X		No	No
Diuretic					
Furosemide	X			No	No
Hydrochlorthiazide	X			No	**Yes**

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

Pharmaceutical	Areas of use			Detected Surface water	Detected Wastewater
	Human	Veterinary	Aquaculture		
Lipid Regulator					
Atorvastatin	X			No	No
Bezafibrate	X			**Yes**	No
Clofibric Acid	X	X		**Yes**	**Yes**
Gemfibrozil	X			**Yes**	**Yes**
Metabolite of nicotine (smoking cessation)					
Cotinine	X			**Yes**	**Yes**
Steroid					
α -Trenbolone		X		No	No
β -Trenbolone		X		No	No
Stimulant					
Caffeine	X			**Yes**	**Yes**
Oral Contraceptive					
17α - Ethinyl estradiol	X			No	No

Table 23: Level of pharmaceuticals detected in surface water and wastewater in First Nation communities in Saskatchewan and by ecozone

Pharmaceutical	Detection limit (ng/l)	FNFNES Saskatchewan Results													
		Surface water							Wastewater						
		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites	
			Collected	Detected	Collected	Detected	Collected	Detected		Collected	Detected	Collected	Detected	Collected	Detected
All Ecozones combined: Pharmaceuticals Detected															
Analgesic															
Codeine	5	15	47	2	13	1	36	1	563	5	4	2	2	3	2
Analgesic/Anti-Inflammatory															
Acetaminophen	10	64	47	2	13	1	36	2	14,600	5	3	2	2	3	2
Diclofenac	15	<15	47	0	13	0	36	0	506	5	5	2	2	3	3
Ibuprofen	20	<20	47	0	13	0	36	0	15,200	5	5	2	2	3	3
Ketoprofen	2	7	47	5	13	3	36	3	77	5	3	2	1	3	2
Naproxen	5	16	47	2	13	2	36	2	4,370	5	5	2	2	3	3
Antacid															
Cimetidine	2	41	47	28	13	9	36	22	36	5	5	2	2	3	3
Ranitidine	20	<20	47	0	13	0	36	0	238	5	4	2	2	3	2
Antibiotic															
Ciprofloxacin	20	<20	47	0	13	0	36	0	7,970	5	4	2	2	3	2
Clarithromycin	2	4	47	2	13	1	36	1	929	5	5	2	2	3	3
Erythromycin	10	<10	47	0	13	0	36	0	21	5	2	2	1	3	1
Sulfamethoxazole	2	19	47	4	13	3	36	3	2,010	5	5	2	2	3	3
Trimethoprim	2	4	47	2	13	1	36	1	696	5	4	2	2	3	3
Anticoagulant															
Warfarin	0.5	<0.5	47	0	13	0	36	0	171	5	3	2	1	3	2

Table 23: Level of pharmaceuticals detected in surface water and wastewater in First Nation communities in Saskatchewan and by ecozone

Pharmaceutical	Detection limit (ng/l)	FNFNES Saskatchewan Results													
		Surface water							Wastewater						
		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites	
			Collected	Detected	Collected	Detected	Collected	Detected		Collected	Detected	Collected	Detected	Collected	Detected
Anticonvulsant															
Carbamazepine	0.5	17	47	5	13	4	36	4	398	5	5	2	2	3	3
Antidiabetic															
Metformin	10	93	47	4	13	3	36	3	17,700	5	5	2	2	3	3
Antihistamine															
Diphenhydramine	10	<10	47	0	13	0	36	0	838	5	2	2	1	3	1
Antihypertensive															
Diltiazem	5	<5	47	0	13	0	36	0	61	5	2	2	1	3	1
Antihypertensive (Beta-blocker)															
Atenolol	5	29	47	1	13	1	36	1	165	5	2	2	1	3	1
Metoprolol	5	7	47	2	13	1	36	1	26	5	5	2	2	3	3
Diuretic															
Furosemide	5	<5	47	0	13	0	36	0	128	5	2	2	1	3	1
Hydrochlorothiazide	5	<5	47	0	13	0	36	0	45	5	5	2	2	3	3
Lipid Regulator															
Bezafibrate	1	3	47	2	13	1	36	1	<1	5	0	2	0	3	0
Clofibric Acid	1	4	47	2	13	1	36	1	6	5	1	2	1	3	1
Gemfibrozil	1	2	7	2	13	1	36	1	9	5	5	2	2	3	3
Metabolite of nicotine (smoking cessation)															
Cotinine	5	17	47	16	13	8	36	12	1,860	5	5	2	2	3	3

Table 23: Level of pharmaceuticals detected in surface water and wastewater in First Nation communities in Saskatchewan and by ecozone

Pharmaceutical	Detection limit (ng/l)	FNFNES Saskatchewan Results													
		Surface water							Wastewater						
		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites	
			Collected	Detected	Collected	Detected	Collected	Detected		Collected	Detected	Collected	Detected	Collected	Detected
Stimulant															
Caffeine	5	31	47	10	13	8	36	9	12,600	5	5	2	2	3	3
Boreal Shield															
Analgesic															
Codeine	5	<5	8	0	2	0	6	0	0	0	0	0	0	0	0
Analgesic/Anti-Inflammatory															
Acetaminophen	10	<10	8	0	2	0	6	0	0	0	0	0	0	0	0
Diclofenac	15	<15	8	0	2	0	6	0	0	0	0	0	0	0	0
Ibuprofen	20	<20	8	0	2	0	6	0	0	0	0	0	0	0	0
Ketoprofen	2	3	8	2	2	1	6	1	0	0	0	0	0	0	0
Naproxen	5	<5	8	0	2	0	6	0	0	0	0	0	0	0	0
Antacid															
Cimetidine	2	3	8	4	2	1	6	3	0	0	0	0	0	0	0
Ranitidine	20	<20	8	0	2	0	6	0	0	0	0	0	0	0	0
Antibiotic															
Ciprofloxacin	20	<20	8	0	2	0	6	0	0	0	0	0	0	0	0
Clarithromycin	2	<2	8	0	2	0	6	0	0	0	0	0	0	0	0
Erythromycin	10	<10	8	0	2	0	6	0	0	0	0	0	0	0	0
Sulfamethoxazole	2	2	8	1	2	1	6	1	0	0	0	0	0	0	0
Trimethoprim	2	<2	8	0	2	0	6	0	0	0	0	0	0	0	0

Table 23: Level of pharmaceuticals detected in surface water and wastewater in First Nation communities in Saskatchewan and by ecozone

Pharmaceutical	Detection limit (ng/l)	FNFNES Saskatchewan Results													
		Surface water							Wastewater						
		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites	
			Collected	Detected	Collected	Detected	Collected	Detected		Collected	Detected	Collected	Detected	Collected	Detected
Anticoagulant															
Warfarin	0.5	<0.5	8	0	2	0	6	0	0	0	0	0	0	0	0
Anticonvulsant															
Carbamazepine	0.5	2	8	1	2	1	6	1	0	0	0	0	0	0	0
Antidiabetic															
Metformin	10	<10	8	0	2	0	6	0	0	0	0	0	0	0	0
Antihistamine															
Diphenhydramine	10	<10	8	0	2	0	6	0	0	0	0	0	0	0	0
Antihypertensive															
Diltiazem	5	<5	8	0	2	0	6	0	0	0	0	0	0	0	0
Antihypertensive (Beta-blocker)															
Atenolol	5	<5	8	0	2	0	6	0	0	0	0	0	0	0	0
Metoprolol	5	<5	8	0	2	0	6	0	0	0	0	0	0	0	0
Diuretic															
Furosemide	5	<5	8	0	2	0	6	0	0	0	0	0	0	0	0
Hydrochlorothiazide	5	<5	8	0	2	0	6	0	0	0	0	0	0	0	0
Lipid Regulator															
Bezafibrate	1	<1	8	0	2	0	6	0	0	0	0	0	0	0	0
Clofibric Acid	1	<1	8	0	2	0	6	0	0	0	0	0	0	0	0
Gemfibrozil	1	<1	8	0	2	0	6	0	0	0	0	0	0	0	0

Table 23: Level of pharmaceuticals detected in surface water and wastewater in First Nation communities in Saskatchewan and by ecozone

Pharmaceutical	Detection limit (ng/l)	FNFNES Saskatchewan Results													
		Surface water							Wastewater						
		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites	
			Collected	Detected	Collected	Detected	Collected	Detected		Collected	Detected	Collected	Detected	Collected	Detected
Metabolite of nicotine (smoking cessation)															
Cotinine	5	<5	8	0	2	0	6	0	0	0	0	0	0	0	0
Stimulant															
Caffeine	5	18	8	2	2	2	6	2	0	0	0	0	0	0	0
Boreal Plains															
Analgesic															
Codeine	5	15	28		7	1	21	1	0	0	0	0	0	0	0
Analgesic/Anti-Inflammatory															
Acetaminophen	10	<10	28	0	7	0	21	0	0	0	0	0	0	0	0
Diclofenac	15	<15	28	0	7	0	21	0	0	0	0	0	0	0	0
Ibuprofen	20	<20	28	0	7	0	21	0	0	0	0	0	0	0	0
Ketoprofen	2	5	28	2	7	1	21	1	0	0	0	0	0	0	0
Naproxen	5	<5	28	0	7	0	21	0	0	0	0	0	0	0	0
Antacid															
Cimetidine	2	6	28	15	7	4	21	11	0	0	0	0	0	0	0
Ranitidine	20	<20	28	0	7	0	21	0	0	0	0	0	0	0	0
Antibiotic															
Ciprofloxacin	20	<20	28	0	7	0	21	0	0	0	0	0	0	0	0
Clarithromycin	2	4	28	2	7	1	21	1	0	0	0	0	0	0	0
Erythromycin	10	<10	28	0	7	0	21	0	0	0	0	0	0	0	0
Sulfamethoxazole	2	19	28	3	7	2	21	2	0	0	0	0	0	0	0
Trimethoprim	2	4	28	2	7	1	21	1	0	0	0	0	0	0	0
Anticoagulant															
Warfarin	0.5	<0.5	28	0	7	0	21	0	0	0	0	0	0	0	0

Table 23: Level of pharmaceuticals detected in surface water and wastewater in First Nation communities in Saskatchewan and by ecozone

Pharmaceutical	Detection limit (ng/l)	FNFNES Saskatchewan Results													
		Surface water							Wastewater						
		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites	
			Collected	Detected	Collected	Detected	Collected	Detected		Collected	Detected	Collected	Detected	Collected	Detected
Anticonvulsant															
Carbamazepine	0.5	17	28	3	7	2	21	2	0	0	0	0	0	0	0
Antidiabetic															
Metformin	10	93	28	3	7	2	21	2	0	0	0	0	0	0	0
Antihistamine															
Diphenhydramine	10	<10	28	0	7	0	21	0	0	0	0	0	0	0	0
Antihypertensive															
Diltiazem	5	<5	28	0	7	0	21	0	0	0	0	0	0	0	0
Antihypertensive (Beta-blocker)															
Atenolol	5	29	28	1	7	1	21	1	0	0	0	0	0	0	0
Metoprolol	5	7	28	2	7	1	21	1	0	0	0	0	0	0	0
Diuretic															
Furosemide	5	<5	28	0	7	0	21	0	0	0	0	0	0	0	0
Hydrochlorothiazide	5	<5	28	0	7	0	21	0	0	0	0	0	0	0	0
Lipid Regulator															
Bezafibrate	1	3	28	2	7	1	21	1	0	0	0	0	0	0	0
Clofibric Acid	1	<1	28	0	7	0	21	0	0	0	0	0	0	0	0
Gemfibrozil	1	2	28	2	7	1	21	1	0	0	0	0	0	0	0
Metabolite of nicotine (smoking cessation)															
Cotinine	5	8	28	9	7	4	21	6	0	0	0	0	0	0	0
Stimulant															
Caffeine	5	11	28	5	7	4	21	4	0	0	0	0	0	0	0
Prairies															
Analgesic															
Codeine	5	0	11	0	4	0	9	0	563	5	4	2	2	3	2

Table 23: Level of pharmaceuticals detected in surface water and wastewater in First Nation communities in Saskatchewan and by ecozone

Pharmaceutical	Detection limit (ng/l)	FNFNES Saskatchewan Results													
		Surface water							Wastewater						
		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites	
			Collected	Detected	Collected	Detected	Collected	Detected		Collected	Detected	Collected	Detected	Collected	Detected
Analgesic/Anti-Inflammatory															
Acetaminophen	10	64	11	2	4	1	9	2	14,600	5	3	2	2	3	2
Diclofenac	15	<15	11	0	4	0	9	0	506	5	5	2	2	3	3
Ibuprofen	20	<20	11	0	4	0	9	0	15,200	5	5	2	2	3	3
Ketoprofen	2	7	11	1	4	1	9	1	77	5	3	2	1	3	2
Naproxen	5	16	11	2	4	2	9	2	4,370	5	5	2	2	3	3
Antacid															
Cimetidine	2	41	11	9	4	4	9	8	36	5	5	2	2	3	3
Ranitidine	20	<20	11	0	4	0	9	0	238	5	4	2	2	3	2
Antibiotic															
Ciprofloxacin	20	<20	11	0	4	0	9	0	<20	5	4	2	2	3	2
Clarithromycin	2	<2	11	0	4	0	9	0	929	5	5	2	2	3	3
Erythromycin	10	<10	11	0	4	0	9	0	21	5	2	2	1	3	1
Sulfamethoxazole	2	<2	11	0	4	0	9	0	2,010	5	5	2	2	3	3
Trimethoprim	2	<2	11	0	4	0	9	0	696	5	4	2	2	3	3
Anticoagulant															
Warfarin	0.5	<0.5	11	0	4	0	9	0	171	5	3	2	1	3	2
Anticonvulsant															
Carbamazepine	0.5	1	11	1	4	1	9	1	398	5	5	2	2	3	3
Anti-diabetic															
Metformin	10	41	11	1	4	1	9	1	17,700	5	5	2	2	3	3
Antihistamine															
Diphenhydramine	10	<10	11	0	4	0	9	0	838	5	2	2	1	3	1
Antihypertensive															
Diltiazem	5	<5	11	0	4	0	9	0	61	5	2	2	1	3	1

Table 23: Level of pharmaceuticals detected in surface water and wastewater in First Nation communities in Saskatchewan and by ecozone

Pharmaceutical	Detection limit (ng/l)	FNFNES Saskatchewan Results													
		Surface water							Wastewater						
		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites		Max concentration (ng/l)	Number of samples		Number of communities		Number of sites	
			Collected	Detected	Collected	Detected	Collected	Detected		Collected	Detected	Collected	Detected	Collected	Detected
Antihypertensive (Beta-blocker)															
Atenolol	5	<5	11	0	4	0	9	0	165	5	2	2	1	3	1
Metoprolol	5	<5	11	0	4	0	9	0	26	5	5	2	2	3	3
Diuretic															
Furosemide	5	<5	11	0	4	0	9	0	128	5	2	2	1	3	1
Hydrochlorothiazide	5	<5	11	0	4	0	9	0	45	5	5	2	2	3	3
Lipid Regulators															
Bezafibrate	1	<1	11	0	4	0	9	0	<1	5	0	2	0	3	0
Clofibric Acid	1	4	11	2	4	1	9	1	6	5	1	2	1	3	1
Gemfibrozil	1	<1	11	0	4	0	9	0	9	5	5	2	2	3	3
Metabolite of nicotine (smoking cessation)															
Cotinine	5	17	11	7	4	4	9	6	1,860	5	5	2	2	3	3
Stimulant															
Caffeine	5	31	11	3	4	2	9	3	12,600	5	5	2	2	3	3

Table 24. Comparison of pharmaceutical levels detected in surface and waste water in First Nations communities in Saskatchewan to findings from Canadian, U.S. and Global studies

	Pharmaceutical	Number of communities		Number of sites		FNFNES Max Concentration (ng/l)		Canadian & US Studies (ng/l)		Global Studies (ng/l)		Reference
		Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	
Analgesic												
1	Codeine	1	2	1	2	15	563.0	1,000 [b]	5,700 [a]	815 [aq] (Wales)	32,295 [ap] (Wales)	(a) (Guerra, et al. 2014); (b) (Kolpin, et al. 2002); (aq) (Kasprzyk-Hordern, Dinsdale and Guwy 2008); (ap) (Kasprzyk-Hordern, Dinsdale and Guwy 2009);
Analgesic/Anti-Inflammatory												
2	Acetaminophen	1	2	2	2	64	14,600	10,000 [b]	500,000 [a]	17,699.4 [d] (Spain)	623,000 [c] (Portugal)	(b) (Kolpin, et al. 2002) ; (a) (Guerra, et al. 2014); (d) (Pascual-Aguilar, Andreu and Pico 2013) (c) (de Jesus Gaffney, et al. 2017)
3	Diclofenac	0	2	0	3	<15	506	500 [f]	28,400 [e]	18,740 [h] (Spain)	863,000 [g] (Pakistan)	(f) (Chiu and Westerhoff 2010); (e) (Metcalfe, Miao, et al. 2004); (h) (Ginebreda, et al. 2010); (g) (Ashfaq, et al. 2017)
4	Ibuprofen	0	2	0	3	<20	15,200	6,400 [j]	75,800 [i]	303,000 [k] (Bulgaria)	1,673,000 [g] (Pakistan)	(j) (Sadezky, et al. 2010); (i) (Metcalfe, Koenig, et al. 2003); (k) (Aus der Beek, et al. 2016) (g) Ashfaq, et al. 2017;
5	Ketoprofen	3	1	3	2	7	77	79 [l]	5,700 [i]	9,808 [n] (Costa Rica)	233,630 [m] (Poland)	(l) (Brun, et al. 2006); (i) (Metcalfe, Koenig, et al. 2003); (n) (Spongberg, et al. 2011) (m) (Kotowska, Kapelewska and Sturgulewska 2014)
6	Naproxen	2	2	2	3	16	4,370	4,500 [l]	611,000 [j]	32,000 [p] (Pakistan)	611,000 [o] (France)	(l) (Brun, et al. 2006); (j) (Sadezky, et al. 2010); (p) (Selke, et al. 2010) (o) (Miege, et al. 2009)
Antacid												
7	Cimetidine	9	2	22	3	41	36	688 [aa]	463 [ad]	1,338 [af] (Korea)	61,200 [ae] (Taiwan)	(aa) (Bradley et al, 2014); (ad) (Lara-Martin, et al. 2014); (af) (Choi, et al. 2008) (ae) (Wang and Lin 2014)
8	Ranitidine	0	2	0	2	<20	238	2,200 [aa]	1,400 [ag]	1,944 [v] (Spain)	160,000 [q] (India)	(aa) (Bradley, et al. 2014); (ag) (Batt, Kincaid, et al. 2016) (v) (Valcarcel, Gonzalez, et al. 2011b) (q) (Lindberg, et al. 2014);
Antibiotic												
9	Ciprofloxacin	0	2	0	2	<20	7,970	360 [j]	6,441 [aar]	6,500,000 [r] (India)	31,000,000 [q] (India)	(j) (Sadezky, et al. 2010); (aar) (Mohapatra, et al. 2016); (r) (Khan, et al. 2013) (q) (Lindberg, et al. 2014)
10	Clarithromycin	1	2	1	3	4	929	243 [t]	8,100 [s]	1,727 [v] (Spain)	15,000 [u] (Turkey)	(t) (de Solla, et al. 2016); (s) (Blair, et al. 2015); (v) (Valcarcel, Gonzalez, et al. 2011b) (u) Yilmaz et al., 2017

Table 24. Comparison of pharmaceutical levels detected in surface and waste water in First Nations communities in Saskatchewan to findings from Canadian, U.S. and Global studies

	Pharmaceutical	Number of communities		Number of sites		FNFNES Max Concentration (ng/l)		Canadian & US Studies (ng/l)		Global Studies (ng/l)		Reference
		Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	
11	Erythromycin	0	1	0	1	<10	21	1,209,000 [j]	18,000 [w]	7,200 [y] (South Africa)	55,300 [x] (Taiwan)	(j) (Sadezky, et al. 2010) (w) (Godfrey, Woessner and Benotti 2007); (y) (Agunbiade and Moodley 2014) (x) (Wang and Lin 2014)
12	Sulfamethoxazole	3	2	3	3	19	2,010	3,280 [aa]	37,700 [z]	49,000 [r] (Pakistan)	1,340,000 [ab] (Taiwan)	(aa) (Bradley, et al. 2014); (z) (Subedi, et al. 2015); (r) (Khan, et al. 2013) (ab) (Lopez-Serna, Petrovic and Barcelo 2012);
13	Trimethoprim	1	2	1	3	4	696	1,220 [aa]	7900 [j]	2,800 [r] (Pakistan)	162,000 [ac] (Korea)	(aa) (Bradley, et al. 2014); (j) (Sadezky, et al. 2010); (r) (Khan, et al. 2013) (ac) (Sim, et al. 2011);
Anticoagulant												
14	Warfarin	0	1	0	2	<0.5	171	313 [ag]	120 [ar]	3 [at] (Spain)	105 [as] (Norway)	ag) (Batt, Kincaid, et al. 2016); (ar) (Lietz and Meyer 2006); (at) (Huerta-Fontela, Galcerna and Ventura 2011); (as) (Schlabach, et al. 2009)
Anticonvulsant												
15	Carbamazepine	4	2	4	3	17	398	3,480 [av]	3,287 [au]	67,715 [v] (Spain)	840,000 [aw] (Israel)	(av) (Roden 2013); (au) (Sosiak and Hebben 2005); (v) (Valcarcel, Gonzalez, et al. 2011b) (aw) (Lester, et al. 2013);
Antidiabetic												
16	Metformin	3	2	3	3	93	17,700	10,100 [t]	99,000 [s]	20,015 [ah] (China)	339,000 [c] (Portugal)	(t) (de Solla, et al. 2016); (s) (Blair, et al. 2015); (ah) (Kong, et al. 2015) (c) (de Jesus Gaffney, et al. 2017);
Antihistamine												
17	Diphenhydramine	0	1	0	1	<10	838	1,411 [ax]	2,380 [an]	121 [az] (South Korea)	1,700 [ay] (Italy)	(ax) (Bartelt-Hunt, et al. 2009); (an) (Kim, et al. 2014); (az) (Bayen, et al. 2013); (ay) (Verlicchi and Zambello 2014);
Antihypertensive												
18	Diltiazem	0	1	0	1	<5	61	130 [ao]	1,350 [an]	65 [aq] (Wales)	5,258 [ap] (Wales)	(ao) (Gross, et al. 2004); (an) (Kim, et al. 2014) (aq) (Kasprzyk-Hordern, Dinsdale and Guwy 2008); (ap) (Kasprzyk-Hordern, Dinsdale and Guwy 2009);
Antihypertensive (Beta-blocker)												
19	Atenolol	1	1	1	1	29	165	1,610 [aa]	10,900 [ai]	30,900 [y] (South Africa)	122, 000 [aj] (Spain)	(aa) (Bradley, et al. 2014); (ai) (Teerlink, et al. 2012); (y) (Agunbiade and Moodley 2014); (aj) (Gomez, et al. 2006);

Table 24. Comparison of pharmaceutical levels detected in surface and waste water in First Nations communities in Saskatchewan to findings from Canadian, U.S. and Global studies

	Pharmaceutical	Number of communities		Number of sites		FNFNES Max Concentration (ng/l)		Canadian & US Studies (ng/l)		Global Studies (ng/l)		Reference
		Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	Surface water	Wastewater	
20	Metoprolol	1	2	1	3	7	26	571 [al]	2,269 [al]	8,041 [am] (Spain)	950,000 [q] (India)	al) (Fono, Kolodziej and Sedlak 2006) (am) (Lopez-Roldan, et al. 2010) (q) (Lindberg, et al. 2014);
Diuretic												
21	Furosemide	0	1	0	1	<5	128	284 [t]	1,830 [ad]	630 [ap] (Wales)	32,558 [aaa] (Portugal)	(ad) (Lara-Martin, et al. 20140; (t) (de Solla, et al. 2016); (aaa) (Santos, et al. 2013); (ap) (Kasprzyk-Hordern, et al. 2009)
22	Hydrochlorothiazide	0	2	0	3	<5	45	620 [ag]	2,950 [aab]	17,589 [aad] (Spain)	6,370 [aac] (Germany)	(aab) (Batt, Kostich and Lazorchak 2008); (ag) (Batt, Kincaid, et al. 2016); (aac) (Valls-Cantenys, et al. 2016); (aad) (Valcarcel, Gonzalez, et al. 2011a)
Lipid Regulators												
23	Bezafibrate	1	0	1	0	3	-	470 [l]	810 [l]	15,060 [h] (Spain)	7,600 [aaf] (Austria)	(l) (Brun, et al. 2006) ; (h) (Ginebreda, et al. 2010) (aaf) (Clara, et al. 2005);
24	Clofibric Acid	1	1	1	1	4	6	630 [aah]	1,250 [aag]	7,910 [h] (Spain)	4,550 [aai] (Germany)	(aah) (Loraine and Pettigrove 2006); (aag) (Xu, et al. 2009); (h) (Ginebreda, et al. 2010); (aai); (Nikolaou, Meric and Fatta 2007)
25	Gemfibrozil	1	2	1	3	2	9	4,200 [aak]	36,530 [aaj]	17,036 [n] (Costa Rica)	28,571 [aal] (Spain)	(aak) (Waiser, et al. 2011); (aaj) (Lee, Peart and Svoboda 2005); (n) (Spongberg, et al. 2011) (aal) (Bueno, et al. 2007);
Metabolite of nicotine (smoking cessation)												
26	Cotinine	8	2	12	3	17	1,860	1,400 [f]	7,800 [aap]	6,582 [v] (Spain)	42,300 [aaq] (Spain)	(f) (Chiu and Westerhoff 2010); (aap) (Benotti and Brownawell 2007); (v) (Valcarcel, Gonzalez, et al. 2011b); (aaq) (Huerta-Fontela, Galceran,, et al. 2008);
Stimulant												
27	Caffeine	8	2	9	3	31	12,600	7,110 [aan]	135,000 [aam]	1,121,446 [n] (Costa Rica)	3,549,000 [aao] (Singapore)	(aan) (Young, et al. 2008); (aam) (Chen, et al. 2015); (n) (Spongberg, et al. 2011); (aao) (Tran, et al. 2014)

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

Pharmaceutical	FNFNES Max Concentration (ng/l) Surface water	Australian Guideline (ng/l)	California Monitoring Trigger Level (ng/L)	New York State Standard (ng/L)
All Ecozones combined: Pharmaceuticals Detected				
Analgesic/Anti-Inflammatory				
Acetaminophen	64	175,000	350,000	5,000
Ketoprofen	7	3,500	3,500	NA
Naproxen	16	220,000	220,000	NA
Antacid				
Cimetidine	41	200,000	NA	NA
Antibiotic				
Clarithromycin	4	250,000	NA	NA
Sulfamethoxazole	3.7	35,000	35,000	5,000
Trimethoprim	4	70,000	61,000	NA
Anticonvulsant				
Carbamazepine	17	100,000	1,000	50,000
Antidiabetic				
Metformin	93	250,000	NA	NA
Antihypertensive(Beta-blocker)				
Atenolol	29	NA	70,000	NA
Metoprolol	7	25,000	25,000	NA
Lipid Regulator				
Bezafibrate	3	300,000	NA	NA
Clofibric Acid	4	750,000	30,000	NA
Gemfibrozil	2	600,000	45,000	NA
Metabolite of nicotine (smoking cessation)				
Cotinine	17	10,000	NA	50,000
Stimulant				
Caffeine	31	350	350	50,000

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

First Nations living in Saskatchewan on-Reserve				Unweighted		Weighted				Weighted				Weighted Percentiles		
Gender	Age group	Sample size	%<LOD	A.M	G.M	A.M.	Lower 95% CI	Upper 95%CI	C.V.%	A.M.	Lower 95% CI	Upper 95%CI	C.V.%I	95th	Lower 95% CI	Upper 95%CI
Total	19-30	139	48.92	0.30	0.12	0.22	<LOD	0.37	37.14	0.08	<LOD	0.15	30.74	1.38	0.27	2.49
Total	31-50	227	44.05	0.43	0.15	0.29	0.18	0.40	18.82	0.10	0.08	0.14	15.79	1.19	0.71	1.67
Total	51-70	189	38.62	0.68	0.18	0.47	0.25	0.69	24.11	0.13	0.09	0.18	18.22	1.89	<LOD	4.46
Total	**Total**	555	43.42	0.48	0.15	0.30	0.24	0.36	10.69	0.10	0.07	0.14	16.64	1.33	1.10	1.56
Males	19-30	35	57.14	0.36	0.12	0.23	0.07	0.39	35.08	0.08	<LOD	0.14	31.23	1.50	0.76	2.24
Males	31-50	62	45.16	0.37	0.13	0.26	0.19	0.33	14.10	0.10	0.07	0.14	16.66	0.94	0.33	1.55
Males	51-70	60	38.33	0.87	0.18	0.61	0.24	0.97	30.66	0.14	0.09	0.23	24.43	3.30	<LOD	7.24
Males	**Total**	157	45.22	0.56	0.14	0.32	0.25	0.40	12.17	0.10	0.07	0.13	16.37	1.50	1.17	1.82
Females	19-30	104	46.15	0.28	0.12	0.20	<LOD	0.37	42.80	0.08	<LOD	0.16	32.55	1.14	<LOD	2.26
Females	31-50	165	43.64	0.46	0.15	0.32	0.14	0.50	28.38	0.11	0.07	0.15	18.59	1.29	0.81	1.77
Females	51-70	129	38.76	0.59	0.18	0.33	0.16	0.50	26.00	0.12	0.08	0.16	17.32	1.47	0.22	2.72
Females	**Total**	398	42.71	0.45	0.15	0.27	0.18	0.37	16.93	0.10	<LOD	0.14	18.48	1.27	0.86	1.69
Females of childbearing age	**19-50**	269	44.61	0.39	0.14	0.26	0.16	0.36	20.44	0.09	<LOD	0.14	21.28	1.27	0.74	1.80

Notes:

Use with caution, CV between 15% and 35%

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

if >40% of sample were below the LOD (level of detection), means are thought to be meaningless and should not be used

Estimates have been adjusted for non-response and are post-stratified to population counts within age/sex group. 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

Due to small sample size of adults aged 71+, the data was combined into the 50-70 age group.

Figure 43a. Mercury concentration in hair of participants living in the Boreal Shield ecozone (n=100)

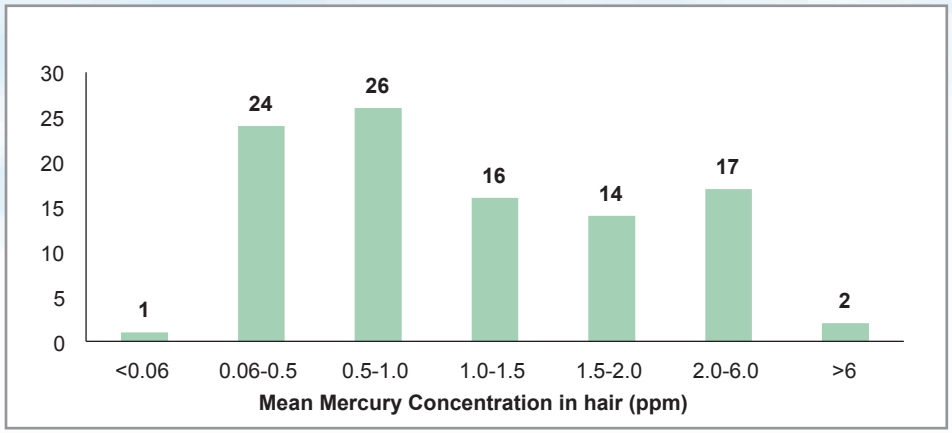


Figure 43b. Mercury concentration in hair of participants living in the Boreal Plains ecozone (n=267)

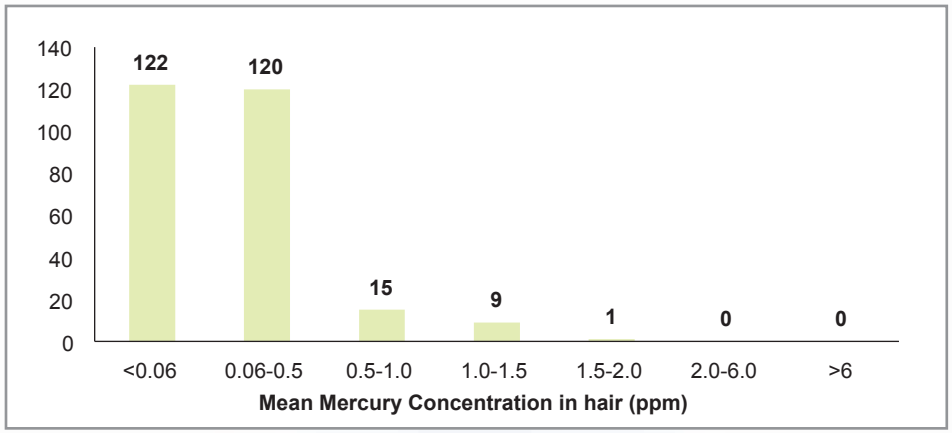


Figure 43c. Mercury concentration in hair of participants living in the Prairies ecozone (n=156)

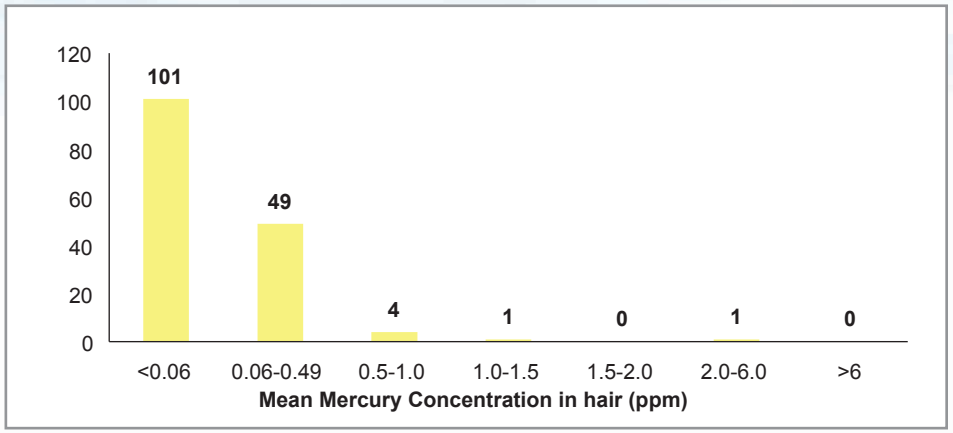


Figure 44a. Mercury concentration in hair of women of childbearing age (WCBA) living in the Boreal Shield ecozone (n=57)

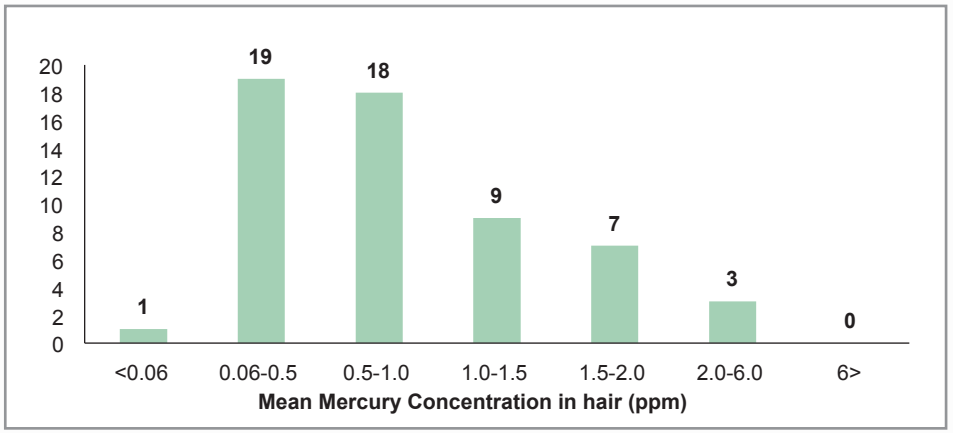


Figure 44b. Mercury concentration in hair of women of childbearing age (WCBA) living in the Boreal Plains ecozone (n=135)

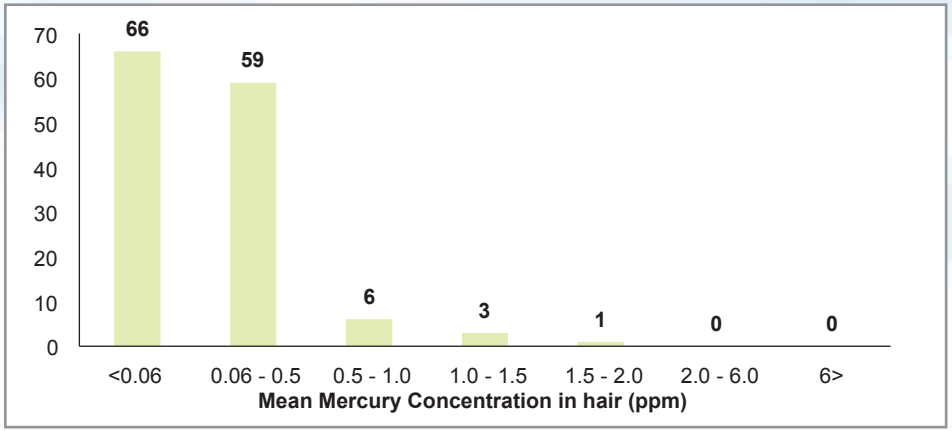
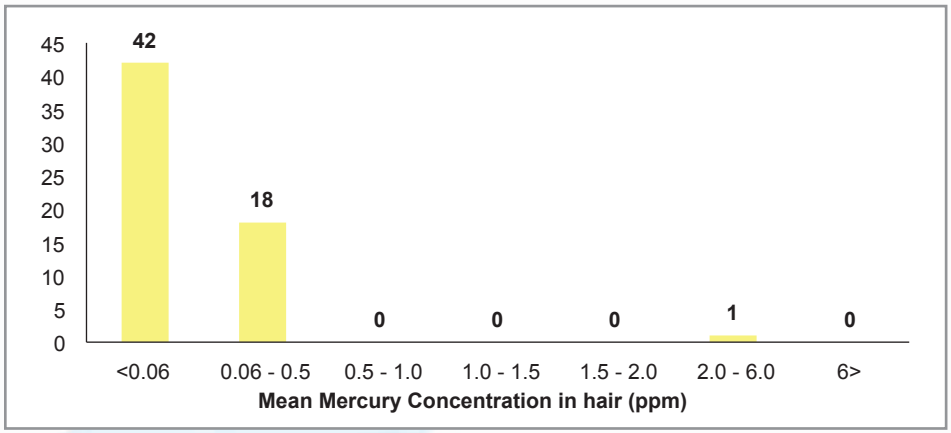


Figure 44c. Mercury concentration in hair of women of childbearing age (WCBA) living in the Prairies ecozone (n=61)



Food Contaminant Analyses

Table 27. Mean and maximum levels of toxic trace metals in traditional food samples from Saskatchewan (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											
Lake trout, raw	3	0.11	0.13	0.001	0.002	0.005	0.01	0.25	0.37	0.25	0.36
Lake trout, smoked	1	0.17	0.17	ND	ND	0.01	0.01	0.40	0.40	0.51	0.51
Lake whitefish, raw	7	0.09	0.24	0.001	0.005	0.003	0.02	0.05	0.09	0.05	0.10
Whitefish, smoked	1	0.41	0.41	0.002	0.002	0.01	0.01	0.12	0.12	0.14	0.14
Longnose/red sucker	3	0.08	0.12	0.0002	0.001	0.003	0.01	0.09	0.13	0.10	0.13
Mariah	1	0.09	0.09	ND	ND	ND	ND	0.28	0.28	0.36	0.36
Mooneye	1	0.23	0.23	0.002	0.002	ND	ND	0.07	0.07	0.08	0.08
Northern pike (jackfish)	9	0.04	0.10	ND	ND	0.001	0.01	0.31	0.49	0.29	0.55
Northern pike/jackfish eggs	1	0.01	0.01	ND	ND	ND	ND	0.01	0.01	ND	ND
Suckerfish liver/eggs	1	0.03	0.03	0.003	0.003	ND	ND	0.01	0.01	NM	NM
Walleye/pickerel	9	0.04	0.08	0.0004	0.004	0.01	0.04	0.40	0.80	0.36	0.67
White sucker	1	0.04	0.04	0.002	0.002	ND	ND	0.04	0.04	0.05	0.05
Yellow perch	1	0.05	0.05	ND	ND	ND	ND	0.16	0.16	0.12	0.12
GAME											
Bear meat	1	ND	ND	0.005	0.005	0.01	0.01	0.01	0.01	NM	NM
Beaver tail/meat	2	0.001	0.002	0.02	0.02	0.01	0.02	0.001	0.002	NM	NM
Caribou blood	1	ND	ND	0.001	0.001	0.02	0.02	0.01	0.01	NM	NM
Caribou bone marrow	2	ND	ND	0.002	0.002	0.03	0.06	0.003	0.01	NM	NM
Caribou brains	2	ND	ND	0.001	0.001	ND	ND	0.002	0.003	NM	NM
Caribou fat	1	ND	ND	0.003	0.003	0.07	0.07	ND	ND	NM	NM
Caribou fetus	1	0.01	0.01	0.001	0.001	0.01	0.01	0.002	0.002	NM	NM
Caribou heart	2	0.01	0.01	0.003	0.003	0.01	0.02	0.01	0.01	NM	NM
Caribou kidney	2	0.01	0.01	4.57	5.23	0.08	0.08	0.72	0.80	NM	NM
Caribou liver	2	0.01	0.01	0.77	1.06	0.10	0.18	0.10	0.20	NM	NM
Caribou meat, raw/dried	3	0.05	0.14	0.01	0.01	0.03	0.07	0.01	0.01	NM	NM
Deer heart	1	ND	ND	0.02	0.02	0.06	0.06	0.001	0.001	NM	NM

Table 27. Mean and maximum levels of toxic trace metals in traditional food samples from Saskatchewan (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
Deer kidney	2	0.003	0.01	3.29	5.12	0.01	0.02	0.03	0.05	NM	NM
Deer liver	2	ND	ND	0.14	0.19	0.005	0.01	0.002	0.003	NM	NM
Deer meat	11	0.004	0.02	0.01	0.04	0.04	0.17	0.001	0.003	NM	NM
Deer meat, smoked	1	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.01	NM	NM
Elk kidney	2	ND	ND	1.11	2.13	0.01	0.02	0.01	0.03	NM	NM
Elk meat	9	0.002	0.01	0.003	0.004	0.03	0.16	0.0002	0.002	NM	NM
Moose bone marrow	1	ND	ND	0.002	0.002	ND	ND	0.01	0.01	NM	NM
Moose fat	1	ND	ND	0.004	0.004	0.01	0.01	0.002	0.002	NM	NM
Moose heart	6	0.002	0.01	0.01	0.01	0.03	0.20	0.002	0.003	NM	NM
Moose kidney	8	0.004	0.02	6.18	13.00	0.01	0.04	0.02	0.04	NM	NM
Moose liver	6	0.01	0.01	1.40	2.40	0.04	0.08	0.01	0.05	NM	NM
Moose meat, raw	13	0.01	0.03	0.004	0.01	0.07	0.48	0.003	0.02	NM	NM
Moose meat, smoked	3	0.02	0.02	0.01	0.01	0.04	0.08	0.003	0.004	NM	NM
Moose nose	1	ND	ND	0.01	0.01	0.01	0.01	0.002	0.002	NM	NM
Muskrat meat	2	0.01	0.01	0.003	0.005	1.13	1.79	0.001	0.002	NM	NM
Rabbit heart	1	ND	ND	0.04	0.04	0.11	0.11	0.01	0.01	NM	NM
Rabbit kidney	1	ND	ND	11.30	11.30	0.01	0.01	0.04	0.04	NM	NM
Rabbit meat	12	0.01	0.01	0.04	0.18	0.12	0.75	0.004	0.03	NM	NM
BIRDS											
Canada goose meat	5	0.01	0.04	0.01	0.03	3.20	16.00	0.003	0.005	NM	NM
Duck gizzards	2	0.04	0.05	0.01	0.01	0.78	1.54	0.03	0.06	NM	NM
Duck heart	1	0.07	0.07	0.01	0.01	9.34	9.34	0.03	0.03	NM	NM
Duck meat	1	0.03	0.03	ND	ND	0.004	0.004	0.01	0.01	NM	NM
Gadwall duck meat	2	0.01	0.01	0.004	0.005	0.01	0.02	0.10	0.18	NM	NM
Mallard duck meat	9	0.01	0.02	0.005	0.03	0.03	0.09	0.01	0.04	0.01	0.01
Northern pintail meat	1	0.01	0.01	0.001	0.001	ND	ND	0.03	0.03	NM	NM
Northern shoveler	1	0.02	0.02	0.005	0.005	0.01	0.01	0.12	0.12	NM	NM
Spruce grouse meat	12	0.01	0.01	0.03	0.13	4.21	23.90	0.001	0.003	NM	NM
Teal duck meat	3	0.02	0.04	0.01	0.01	0.83	2.20	0.04	0.08	NM	NM

Table 27. Mean and maximum levels of toxic trace metals in traditional food samples from Saskatchewan (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
Wigeon duck meat	2	0.02	0.02	0.004	0.005	0.10	0.19	0.01	0.01	NM	NM
BERRIES/FRUIT											
Blueberries	10	0.002	0.01	0.0002	0.001	0.003	0.01	ND	ND	NM	NM
Bog cranberries	8	0.001	0.01	0.004	0.01	0.004	0.03	ND	ND	NM	NM
Cranberries, mountain	1	ND	ND	ND	ND	0.01	0.01	ND	ND	NM	NM
Highbush cranberries	2	ND	ND	0.001	0.002	0.005	0.01	ND	ND	NM	NM
Lowbush cranberries	2	ND	ND	0.003	0.004	0.003	0.01	ND	ND	NM	NM
Pincherries	10	0.004	0.01	0.001	0.01	0.01	0.05	0.0002	0.001	NM	NM
Raspberries	4	0.004	0.01	0.004	0.01	0.01	0.01	0.0003	0.001	NM	NM
Raspberry jam	1	ND	ND	ND	ND	ND	ND	ND	ND	NM	NM
Saskatoon berries	9	0.0005	0.004	0.01	0.03	0.01	0.04	ND	ND	NM	NM
GREENS/ROOTS/TREE FOODS											
Crab apples	1	ND	ND	ND	ND	0.01	0.01	ND	ND	NM	NM
Licorice tea	1	0.001	0.001	ND	ND	0.0003	0.0003	ND	ND	NM	NM
Mint tea	7	0.001	0.00	ND	0.0001	0.001	0.001	ND	ND	NM	NM
Muskeg/Labrador tea	5	0.001	0.002	ND	0.0001	0.0004	0.001	ND	ND	NM	NM
Rat root (wihkes) tea	5	0.001	0.003	0.0001	0.0003	0.0004	0.002	ND	ND	NM	NM
Rosehip tea	1	0.0003	0.0003	ND	ND	0.001	0.001	ND	ND	NM	NM
Rosehips	2	0.01	0.01	0.002	0.003	0.01	0.02	ND	ND	NM	NM
Sage tea	2	0.001	0.001	ND	ND	0.0001	0.0001	ND	ND	NM	NM
Wild rice	1	0.01	0.01	0.002	0.002	0.13	0.13	ND	ND	NM	NM
GARDEN PLANTS											
Carrots	1	0.005	0.005	0.01	0.01	0.005	0.005	ND	ND	NM	NM
Potatoes	1	0.01	0.01	0.02	0.02	0.01	0.01	ND	ND	NM	NM
Rhubarb	3	0.04	0.11	0.01	0.02	0.01	0.01	ND	ND	NM	NM
Tomatoes	1	ND	ND	0.002	0.002	0.03	0.03	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 Saskatchewan, by ecozone and total region

Toxic metal	Boreal Shield		Boreal Plains		Prairies		Saskatchewan	
	Traditional Food	%	Traditional Food	%	Traditional Food	%	Traditional Food	%
Arsenic	Caribou meat	55.5	Moose meat	23.7	Walleye	34.3	Caribou meat	28.1
	Whitefish	21.2	Walleye	22.1	Northern pike	29.0	Whitefish	21.5
	Lake trout	11.7	Lake whitefish	17.5	Deer meat	7.8	Walleye	12.9
	Mooneye	3.4	Lake trout	13.2	Lake trout	7.8	Lake trout	11.9
	Walleye	3.3	Northern pike	10.7	Lake whitefish	7.0	Moose meat	9.1
	Northern pike	1.7	Deer meat	3.4	Caribou meat	3.2	Northern pike	7.9
	Moose meat	1.0	Mallard	2.4	Mallard	3.2	Deer meat	2.0
	Goose (Canada/Brant)	0.7	Caribou meat	1.4	Yellow perch	2.1	Mooneye	1.6
	Caribou liver	0.3	Elk meat	1.1	Cherries (pin/ chokecherries)	1.1	Mallard	1.2
	Caribou kidney	0.3	Yellow perch	0.6	Raspberries	0.9	Yellow perch	0.4

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

Toxic metal	Boreal Shield		Boreal Plains		Prairies		Saskatchewan	
	Traditional Food	%	Traditional Food	%	Traditional Food	%	Traditional Food	%
Cadmium	Caribou kidney	64.1	Moose kidney	46.5	Moose kidney	63.7	Moose kidney	42.9
	Caribou liver	15.1	Deer kidney	25.6	Elk kidney	13.3	Caribou kidney	16.9
	Moose kidney	13.9	Moose liver	20.4	Deer kidney	9.9	Deer kidney	16.1
	Moose liver	4.1	Moose meat	2.0	Moose liver	8.1	Moose liver	13.7
	Caribou meat	1.4	Caribou kidney	1.7	Caribou kidney	1.8	Elk kidney	3.0
	Whitefish	0.5	Deer meat	1.4	Deer liver	0.8	Caribou liver	2.8
	Grouse meat	0.3	Deer liver	0.9	Elk meat	0.6	Moose meat	1.3
	Moose meat	0.2	Grouse meat	0.3	Moose meat	0.5	Deer meat	0.8
	Rabbit meat	0.1	Mallard	0.3	Deer meat	0.5	Deer liver	0.7
	Beaver meat	0.1	Caribou liver	0.2	Rabbit meat	0.3	Caribou meat	0.6

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

Toxic metal	Boreal Shield		Boreal Plains		Prairies		Saskatchewan	
	Traditional Food	%	Traditional Food	%	Traditional Food	%	Traditional Food	%
Lead	Moose meat	40.5	Goose (Canada/Brant)	91.5	Moose meat	70.6	Grouse	31.0
	Goose (Canada/Brant)	31.1	Caribou meat	2.3	Grouse meat	12.1	Moose meat	22.5
	Grouse meat	11.3	Caribou liver	1.4	Deer meat	4.1	Goose (Canada/Brant)	19.5
	Deer meat	3.9	Moose meat	1.2	Elk meat	3.3	Deer meat	12.0
	Caribou meat	2.7	Whitefish	1.0	Teal duck	2.4	Rabbit meat	5.2
	Elk meat	2.0	Caribou kidney	0.7	Muskrat meat	2.2	Elk meat	2.2
	Rabbit meat	1.4	Muskrat meat	0.4	Mallard	1.3	Wild rice	1.5
	Muskrat meat	1.4	Grouse meat	0.4	Rabbit meat	1.2	Walleye	1.2
	Teal duck	1.3	Caribou bone marrow	0.3	Wild rice	0.9	Saskatoon berries	1.2
	Mallard	0.8	Caribou fat	0.1	Moose liver	0.4	Cherries (pin/ chokecherries)	0.9

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

Toxic metal	Boreal Shield		Boreal Plains		Prairies		Saskatchewan	
	Traditional Food	%	Traditional Food	%	Traditional Food	%	Traditional Food	%
Mercury	Walleye	40.4	Lake trout	32.0	Walleye	50.0	Northern pike	39.5
	Northern pike	28.9	Northern pike	16.5	Northern pike	31.0	Walleye	38.7
	Lake trout	12.5	Walleye	14.4	Lake whitefish	7.4	Lake trout	8.4
	Whitefish	8.0	Caribou kidney	14.0	Lake trout	7.1	Lake whitefish	3.6
	Caribou kidney	4.1	Whitefish	11.7	Moose liver	1.0	Yellow perch	3.2
	Caribou meat	1.2	Caribou meat	4.1	Moose meat	0.9	Mallard	2.6
	Caribou liver	0.8	Caribou liver	3.8	Mallard	0.6	Caribou kidney	1.1
	Moose meat	0.8	Mooneye	1.0	Yellow perch	0.4	Moose meat	0.8
	Moose liver	0.7	Northern shoveler	0.6	Caribou kidney	0.3	Elk kidney	0.6
	Mallard	0.6	Gadwall	0.6	Deer kidney	0.3	Teal duck	0.4

Table 29. Exposure estimates (µg/kg body weight/day) for metals from traditional food for First Nations adults in Saskatchewan, using mean and maximum concentrations (n=1042)

Contaminant	PTDI (µg/kg/day)	Level of concentration	n>PTDI	Mean	Median	95th percentile	HQ Mean/PTDI	HQ 95th/PTDI
Arsenic	1	mean	1	0.01	0	0.05	0.01	0.05
		maximum	2	0.02	0	0.06	0.02	0.06
Cadmium	1	mean	10	0.04	0	0.14	0.04	0.14
		maximum	13	0.05	0	0.16	0.05	0.16
Lead	3.6	mean	2	0.05	0	0.17	0.01	0.05
		maximum	2	0.09	0.01	0.42	0.02	0.12
Mercury*	0.5	mean	17	0.04	0.00	0.16	0.07	0.32
		maximum	19	0.04	0.003	0.17	0.07	0.35

*analyses restricted to women aged 51+ and all men only (n=547)

Table 30. Exposure estimates (µg/kg body weight/day) for mercury from traditional food (using mean and maximum concentrations) among First Nations women of childbearing age (WCBA) in Saskatchewan (n=495)

Level of mercury concentration	PTDI (µg/kg/day)	n>PTDI	Mean	Median	95th percentile	HQ Mean/PTDI	HQ 95th/PTDI
Mean	0.2	20	0.02	0.001	0.14	0.12	0.70
Maximum	0.2	25	0.03	0.001	0.15	0.13	0.76

Table 31a. Toxic metal exposure estimates (µg/kg body weight/day) from traditional food for First Nations adults in Saskatchewan, using mean and maximum concentrations, consumers only (n=989)

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	0.06	0.01	0.06
		maximum	7	0.04	0.18	0.04	0.18
Cadmium	1	mean	11	0.05	0.20	0.05	0.20
		maximum	16	0.09	0.37	0.09	0.37
Lead	3.6	mean	1	0.05	0.22	0.01	0.06
		maximum	26	0.37	1.73	0.10	0.48
Mercury*	0.5	mean	17	0.04	0.20	0.08	0.41
		maximum	34	0.08	0.39	0.16	0.78

*analyses restricted to women aged 51+ and all men only (n=527)

Table 31b. 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=163)

Contaminant	PTDI (µg/kg/day)	Level of concentration	n>PTDI	Mean	95th percentile	HQ Mean/PTDI	HQ 95th/PTDI
Arsenic	1	mean	0	0.07	0.25	0.07	0.25
		maximum	2	0.14	0.60	0.14	0.60
Cadmium	1	mean	3	0.10	0.53	0.10	0.53
		maximum	3	0.10	0.54	0.10	0.54
Lead	3.6	mean	2	0.40	1.69	0.11	0.47
		maximum	17	1.04	4.75	0.29	**1.32**
Mercury*	0.5	mean	11	0.25	0.82	0.50	**1.64**
		maximum	16	0.33	1.08	0.66	**2.17**

*analyses restricted to women aged 51+ and all men only (n=68)

Table 31c. Toxic metal exposure estimates (µg/kg body weight/day) from traditional food for First Nations adults in the Boreal Plains, using ecozone-specific mean and maximum concentrations, consumers only (n=478)

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	0.02	0.01	0.02
		maximum	0	0.01	0.06	0.01	0.06
Cadmium	1	mean	4	0.04	0.13	0.04	0.13
		maximum	5	0.07	0.20	0.07	0.20
Lead	3.6	mean	0	0.03	0.16	0.01	0.04
		maximum	0	0.24	1.41	0.07	0.39
Mercury*	0.5	mean	2	0.03	0.08	0.05	0.15
		maximum	3	0.04	0.12	0.08	0.24

*analyses restricted to women aged 51+ and all men only (n=249)

Table 31d. Toxic metal exposure estimates (µg/kg body weight/day) from traditional food for First Nations adults in the Prairies, using ecozone-specific mean and maximum concentrations, consumers only (n=258)

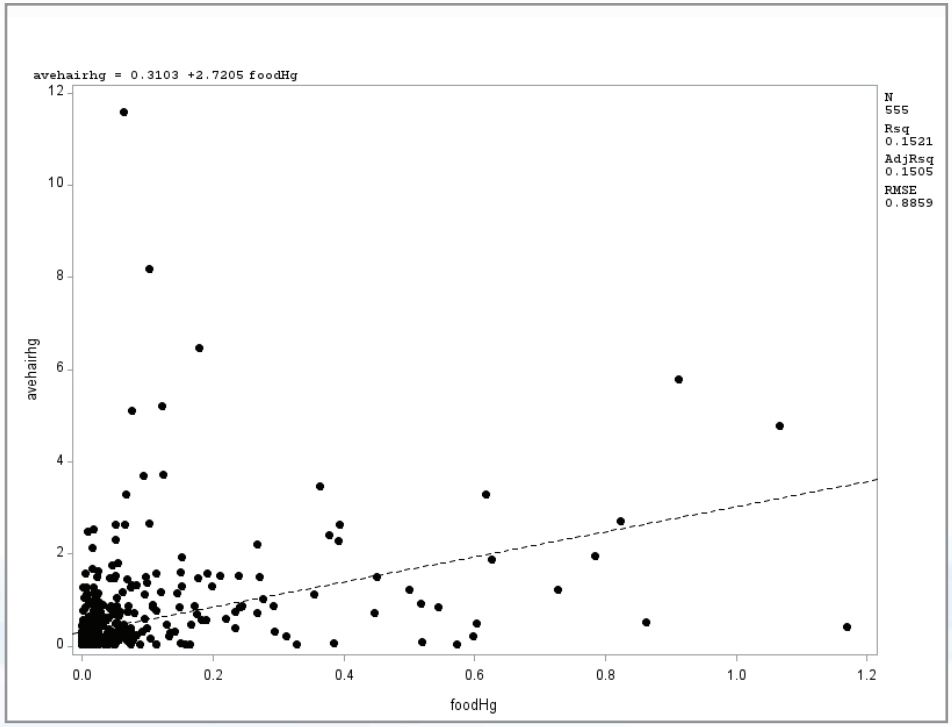
Contaminant	PTDI (µg/kg/day)	Level of concentration	n>PTDI	Mean	95th percentile	HQ Mean/PTDI	HQ 95th/PTDI
Arsenic	1	mean	0	0.003	0.01	0.003	0.01
		maximum	0	0.004	0.01	0.004	0.01
Cadmium	1	mean	3	0.02	0.04	0.02	0.04
		maximum	3	0.03	0.05	0.03	0.05
Lead	3.6	mean	0	0.01	0.05	0.004	0.01
		maximum	0	0.03	0.12	0.01	0.03
Mercury*	0.5	mean	0	0.01	0.02	0.01	0.05
		maximum	0	0.01	0.04	0.02	0.08

*analyses restricted to women aged 51+ and all men only (n=164)

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

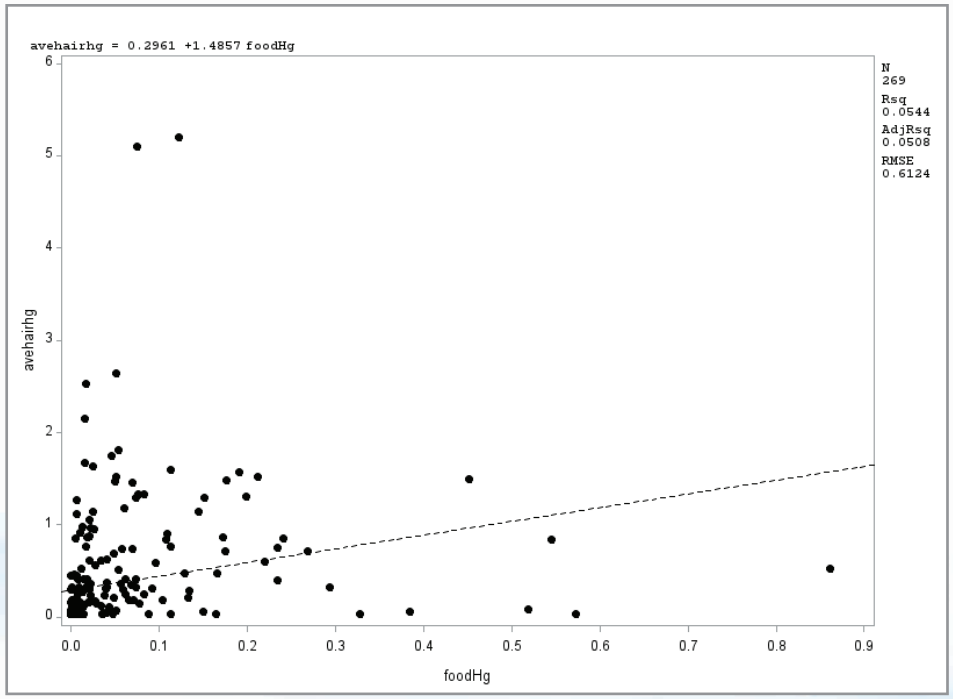
Region or ecozone	Level of mercury concentration	PTDI (µg/kg/day)	n>PTDI	Mean	95th percentile	HQ Mean/PTDI	HQ 95th/PTDI
First Nations in Saskatchewan (n=462)	Mean	0.2	27	0.03	0.18	0.16	0.88
	Maximum	0.2	55	0.07	0.32	0.33	**1.61**
Boreal Shield (n=95)	Mean	0.2	15	0.10	0.34	0.49	**1.71**
	Maximum	0.2	21	0.13	0.45	0.63	**2.26**
Boreal Plains (n=229)	Mean	0.2	6	0.02	0.11	0.12	0.57
	Maximum	0.2	11	0.04	0.16	0.18	0.82
Prairies (n=94)	Mean	0.2	1	0.005	0.02	0.02	0.12
	Maximum	0.2	2	0.01	0.03	0.03	0.15

Figure 45. Correlation between mercury exposure from traditional food and hair mercury levels, total population (n=555)



r =0.39

Figure 46. Correlation between mercury exposure from traditional food and hair mercury levels, women of childbearing age (n=269)



r=0.24

Moose meat smoking in Lac La Ronge.
Photo by Rebecca Hare.

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

Traditional food species	n*	Total PAHs ng TEQ/g	
		Mean	Max
FISH			
Lake trout, raw	3	0.45	1.36
Lake trout, smoked	1	2.91	2.91
Lake whitefish, raw	7	0.40	1.73
Whitefish, smoked	1	30.65	30.65
Longnose/red sucker fish	3	0.09	0.27
Mariah	1	ND	ND
Mooneye	1	ND	ND
Northern pike (jackfish)	9	0.0001	0.0004
Walleye/pickerel	9	ND	0.0004
White sucker	1	ND	ND
Yellow perch	1	ND	ND
LAND MAMMALS			
Caribou meat, raw/dried	3	5.29	10.43
Deer meat, raw	11	0.04	0.40
Deer meat, smoked	1	1.72	1.72
Elk kidney	2	ND	ND
Elk meat	9	0.16	0.79
Moose meat, raw	13	11.66	40.56
Moose meat, smoked	3	24.04	41.02
BIRDS			
Canada goose meat	5	3.68	13.52
Mallard duck meat	9	1.64	6.27

n*=number of communities

Table 34. Mean and maximum levels of organochlorines in Saskatchewan 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											
Lake trout, raw	3	3	1.33	1.68	3.15	5.42	1.28	1.76	1.20	3.29	5.43
Lake trout, smoked	1	1	1.52	1.52	5.68	5.68	ND	ND	ND	ND	15.18
Lake whitefish, raw	7	7	0.57	1.69	0.68	1.40	0.28	1.44	0.27	1.62	0.67
Whitefish, smoked	1	1	2.91	2.91	2.25	2.25	2.93	2.93	3.59	3.59	4.80
Longnose/red sucker	3	3	0.41	0.78	0.80	1.54	0.10	0.20	0.07	0.20	0.73
Mariah	1	1	0.32	0.32	0.26	0.26	0.25	0.25	0.22	0.22	0.22
Mooneye	1	1	0.54	0.54	0.54	0.54	0.48	0.48	0.48	0.48	0.71
Northern pike (jackfish)	9	9	0.08	0.14	0.35	0.99	0.01	0.09	ND	ND	0.15
Walleye/pickerel	9	9	0.12	0.39	0.27	0.57	0.05	0.18	0.014	0.13	0.15
White sucker	1	1	0.16	0.16	0.33	0.33	0.05	0.05	ND	ND	ND
Yellow perch	1	1	0.09	0.09	0.13	0.13	ND	ND	ND	ND	ND
LAND MAMMALS											
Caribou fat	1	1	34.70	34.70	ND	ND	ND	ND	ND	ND	0.22
Moose fat	1	1	22.90	22.90	ND	ND	ND	ND	ND	ND	0.18
BIRDS											
Canada goose meat	5	0.27	0.40	1.62	5.90	0.08	0.23	ND	ND	0.50	2.0
Mallard duck meat	9	0.90	4.29	4.17	25.00	0.10	0.42	ND	ND	24.45	169.95

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

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

Traditional Food Sample	n*	Mean total PBDEs	Max total PBDEs
FISH			
Lake trout, raw	3	2.03	2.90
Lake trout, smoked	1	2.00	2.00
Lake whitefish, raw	7	0.55	1.23
Whitefish, smoked	1	0.90	0.90
Longnose/red sucker	3	0.50	0.71
Mariah	1	0.25	0.25
Mooneye	1	0.24	0.24
Northern pike (jackfish)	9	0.37	1.63
Walleye/pickerel	9	0.25	0.74
White sucker fish	1	0.29	0.29
Yellow perch	1	0.11	0.11
BIRDS			
Canada goose meat	5	0.26	0.74
Mallard duck meat	9	0.70	3.37

n*=number of communities

Frying moose liver. Photo by Rebecca Hare

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

Traditional Food Sample	n*	Mean total PFCs	Max total PFCs
FISH			
Lake trout, raw	3	5.78	9.88
Lake trout, smoked	1	1.42	1.42
Lake whitefish	7	2.15	5.11
Whitefish, smoked	1	13.52	13.52
Longnose/red sucker	3	5.66	8.32
Mariah	1	1.89	1.89
Mooneye	1	3.39	3.39
Northern pike (jackfish)	9	1.52	4.32
Walleye/pickerel	9	2.13	6.42
White sucker	1	3.76	3.76
Yellow perch	1	1.36	1.36
GAME			
Caribou kidney	2	4.81	5.13
Caribou liver	2	27.40	38.85
Caribou meat, raw/dried	3	0.97	2.11
Deer meat	11	3.68	11.04
Elk kidney	2	1.59	2.31
Elk meat	9	2.64	15.27
Moose kidney	8	5.82	13.85
Moose liver	6	0.88	3.02
Moose meat	13	3.64	28.49
BIRDS			
Canada goose meat	5	4.61	16.00
Mallard duck meat	9	17.58	101.97

n*=number of communities

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

Traditional Food Sample	n*	Mean Dioxins and Furans	Max Dioxins and Furans
FISH			
Lake trout, raw	3	0.04	0.06
Lake trout, smoked	1	0.30	0.30
Lake whitefish	7	0.01	0.05
Whitefish, smoked	1	0.07	0.07
Longnose/red sucker	3	0.01	0.03
Mariah	1	ND	ND
Mooneye	1	0.0001	0.0001
Northern pike (jackfish)	9	0.003	0.02
Walleye/pickerel	9	0.0001	0.001
White sucker	1	0.004	0.004
Yellow perch	1	ND	ND
BIRDS			
Canada goose meat	5	0.07	0.27
Mallard duck meat	9	0.21	1.70

Table 38. Exposure estimates (µg/kg body weight/day) for organics from traditional food for First Nations adults in Saskatchewan using mean concentrations (n=1042)

Organics	PTDI (µg/kg/day)	n>PTDI	Mean	Median	95th percentile	Mean/ PTDI	95th/ PTDI
HCBs	0.27	0	0.0001	0	0.0003	0.0003	0.001
DDE	20	0	0.0002	0.00001	0.001	0.00001	0.000
PCB	1	0	0.0005	0	0.002	0.0005	0.002
Chlordane	0.05	0	0.00003	0	0.0001	0.001	0.002
Toxaphene	0.2	0	0.00003	0	0.00003	0.0001	0.0002
PAH	40	0	0.002	0.0001	0.01	0.00004	0.0002
PFCs	0.08	0	0.001	0.0002	0.01	0.02	0.07
PBDE	0.1	0	0.0001	0	0.001	0.001	0.01
Dioxin and Furan	2.3 pg/kg/day	0	0.005	0	0.02	0.002	0.01

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

Ecozone	Level of concentration	n> PTDI	Mean	95th percentile	HQ Mean/PTDI	HQ 95th/PTDI
Boreal Shield (n=163)	mean	0	0.001	0.003	0.001	0.003
	maximum	0	0.001	0.005	0.001	0.005
Boreal Plains (n=478)	mean	0	0.001	0.002	0.001	0.002
	maximum	0	0.003	0.01	0.003	0.01
Prairies (n=258)	mean	0	0.00002	0.0001	0.00002	0.0001
	maximum	0	0.00002	0.0001	0.00002	0.0001
Total First Nations in Saskatchewan (n=989)	mean	0	0.0005	0.002	0.0005	0.002
	maximum	0	0.003	0.01	0.003	0.01

Photos by Stéphane Decelles

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 market-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.

Benefit of Traditional Foods vs Risk: Traditional foods offer many nutritional and cultural benefits. These must be weighed against the market-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.[i] 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.[ii]

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.

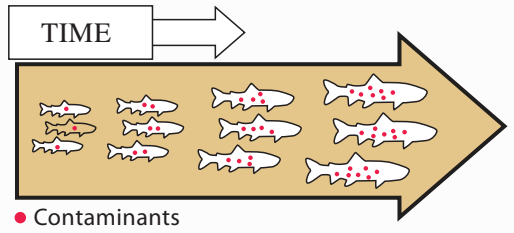

Illustration of how POPs accumulate in animals and people faster than the body can excrete the substance[iii]

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 pesticides, 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.[xv] 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.

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Appendix B. Statistical tools used to obtain weighted estimates at the regional level

1: Non-Response adjustment factor:

For each stratum $h=1,\ldots,H$, and each community $i=1,\ldots,n_h$, 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 $h=1,\ldots H$.

ii) Let m^*_{hi} be the number of times the (hi)-th sample community is selected ($\bullet_i m^*_{hi} = m_h$).

iii) Define the bootstrap weights as

$$w^*_{hijk} = \frac{n_h}{n_h - 1} m^*_{hi} \; WFINAL3_{hijk}$$

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 be the population parameter of interest. Let $\hat{}$ be the full-sample estimate for obtained by using the final weight and let $\hat{}^*_b$, 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 $\hat{}$ is given by:

$$se_{BOOT}(\hat{}) = \sqrt{\hat{V}_{BOOT}(\hat{})},$$

where $\hat{V}_{BOOT}(\hat{}) = \frac{1}{B}\bullet_{b=1}^{B}(\hat{}^*_b - \hat{})^2 = 0.002\bullet_{b=1}^{500}(\hat{}^*_b - \hat{})^2.$

with a CV: $cv(\hat{}) = \frac{se_{BOOT}(\hat{})}{\hat{}}\ 100\%$

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	0.001
Antimony	Sb	0.0002
Arsenic	As	0.0002
Barium	Ba	0.0002
Beryllium	Be	0.0002
Bismuth	Bi	0.0002
Boron	B	0.01
Cadmium	Cd	0.00004
Calcium	Ca	0.01
Chromium	Cr	0.0002
Cobalt	Co	0.0002
Copper	Cu	0.0002
Iron	Fe	0.01
Lead	Pb	0.0002
Lithium	Li	0.0002
Magnesium	Mg	0.01
Manganese	Mn	0.0002
Mercury (by CVASF)	Hg	0.00002

Element	Symbol	DLs (ppm)
Molybdenum	Mo	0.0001
Nickel	Ni	0.0002
Phosphorous	P	0.03
Potassium	K	0.02
Selenium	Se	0.0002
Silicon	Si	0.05
Silver	Ag	0.00005
Sodium	Na	0.01
Strontium	Sr	0.0002
Tellurium	Te	0.0002
Thallium	Tl	0.00002
Thorium	Th	0.0005
Tin	Sn	0.0002
Titanium	Ti	0.0002
Uranium	U	0.0001
Vanadium	V	0.0002
Zinc	Zn	0.001
Zirconium	Zr	0.002

Table C.6 PCDDs and PCDFs subcontracted to Pacific Rim Laboratories

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 subcontracted to Pacific Rim Laboratories

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)
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 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	0.5
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

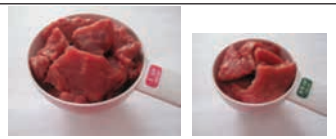
Step 3:

$$\frac{72.7 \text{ kg}}{(1.73\text{m} \times 1.73\text{m})} = 24.3$$

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 Saskatchewan (n=1040)
	Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
Total traditional food	34.44	32.88	47.53	45.39	37.38
Moose meat	9.36	5.58	11.92	6.48	8.61
Deer meat	3.08	2.15	4.60	5.40	3.35
Walleye	2.91	2.61	4.91	3.66	3.26
Caribou meat	2.27	2.24	5.39	3.52	2.91
Northern pike	2.05	2.57	3.60	3.63	2.60
Elk meat	2.82	1.73	3.16	2.59	2.59
Lake whitefish	1.61	3.57	2.23	2.36	2.27
Trout, lake	0.82	1.29	1.25	0.96	1.03
Mallard	0.89	0.9	1.35	1.28	1.01
Blueberry (bilberry, huckleberry)	0.86	0.79	0.57	0.71	0.78
Rabbit meat	0.51	0.49	0.86	0.57	0.57
Sucker	0.25	1.48	0.25	0.35	0.56
Saskatoon berries	0.55	0.62	0.47	0.6	0.56
Corn/hominy	0.49	0.54	0.45	0.67	0.51
Grouse	0.31	0.32	0.54	0.75	0.39
Moose liver	0.19	0.5	0.29	1.17	0.37
Bison meat	0.64	0.11	0.06	0.07	0.35
Raspberry (tall)	0.33	0.31	0.36	0.22	0.32
Moose kidney	0.20	0.42	0.34	0.38	0.3
Beans	0.29	0.34	0.34	0.07	0.29
Cherry (pin, chokecherry)	0.27	0.25	0.11	0.22	0.23
Wild rice	0.2	0.14	0.39	0.08	0.21

Food	Mean grams/ person/ day				
	Women		Men		First Nations in Saskatchewan (n=1040)
	Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
Goose (Canada, brant)	0.13	0.11	0.32	0.63	0.2
Deer liver	0.08	0.20	0	0.84	0.17
Wild strawberry	0.22	0.14	0.12	0.04	0.17
Deer kidney	0.07	0.21	0.05	0.66	0.16
Beaver meat	0.1	0.18	0.13	0.45	0.16
Caribou kidney	0.13	0.08	0.27	0.19	0.15
Round whitefish	0.07	0.16	0.17	0.42	0.14
Rhubarb	0.14	0.15	0.02	0.21	0.13
Crabapple	0.16	0.11	0.05	0.09	0.12
Arctic grayling	0.07	0.1	0.1	0.43	0.11
Sauger	0.16	0.02	0.13	0.02	0.11
Caribou liver	0.14	0.03	0.06	0.17	0.1
Yellow perch	0.06	0.06	0.23	0.05	0.09
Caribou heart	0.09	0.06	0.09	0.18	0.09
Black bear meat	0.01	0.04	0.04	0.71	0.08
Mint	0.11	0.04	0.05	0.06	0.08
Squash	0.13	0.04	0	0.12	0.08
Caribou brain	0.07	0.06	0.08	0.19	0.08
Mooneye	0.04	0.09	0.14	0	0.07
Elk liver	0.08	0.02	0.01	0.22	0.07
Elk kidney	0.10	0.03	0.07	0.03	0.07
Labrador tea	0.10	0.06	0.01	0.07	0.07
Trout, rainbow	0.05	0.08	0.04	0.1	0.06
Jackrabbit/snowshoe hare meat	0.09	0.02	0.06	0.06	0.06

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 Saskatchewan (n=1040)
	Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
Northern pintail	0.06	0.07	0.03	0.09	0.06
Cranberry, bog, swamp (mossberry)	0.06	0.07	0.03	0.05	0.06
Cranberry, mountain (lingonberry)	0.02	0.09	0.05	0.18	0.06
Rat root (wihkes, sweet flag)	0.06	0.09	0.03	0.08	0.06
Other cultivated traditional food (carrots, potatoes, wild peas, zucchini)	0	0.16	0.13	0	0.06
Caribou bone marrow	0.06	0.04	0.08	0.07	0.06
Caribou blood	0.08	0.02	0.01	0.20	0.06
Muskrat meat	0.02	0.05	0.06	0.23	0.05
Gadwall	0.05	0.04	0.10	0.05	0.05
Ptarmigan (willow, rock)	0.01	0.01	0.08	0.30	0.05
Sunflower seeds	0.08	0.02	0.04	0.01	0.05
Wild onion/chives	0.08	0.04	0.01	0	0.05
Sweetgrass	0.05	0.08	0.02	0.03	0.05
Goldeye	0.02	0.11	0.01	0.01	0.04
Porcupine meat	0.01	0.01	0.08	0.22	0.04
Northern shoveler	0.01	0	0.02	0.29	0.04
Teal	0.02	0.01	0.13	0.14	0.04
High bush cranberry (pembina)	0.04	0.03	0.01	0.05	0.04
Sage	0.04	0.07	0	0.03	0.04
Seagull eggs	0.03	0.01	0.04	0.14	0.04

Food	Mean grams/ person/ day				
	Women		Men		First Nations in Saskatchewan (n=1040)
	Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
Trout, brook	0.01	0.01	0.04	0.11	0.03
Channel catfish	0.01	0.11	0	0	0.03
Wood duck	0.01	0.03	0.08	0.01	0.03
Redhead	0	0	0.16	0.05	0.03
Snow goose (blue goose)	0.01	0.02	0.01	0.19	0.03
Dandelions	0.05	0.04	0.01	0	0.03
Maple syrup	0.01	0.02	0.1	0.01	0.03
Caribou fat	0.04	0.01	0.02	0.06	0.03
Duck eggs	0.03	0.02	0.02	0.02	0.03
Burbot (ling)	0.01	0.02	0.05	0.02	0.02
Sturgeon	0.02	0.04	0	0	0.02
American wigeon	0	0.01	0.01	0.13	0.02
Canvasback	0	0.03	0.04	0.05	0.02
Rosehips	0.01	0.06	0	0.01	0.02
Mooseberry, squashberry (low bush cranberry)	0.02	0.03	0	0.01	0.02
Moose heart	0.01	0	0	0.14	0.02
Moose blood	0.01	0	0	0.16	0.02
Small/largemouth bass	0	0.03	0.01	0	0.01
Black bear fat	0	0.01	0	0.06	0.01
Long-tailed duck	0	0	0.02	0.07	0.01
Ruddy duck	0.01	0.02	0.01	0	0.01
Scaup	0.01	0.01	0.01	0	0.01
Golden eye	0	0	0.04	0	0.01
Bufflehead	0.02	0	0	0	0.01
Loon	0	0.01	0.06	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 Saskatchewan (n=1040)
	Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
Gray partridge	0	0.01	0.02	0	0.01
Dewberry (dwarf raspberry, trailing)	0.01	0.01	0.02	0.01	0.01
Gooseberry	0	0.01	0.02	0	0.01
Wild asparagus	0	0.01	0	0	0.01
Other wild plants (wild carrot, bitter root, Canadian thistle, lily root, wild rose petals)	0	0.02	0	0	0.01
Beaked hazelnuts	0	0	0.02	0	0.01
Spruce pitch/gum	0.01	0.01	0	0.04	0.01
Chanterelle	0.01	0.01	0.02	0	0.01
Moose brain	0	0	0	0.13	0.01
Moose fat	0	0	0	0.04	0.01
Moose bone marrow	0	0	0	0.05	0.01
Mudhen/coot eggs	0	0.01	0	0.02	0.01
Birch syrup	0	0	0	0.04	0
Pronghorn kidney	0	0.02	0	0	0
Bison liver	0	0	0	0.02	0
Bison kidney	0	0	0	0.02	0
Swan (tundra)	0	0	0	0.02	0
Bearberry (Kinnickinnick)	0	0.02	0	0	0

Food	Mean grams/ person/ day				
	Women		Men		First Nations in Saskatchewan (n=1040)
	Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
Stinging nettle	0	0.02	0	0	0
Morel	0	0.01	0.01	0	0
Cloudberries (bakeapple)	0	0	0	0.01	0
Black currant	0	0	0.01	0	0
Red currant	0	0	0.01	0	0
Trout, splake	0	0.01	0	0	0
Squirrel meat	0	0	0.01	0	0
Ring-necked duck	0	0	0.01	0	0
Scoter	0	0	0	0.01	0
Merganser	0	0.01	0	0	0
Greater white-fronted goose (speckle belly)	0	0.01	0	0	0
Bunchberries	0	0.01	0	0	0
Yarrow	0	0.01	0	0	0
Birch twig tea	0	0.01	0	0	0
Juniper (stem, root) tea	0	0.01	0	0	0
Tamarack gum	0	0.01	0	0	0
Other land mammals (lynx, wild boar)	0	0	0	0.01	0
Balsam poplar bark	0	0.01	0	0	0
Balsam poplar sap	0	0.01	0	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 Saskatchewan (n=1040) *
	Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
Total traditional food	157.33	152.98	215.22	150.83	174.75
Moose meat	51.29	27.62	62.47	20.82	51.29
Deer meat	11.97	8.63	16.66	38.00	15.62
Walleye	13.15	8.91	24.12	12.23	14.01
Elk meat	15.39	6.9	20.82	12.49	12.43
Lake whitefish	8.22	17.82	13.23	8.15	10.89
Northern pike	7.67	10.39	25.68	15.29	10.41
Trout, lake	3.29	4.84	9.34	5.46	4.84
Mallard	4.57	4.57	5.59	6.05	4.57
Blueberry (bilberry, huckleberry)	4.73	2.37	2.96	1.97	3.95
Rabbit meat	2.56	1.73	4.16	3.12	3.22
Caribou meat	3.85	1.61	8.33	2.6	3.19
Saskatoon berries	2.96	2.96	2.37	3.55	2.96
Corn/hominy	2.32	3.48	2.32	3.48	2.32
Grouse	1.14	2.28	2.33	2.79	1.86
Raspberry (tall)	1.58	1.18	1.97	1.38	1.18
Moose liver	1.11	1.11	1.66	2.21	1.11
Moose kidney	1.11	0.55	2.21	2.21	1.11
Sucker	1.10	3.71	0	0	1.10
Cherry (pin, chokecherry)	0.89	1.18	0.79	1.58	1.08

Food	95th percentile grams/ person/ day				
	Women		Men		First Nations in Saskatchewan (n=1040) *
	Age 19-50 (n=495)	Age 51+ (n=226)	Age 19-50 (n=207)	Age 51+ (n=112)	
Goose (Canada, brant)	0.76	0.76	0.93	0.93	0.93
Wild rice	0.58	1.16	0.87	0.58	0.87
Wild strawberry	0.69	0.79	0.39	0.2	0.59
Rhubarb	0.29	0.87	0	0.87	0.58
Beans	0.29	1.16	1.74	0	0.58
Beaver meat	0.43	0.35	0.52	1.56	0.52
Crabapple	0.49	0.49	0.20	0.39	0.49
Bison meat	0.43	0.35	0.52	0.52	0.43
Mint	0.55	0.16	0.15	0.22	0.34
Rat root (wihkes, sweet flag)	0.33	0.49	0.11	0.32	0.33
Caribou kidney	0.28	0	0	0	0.28
Labrador tea	0.33	0.33	0.05	0.33	0.27
High bush cranberry (pembina)	0	0.20	0	0.20	0.1
Teal	0	0	0	1.40	0
Deer liver	0	0	0	0.83	0
Deer kidney	0	0	0	0.83	0
Jackrabbit/snowshoe hare meat	0	0.35	0	0	0
Maple syrup	0	0	0.34	0	0
Rosehips	0	0.20	0	0	0

*n=2 missing age values

Appendix H. Types of fruits and vegetables consumed from personal or community gardens in First Nations communities in Saskatchewan

Types of fruits and vegetables eaten from gardens	Percent of all fruits and vegetables reported (n=1690 responses)
Potatoes	27.9
Carrots	17.6
Onions	11.6
Cucumbers	8.0
Tomatoes	6.6
Corn	5.1
Beets	4.0
Peas (green/snap)	3.8
Lettuce	2.3
String beans (green/yellow)	2.2
Turnips	1.9
Pumpkin/spaghetti squash	1.3
Radish	1.3
Cabbage	1.0
Berries (raspberries, strawberries, Saskatoon berries, blueberries)	0.9
Zucchini	0.8

Types of fruits and vegetables eaten from gardens	Percent of all fruits and vegetables reported (n=1690 responses)
Celery	0.7
Peppers (bell/hot)	0.7
Rhubarb	0.5
Apples/crabapples	0.3
Broccoli	0.3
Dill	0.2
Sunflower	0.2
Cauliflower	0.2
Spinach	0.16
Red Kidney Beans	0.14
Cauliflower	0.13
Kale	0.11
Watermelon	0.07
Cantaloupe	0.06
Leeks	0.03
Asparagus	0.02
Kohlrabi	0.02

Appendix I.

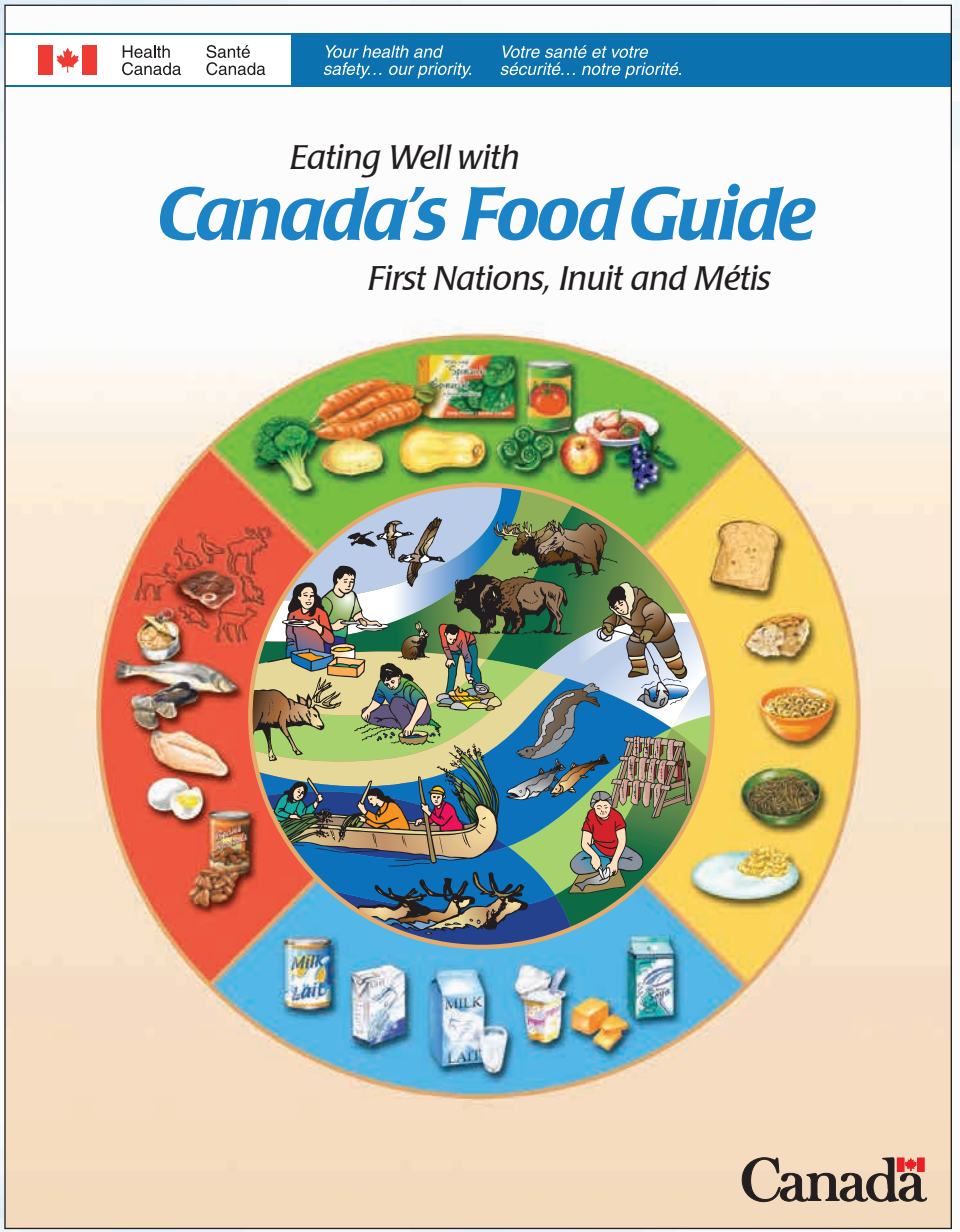
Eating Well with Canada's Food Guide First Nations, Inuit and Métis

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 Adults (19-50 years) 2 Adults (51+ years) 3	Teens 3–4 Adults (19-50 years) 2 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

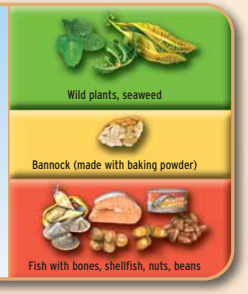
Following Canada's Food Guide and limiting foods and drinks which contain a lot of calories, fat, sugar or salt are important ways to respect your body. Examples of foods and drinks to limit are:

- 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.

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Appendix J. List of common foods and beverages avoided because of intolerance

Foods avoided	Percentage calculated from 450 food intolerances reported by 355 adults	As a percentage of all adults (n=1042)
Milk and dairy products	46.0	17.0
Greasy/fried food	6.7	2.5
Vegetables (includes carrot, corn, cucumber, garlic, mushroom, pepper, potato, tomato, turnip)	6.5	2.4
Meat (includes pork, beef, chicken, deer, moose, elk)	5.5	2.0
Spices and spicy foods	4.2	1.6
Eggs	3.6	1.3
Fruits (includes apple, banana, blueberry, cherry, cranberry, grapefruit, orange, peach, raisin, raspberry, watermelon)	3.2	1.2
Caffeine (coffee/tea)	3.1	1.1
Carbonated drinks	2.4	0.9
Acidic foods (includes vinegar, pickles)	2.4	0.9
Fast food (includes McDonald's, KFC, Chinese food)		
Bread/baked goods	1.7	0.6
Oil/fat	1.7	0.6
Fish/shellfish	1.6	0.6

Foods avoided	Percentage calculated from 450 food intolerances reported by 355 adults	As a percentage of all adults (n=1042)
Gluten/wheat	1.4	0.5
Processed meat (includes bacon, bologna, hot dogs)	1.1	0.4
Rice	0.9	0.3
Fruit juice	0.9	0.3
Sugar/sweets	0.9	0.3
Pasta	0.9	0.3
Water	0.7	0.3
Oats/oatmeal	0.6	0.2
Beans/legumes	0.4	0.1
Starchy foods	0.3	0.1
Soya sauce	0.3	0.1
Chocolate	0.2	0.1
Gum	0.2	0.1
Nuts/peanuts	0.2	0.1
Canned food	0.2	0.1
Alcohol	0.1	0.04
Barley	0.1	0.04
Salt	0.1	0.04

Appendix K. Market food intake (g/person/day)

Total Diet Study food code*	Food Description	First Nations in Saskatchewan (n=1042) grams/person/day
K03	Coffee	478.4
PP08	Tap Water, Kitchen	462.3
K04	Soft drinks	200.0
PP10	Water, bottled	178.7
K05	Tea	167.1
KFNFNES08	Fruit flavoured drinks	82.1
G19	Potatoes, boiled without skins	55.2
A02	Milk, 2%	49.6
FNFNES9	Other beverages (iced tea, smoothies)	44.7
F07	Cereals, oatmeal	37.0
FFNFNES22	Bannock	33.8
F01	Bread, white	33.6
F19	Rice	32.4
C01	Eggs	31.2
C02	Poultry, chicken and turkey	30.4
E04	Soups, dehydrated	28.9
E01	Soups, meats, canned	26.6
N02	French fries	25.6
E03	Soups, tomato, canned	25.5
F16	Pasta, plain	25.1
F15	Pasta, mixed dishes	25.0
B03	Beef, ground	23.9
EFNFNES06	Soups, homemade	23.6
N01	Pizza	19.3
F02	Bread, whole wheat	16.7
B04	Pork, fresh	16.0

Total Diet Study food code*	Food Description	First Nations in Saskatchewan (n=1042) grams/person/day
FNFNES2	Mixed meat dishes	15.6
E02	Soups, creamed vegetable, canned	15.6
EFNFNES05	Soups, vegetable, canned, not creamed	15.5
N05	Chicken burger	13.3
B11	Wiener, sausage	12.8
J08	Sugar, white/brown	12.5
G24	Tomatoes, canned and sauce	11.2
B08	Cold cuts and luncheon meats	10.4
H01	Apple juice, canned/frozen	10.2
NFNFNES10	Sandwich/subs	10.0
H08	Citrus juice, frozen	9.2
FNFNES4	Other vegetables (chives, mixed frozen vegetables, garlic)	8.6
H04	Bananas	8.3
G06	Carrots	7.9
IFNFNES05	Gravy	7.7
G20	Potatoes, chips (plain, salted)	7.3
KFNFNES10	Energy/sports drinks	7.1
G09	Corn	6.8
N03	Hamburger	6.7
H09	Citrus juice, canned	6.6
H03	Apple, raw	6.3
I02	Margarine	6.2
H07	Citrus fruits	6.1
I01	Cooking fats and salad oils	5.9
B02	Beef, roast	5.8
A06	Cream	5.5

Total Diet Study food code*	Food Description	First Nations in Saskatchewan (n=1042) grams/person/day
F05	Cereals, cooked, wheat	5.4
A07	Ice cream	5.4
A08	Yogourt	5.1
F20	Buns and rolls	5.0
G13	Onions	4.8
HHFNFNES23	Other fruit juice (lemon, pomegranate, grape, cranberry, mixed fruit)	4.7
FNFNES12	Mixed vegetarian dishes	4.5
F04	Cake	4.3
IFNFNES06	Dairy substitutes	4.0
B05	Pork, cured	3.8
G17	Potatoes, baked with skin	3.7
A11	Cheese, processed	3.5
A03	Milk, 1%	3.5
B09	Lunch meat, canned	3.4
F06	Cereals, corn	3.3
H05	Blueberries	3.3
FNFNES11	Mixed poultry dishes	3.2
SFNFNES01	Corn/tortilla chips	3.2
G01	Baked beans, canned	3.2
A09	Cheese	3.1
H11	Grapes	3.0
A01	Milk, whole	2.9
F14	Pancakes	2.9
J03	Gelatin dessert	2.8
G23	Tomatoes (raw and broiled)	2.8
B01	Beef, steak	2.8
G11	Lettuce	2.7

Total Diet Study food code*	Food Description	First Nations in Saskatchewan (n=1042) grams/person/day
PP01	Condiments	2.6
KFNFNES11	Hot chocolate	2.5
FNFNES6	Other fruits (blackberry, fruit salad, lemon, pomegranate, fresh pineapple)	2.5
J01	Chocolate bar	2.1
A05	Evaporated Milk	2.0
F08	Cereals, wheat and bran	2.0
G02	Beans, string	2.0
F13	Muffins	2.0
F09	Cookies	2.0
F18	Pie, other	1.9
F11	Danish and donuts	1.9
A12	Butter	1.8
G04	Broccoli	1.8
G08	Celery	1.8
J06	Peanut butter and peanuts	1.7
M05	Frozen Entrees (oven/microwave)	1.5
F17	Pie, apple	1.5
N06	Hot dog	1.5
FF21	Bread, other	1.4
G10	Cucumbers and dill pickles	1.4
D01	Fish, marine (sole, salmon, haddock)	1.4
F03	Bread, rye	1.3
A04	Milk, skim	1.3
F10	Crackers	1.3
H19	Strawberries	1.2
G14	Peas	1.2

Total Diet Study food code*	Food Description	First Nations in Saskatchewan (n=1042) grams/person/day
M01	Popcorn	1.1
FFNFNES25	Granola bars	1.1
G12	Mushrooms	1.1
J05	Jams	1.0
J02	Candy	1.0
H12	Melons	1.0
FNFNES13	Protein supplement	1.0
G15	Peppers	0.9
FFNFNES26	Bagels	0.9
G22	Tomato juice, canned	0.9
F12	Flour, wheat	0.8
FFNFNES24	Cereals, rice	0.8
D03	Fish, canned	0.8
J07	Puddings	0.8
J10	Seeds, shelled	0.7
H13	Peaches	0.7
J09	Syrup	0.7
II04	Mayonnaise	0.7
JJ12	Nuts	0.7
H02	Apple sauce	0.7
PP07	Soya sauce	0.6
N08	Egg breakfast on a bun, bagel, muffin or croissant	0.5
J04	Honey	0.5
NFNFNES11	Onion rings	0.4
G21	Rutabagas or turnip	0.4
FFNFNES32	Barley	0.4
FNFNES10	Other fast foods (burrito, taco)	0.4
H14	Pears	0.4

Total Diet Study food code*	Food Description	First Nations in Saskatchewan (n=1042) grams/person/day
FNFNES1	Mixed dairy products (banana split, yogourt granola parfait)	0.4
AFNFNES16	Cream cheese	0.3
G05	Cabbage	0.3
FNFNES5	Other salty snacks (trail mix, pretzels, vegetable chips)	0.3
B10	Organ Meats	0.3
FNFNES3	Other cereal products	0.3
G03	Beets	0.3
A10	Cheese, cottage	0.2
NFNFNES09	Sausage breakfast on a bun, bagel, muffin or croissant	0.2
PP02	Salt	0.2
AFNFNES13	Cream sauce	0.2
AFNFNES18	Milkshake	0.2
D04	Shellfish, fresh or frozen	0.2
GG22	Spinach	0.2
FFNFNES29	Tortilla/taco shell	0.2
JFNFNES16	Artificial sweetener	0.1
G07	Cauliflower	0.1
G18	Potatoes, boiled with skins	0.1
AFNFNES15	Soy milk beverage	0.1
AFNFNES14	Almond milk beverage	0.1
GFNFNES31	Bok choy	0.1
H18	Raspberries	0.1
GG24	Brussel sprouts	0.1
GFNFNES30	Sweet potato	0.1
H10	Grape juice, bottled	0.05
JFNFNES19	Popsicles	0.05

Total Diet Study food code*	Food Description	First Nations in Saskatchewan (n=1042) grams/person/day
PP06	Herbs and spices	0.04
AFNFNES19	Milk, condensed	0.04
HHFNFNES22	Avocado	0.04
GFNFNES25	Kale	0.04
H16	Plums, prunes	0.03
H17	Raisins	0.03
H15	Pineapple, canned	0.03
N07	Chicken (breaded, fried, nuggets or pieces)	0.03
HH20	Kiwi	0.03
JFNFNES18	Sweet toppings	0.03
N04	Fish burger	0.02
HHFNFNES25	Cranberry	0.02
JFNFNES15	Frosting	0.02
GFNFNES27	Radish	0.02
L01	Baby food- Cereals (mixed)	0.01
FNFNES7	Other meat products (pork skins)	0.01
FNFNES8	Other miscellaneous (fibre supplement)	0.01

* 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

Photo by Carol Armstrong-Monohan

Appendix L. List of supplements taken by First Nations in Saskatchewan

Types of supplements reported to be taken	% of all types of supplements reported (n=278)
Vitamin D	21.72
Multivitamin/mineral supplement	16.91
Calcium	13.07
Vitamin B (6, 12, complex)	8.39
Iron	6.86
Omega/fish oil	6.58
Prenatal supplement	6.31
Vitamin C	3.79
Magnesium	2.95
Garlic	1.72
Calcium plus vitamin D +/or magnesium	1.70
Protein supplement	1.47
Vitamin E	1.28
Fibre	1.17
Weight loss product	1.09
Folic acid	0.83
Cranberry concentrate	0.64
Glaceau vitamin water	0.55
Apple cider vinegar	0.47
Chlorella	0.44
Medi-collagenics (anti-aging)	0.36
Echinacea	0.26
Acidophilus with bifidus	0.21
Young living essentialzyme	0.21
Young living ningxia red	0.21
Young living sulfurzyme	0.21
Young living thyromin	0.21
Siberian ginseng	0.18
Vitamin K	0.13
Life oil of oregano	0.10

Appendix M. Average costs of nutritious food basket items in grocery stores near participating First Nations communities and in Saskatoon

Food Item	Purchase Unit	Across Saskatchewan (n=14 stores)	Taiga Shield (n=1 store)	Boreal Shield (n=2 stores)	Boreal Plains (n=7 stores)	Prairies (n=4 stores)	Saskatoon
	Price per purchase unit in CDN dollars						
MILK & MILK ALTERNATIVES							
Milk, partly skimmed, 2% M.F.	4 L	7.27	19.69	8.79	5.65	5.83	4.45
Cheese, processed food, cheddar, slices	500 GM	6.30	11.32	7.82	5.17	5.99	3.88
Cheese, mozzarella, partially skim (16.5% M.F.)	200 GM	4.34	7.37	5.49	3.85	3.74	3.98
Cheese, cheddar	200 GM	4.86	7.37	6.73	4.18	4.33	2.37
Yogourt, fruit bottom, 1% to 2% M.F.	750 GM	4.09	7.21	5.28	3.65	3.36	2.69
EGGS							
Grade A large eggs	dozen	3.48	5.39	4.29	3.04	3.25	2.64
MEAT, POULTRY AND LEGUMES							
Chicken, legs	1 KG	8.48	14.41	8.96	7.56	7.64	6.48
Ham, sliced, regular (approximately 11% fat)	175 GM	3.20	4.79	4.47	2.62	3.04	2.33
Beef, hip, inside (top) round roast	1 KG	16.06	16.06	24.46	13.74	15.35	13.98
Beef, hip, inside (top) round steak	1 KG	16.80	27.03	16.80	15.15	16.73	13.98
Beef, ground, lean	1 KG	12.82	12.82	16.03	12.38	11.89	8.79
Beans, baked, canned in tomato sauce	398 ML	1.47	1.79	1.87	1.18	1.61	0.87
Peanuts, dry roasted	700 GM	5.72	5.72	5.72	5.61	5.89	4.13
Lentils, dry	454 GM	2.49	2.49	3.21	2.45	2.20	1.31
Peanut butter, smooth type, fat, sugar and salt added	500 GM	4.43	7.85	5.79	3.21	4.74	1.49
Pork, loin, centre chop, bone-in	1 KG	13.02	17.99	13.10	12.41	12.66	8.80
FISH							
Tuna, light, canned in water	170 GM	1.82	2.29	3.04	1.51	1.57	0.85
Fish (sole, haddock, pollock, halibut), frozen	400 GM	5.52	5.52	5.52	5.35	5.78	10.58
Salmon, chum (keta), canned	213 GM	2.45	2.49	2.99	2.14	2.64	1.75

Food Item	Purchase Unit	Across Saskatchewan (n=14 stores)	Taiga Shield (n=1 store)	Boreal Shield (n=2 stores)	Boreal Plains (n=7 stores)	Prairies (n=4 stores)	Saskatoon
	Price per purchase unit in CDN dollars						
ORANGE VEGETABLES & FRUIT							
Peach, canned halves or slices, juice pack	398 ML	2.41	3.09	3.82	2.07	2.03	2.17
Melon, cantaloupe, raw	1 KG	3.40	3.40	6.56	2.42	3.30	5.77
Sweet potato, raw	1 KG	3.06	3.06	3.06	2.95	3.23	3.24
Carrot, raw	1 KG	2.72	5.94	3.61	2.19	2.27	1.63
DARK GREEN VEGETABLES							
Beans, snap (Italian, green or yellow), frozen	1 KG	4.35	4.35	6.81	3.76	4.00	4.37
Lettuce, cos or romaine	1 KG	5.36	9.95	5.74	4.79	4.87	1.31
Vegetables, mixed, frozen	1 KG	4.51	7.53	5.59	3.85	4.21	2.22
Broccoli, raw	1 KG	5.65	11.61	5.73	4.28	6.16	3.59
Peas, green, frozen	1 KG	4.51	7.53	6.92	3.52	4.04	2.28
Pepper, sweet, green, raw	1 KG	7.29	10.45	9.79	6.59	6.31	5.00
OTHER VEGETABLES & FRUIT							
Apple, raw	1 KG	3.70	8.44	6.16	2.62	2.89	2.19
Banana, raw	1 KG	2.74	8.29	3.92	1.92	2.00	1.70
Grape, red or green, raw	1 KG	7.29	15.19	8.79	6.28	6.09	3.60
Oranges, all commercial varieties, raw	1 KG	4.60	9.08	8.67	3.45	3.17	1.96
Orange juice, frozen concentrate	355 ML	2.91	4.68	3.19	2.38	3.13	1.35
Pear, raw	1 KG	4.36	8.45	3.92	3.37	5.03	3.90
Raisin, seedless (sultana)	750 GM	6.84	6.30	7.48	6.62	6.99	4.11
Strawberry, frozen, unsweetened	600 GM	6.01	12.49	6.54	5.44	4.99	3.95
Apple juice, canned or bottled, added vitamin C	1.36 L	2.69	4.69	4.61	1.87	2.47	1.60
Potato, white, raw	4.54 KG	8.29	24.29	13.09	6.11	5.18	5.98
Corn, canned vacuum packed	341 ML	1.50	1.99	2.14	1.22	1.48	1.08
Rutabaga (turnip), raw	1 KG	2.13	2.13	2.13	2.02	2.29	1.48
Cabbage, raw	1 KG	1.99	1.99	1.64	1.76	2.51	1.72
Cucumber, raw	1 KG	4.86	9.84	7.31	3.92	3.79	2.83
Celery, raw	1 KG	4.60	14.74	6.93	2.94	3.40	2.18

Food Item	Purchase Unit	Across Saskatchewan (n=14 stores)	Taiga Shield (n=1 store)	Boreal Shield (n=2 stores)	Boreal Plains (n=7 stores)	Prairies (n=4 stores)	Saskatoon
	Price per purchase unit in CDN dollars						
Lettuce, iceberg	1 KG	4.47	8.46	5.97	3.09	4.81	3.49
Mushroom, raw	1 KG	10.23	18.95	15.70	8.29	8.22	8.10
Onion, raw	1 KG	2.78	6.99	3.71	1.93	2.54	1.54
Tomato, red, raw	1 KG	5.08	8.90	8.51	4.30	3.60	2.93
Tomato, canned, whole	796 ML	2.22	4.70	3.17	1.64	2.01	1.79
Vegetable juice cocktail	1.89 L	4.72	8.93	7.14	3.59	4.15	2.78
WHOLE GRAIN PRODUCTS							
Cereal, bran flakes with raisins	775 GM	6.90	12.72	6.61	5.65	7.48	4.67
Cereal, oats, quick cooking	1 KG	3.77	6.69	5.79	3.08	3.07	1.70
Cereal, toasted oat Os	525 GM	6.60	12.06	7.03	5.80	6.21	2.89
Bread, pita, whole-wheat	284 GM	2.44	2.44	2.44	2.32	2.62	1.69
Bread, whole wheat	675 GM	3.32	5.03	3.27	3.30	2.93	2.14
Grains, wheat flour, whole-grain	2.5 KG	6.51	6.29	11.33	5.10	6.28	1.63
NON WHOLE GRAIN PRODUCTS							
Cookie, plain (arrowroot, social tea)	350 GM	4.66	7.19	5.63	3.98	4.58	1.05
Roll, hamburger	350 GM	2.53	4.03	2.98	2.21	2.41	1.20
Cracker, saltine, unsalted top	450 GM	3.78	7.49	4.62	3.01	3.60	2.43
Bread, white	675 GM	3.24	5.03	2.76	3.48	2.67	2.17
Pasta, spaghetti, enriched	900 GM	3.75	3.99	4.57	3.32	3.94	2.01
Grains, wheat flour, white, enriched, all purpose	2.5 KG	6.06	6.59	7.72	5.03	6.64	2.63
Rice, white, long-grain, parboiled	900 GM	4.16	4.16	7.65	2.98	4.19	0.95
FATS AND OILS							
Vegetable oil, canola	1.89 L	7.18	12.58	10.79	5.60	6.38	3.07
Salad dressing, mayonnaise type	475 ML	3.80	6.99	5.05	3.16	3.33	1.59
Salad dressing, Italian, regular	950 ML	6.03	11.70	10.80	3.75	5.66	2.98
Margarine, tub, non-hydrogenated	907 GM	4.61	6.69	5.42	4.24	4.24	4.20

Appendix N. Participants' comments about traditional food

"Get to prepare yourself, wildlife is healthy." Share with other families."

"I believe traditional food is far superior over store bought, to pass on knowledge and teachings that we are losing."

"Traditional food is great learning tool."

"Parents grew up on it so passing along tradition for future generations."

"Learning how to be dependent on the land, keeping culture alive, healthier."

"Satisfaction of feeding and providing for grandkids and family."

"It keeps my children healthy."

"Having food to eat that is not processed and is healthier."

"Healthy lifestyle, no diabetes, longer life."

"Pass on traditions through berry picking and hunting."

"Good taste. Enjoyment of hunting."

"That's what we grew up with ever since I can remember."

"I love traditional food because it's healthy."

"Survival, what our creator gave us."

"Brings families and community together."

"Exercise when you're hunting."

"Strengthen cultural capacity and well-being."

"Caribou, bannock and fish keeps you healthy and gives you strong bones."

"You get the best benefits from traditional food."

"Provide for oneself, know where it came from."

"It is very important to be able to hunt and gather our traditional food for health, economic and traditional benefits."

"Natural, nothing added, no pesticides, no additives, not genetically modified."

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: - rice, pot barley, corn, amaranth, millet, oats, buckwheat, bulgar, quinoa, etc - flours made from wheat, rye, rice, potato, soy, millet, etc. - flours that are made into: Breads, pasta, etc. 	• Flavoured or Instant rice • Fried bread, White bread, White buns, English muffins • Baked goods and pastries (ex. Commercial muffins with a diameter more than 2 inches, cakes, cookies, danishes, croissant, cinnamon buns) • High fat crackers • Commercial or home-made pasta salads made with lots of dressing • Instant noodles (packages, cup) with seasoning mix • Microwave popcorn and fried snack foods e.g. Potato, tortilla chips • Commercial cereals high in sugar • Instant, flavoured oatmeal	• Parboiled/converted rice, white rice, mix of brown and white rice • Baked bannock, enriched breads, buns, bagels, tortillas, English muffins, pancakes, whole wheat fried bread (canola oil), etc • Lower fat baked goods that are small in size (2-inch muffins, mini loaves • Low-fat crackers (no trans fat) • Pasta salads made with low fat dressing • Other rice noodles • Trans-fat free, low-fat baked grain and corn snacks (baked tortilla chips, popcorn) • Whole grain cereals (limited sugar, fat content)	• Brown rice, wild rice • Whole grain baked bannock, breads, buns, bagels, tortillas, English muffins, pancakes, etc • Some small baked lower fat items with whole grains, fibre, fruit or nuts, such as loaves, muffins • Low-fat whole grain crackers • Most whole grain pastas • Whole grain pasta salads made with low fat dressing and plenty of vegetables • Brown rice noodles • Whole grain and corn snacks (cereal mix, tortilla chips, hot air popcorn with no butter) • 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 (Juice and concentrated fruit juice does not count as a fruit ingredient for this food group – see "Vegetables and Fruit Juices) 	• 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) • Fruit with a sugar based coating (e.g., yogurt- or chocolate- covered raisins) • Dried fruit (e.g., fruit roll-ups/leathers/ chips) or fruit juice snacks (e.g., gummies) • Regular potato/vegetable chips • Coated/breaded and deep-fried vegetables (e.g., French-fried potatoes, onion rings) • 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) • Some sweetened baked fruit slices • Dried fruit (fruit main ingredient), small portions, see health note below • Low-salt, baked potato/vegetable chips • 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 • Indian ice-cream • 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): - may be diluted with water or carbonated water - may have added food ingredients, e.g. Fruit pulp, fruit puree - may not be fortified with vitamins other than Vitamin C, or with minerals other than calcium. 	• All fruit juices of any kind including those containing 100% fruit juice, “drinks”, “blends”, “cocktails”, “splashes”, “punches” and “beverages” (if sweetened with added sugars) • Most regular tomato and vegetable juices • Juice crystals • Fruit smoothies made with juice • 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) • Juice drinks with added caffeine, guarana or yerba	• Some lower-sodium tomato and vegetable juices • 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; Cream is NOT considered a milk ingredient 	• Candy flavoured ice creams, sundaes and many frozen yogurts • Frozen 'yogurt' not based on milk ingredients (see "Candies, Chocolates, etc" food grouping) • Most ice milks, ice creams, and frozen novelties • Some puddings/custards • Some higher fat cheeses • Most cream cheese and light cream cheeses and spreads (see condiment section) • Most processed cheese slices and spreads made without milk • Whole fat cottage cheese	• Small portions of some ice milks and frozen yogurts – simply flavoured • Small portions of sherbet • Puddings/custards made with low fat milk and limited added sugar • Pudding/custards/ice milk bars with artificial sweeteners (not for children) • Most flavoured yogurts • Yogurt with artificial sweeteners • Processed cheese slices made with milk • 1-2% milk fat cottage cheese	• Canned salmon with bones • Some flavoured yogurts (lower sugar and fat) • Plain yogurt (low-fat) • Most regular and reduced fat or light cheeses, cheese strings (unprocessed) • Low-sodium cottage cheese (1% milk fat.)
Milk & Calcium Containing Beverages			
Milk must be the first ingredient. Cream is NOT considered a milk ingredient. Fortified soy drinks contain protein and calcium and are included in this food grouping. 	• Most candy flavoured milks • Most eggnogs • Most hot chocolate mixes made with water (see also "Other Beverages") • Smoothies made with Leave off the Community Table ingredients • Some blended sweetened regular and decaf coffee drinks • Powdered coffee whitener • Flavoured, creams and coffee whiteners	• Most basic flavoured milks and fortified soy drinks • Yogurt drinks • Some eggnogs if lower in sugar and fat • Most hot chocolates made with milk • Smoothies made with Sometimes on the Community Table ingredients • Whole, 2% milk, soy milk or canned milk for coffee	• Plain, unflavoured fortified soy and rice drinks • Skim, 1% and 2% milk • Some hot chocolates made with milk and very little added sugar • Smoothies made with ingredients from the "Great on the Table Anytime" list • 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. *See the "Nuts & Seed Mixes or Bars" category for guidelines on these items 	• Many products breaded and/or deep fried in hydrogenated or partially hydrogenated oils or in vegetable shortening (e.g. Chicken fingers) • Marbled or fatty meats • Many cold cuts and deli meats (deli chicken, deli beef, pepperoni, bologna, salami, etc) if high in salt or contain nitrates • Canned meats (Kam, Klik, corned beef, ham, etc) • Some seasoned chicken or tuna salads • Most regular wieners, sausages, smokies, bratwurst • Most pepperoni/chicken sticks • Some jerky • Bacon	• Some breaded and baked chicken/fish/meat • Some marinated poultry • Some fish canned in oil • Some deli meats if not too salty • Some chicken or tuna salads, lightly seasoned • Some lean wieners, sausages • Lean pepperoni/chicken/turkey sticks • Some jerky, lightly seasoned • Smoked fish (salt used) • Some egg salads, lightly seasoned • Legume salads, lightly seasoned • Some refried beans • Turkey bacon	• Chicken, turkey • Fish, seafood, fresh or canned in water/ broth • Lean meat (beef, pork, lamb) • Lean traditional meats (venison, bison, moose, caribou, duck, etc) • Eggs • Tofu • Chicken salads if lower salt and fat • Lean wieners if lower salt • Jerky (plain), dried deer/moose/caribou meat • Beans, peas, lentils • Most legume salads if lower salt • 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. 	• Nuts with a sugar based coating (eg. Chocolate, yogurt covered nuts) • Salty or sugary nut/seed bars and mixes (e.g. sesame snap bars) • 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 • 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. 	• Sandwiches with deli or processed meats • Subway style sandwiches greater than 6 inches • Some pizzas (4 cheese/double cheese, meat lover) • Pizza pockets • Meat pot pies • Sausage/vegetable rolls • Pasta with a cream based sauce	• Most sandwiches • Short (e.g. 6 inch) submarine sandwiches, and burgers made with lean roasted meats (turkey, chicken, beef), but few vegetables • Whole wheat pizza topped with lean meat and vegetables and lightly topped with cheese • Baked pizza pockets, pizza pretzels, pizza bagels • Some curries, moderately salted • Stir fries prepared with low sodium sauces • Sushi • Rice and egg/meat Pilaf • Pasta with milk or vegetable based sauce • Hard tacos with meat or bean filling	• Whole grain sandwiches • 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 • Whole wheat pizzas with vegetables • Stews, chilies, curries (lower sodium) • Stir fries on rice, if sauce is low in sodium • Pilaf (with vegetables) • Pasta with vegetable and meat based sauce • Burritos (bean or meat) • Soft tacos filled with “Great on the Table” ingredients • Some low sodium frozen entrees
Candies, Chocolates			
	• Most regular packages • Most very small packages of candies/ chocolates • Very small portions of dessert gelatins	• Sugar-free gum or mints or cough drops • Diabetic candies (adults only) • Dark chocolate > 55% cocoa	None

Food Category	Leave off the Table	Better on the Table	Great on the Table Anytime
Soups			
Includes dry, canned and fresh 	• Some instant soups, plain or seasoned • Ramen noodles • Regular canned soups, broth or milk based • Many canned soups, broth or milk based	• Soups made with soup bouillon/stock and other ingredients from the "Great on the Table Anytime" list • Homemade chicken noodle soup • Hamburger soup made with regular fat meat • Some low-sodium canned or instant soups	• Home-made soups made with homemade stocks or without added bouillon/stock • Hamburger soup made with lean meat (lean ground beef, moose or deer meat) • Some soups made with meat or beans/ lentils • 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 • Most sport drinks* • Most hot chocolate mixes made with water • Water (flavoured or not) minimally sweetened • Diet decaffeinated soft drinks and diet non-carbonated drinks (Secondary schools only)	• Soda water ** • Decaffeinated tea • Decaffeinated coffee	• Water, plain • Lemon/lime water • Soda water ** • Soapberry punch • Sparkling/carbonated water or water with added flavours (no added sugar and/or no artificial sweeteners) • Indian tea/Labrador Tea • Herbal teas (fruit/mint flavoured unsweetened teas) • 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) • Hot sauce: 5 - 10 mL • Table salt: ¼ - ½ mL • Soft margarine, butter: 5 - 10 mL • Cream: 5 - 15 mL Whipped Cream (from cream): 15 - 30 mL • Regular/light cream cheese or processed cheese spread: 5 - 15 mL • Regular sour cream: 15 - 30 mL • Low-fat sour cream: 15 – 45 mL • Fat-free sour cream: 15 – 60 mL • Low-fat/fat-free dips, dressings, spreads (e.g., mayonnaise, miracle whip, sandwich spread): 5 - 15 mL • Regular dips, dressings, spreads: 5 - 10 mL • Oil for sautéing or dressing (e.g., homemade vinegar and oil): 5 - 10 mL • Ketchup, mustard, relishes: 10 - 15 mL • Pickles (regular): 10-15 ml (Low sodium pickles: no limit) • Horseradish: 10 - 45 mL • Jarred salsa, sauerkraut: 10 - 30 mL (fresh salsa can fit into the Vegetables and Fruit food grouping) • Salad toppers (e.g. Bacon bits): 5 - 10 mL Croutons: 25 - 50 mL • Sugars, honey, jams/jellies, molasses, syrups (e.g., pancake): 15 mL • Flavoured syrups (e.g. for lattes): 1 pump (10 mL)	• Herbs and salt-free seasonings, garlic, pepper, lemon juice, Mrs. Dash • Horseradish: 10-45 ml • 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. Serve condiments and add-ins on the side whenever possible.		

Appendix P. Summary of Results for Saskatchewan

First Nations Food, Nutrition and Environment Study (FNFNES)

Saskatchewan 2015

University of Ottawa
Université de Montréal
Assembly of First Nations

Summary of Results:
Saskatchewan

Who participated?

721
Ave. age: 42

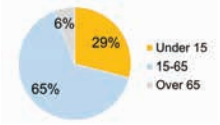
1042

5 is the median # of people living in each home

57% of households had at least **1** adult working full-time

321
Ave. age: 43

Age distribution of households



What is the FNFNES about?

The FNFNES took place in **14** First Nations communities in Saskatchewan in 2015 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?

Fond du Lac Denesuline First Nation
Black Lake Denesuline First Nation
Lac La Ronge Indian Band – (Grandmother's Bay, Sucker River, Stanley Mission)
Lac La Ronge Indian Band – (La Ronge, Hall Lake, Little Red River)
Pelican Lake First Nation
Onion Lake Cree Nation
Ahtahkakoop Cree Nation
Shoal Lake Cree First Nation
James Smith Cree Nation
The Key First Nation
Muskeg Lake Cree Nation
Beardy's and Okemasis First Nation
Mosquito, Grizzly Bear's Head, Lean Man First Nation
White Bear First Nation

What were the findings on health?

26% of adults said their health was **very good** or **excellent**

34% of adults are **physically active**

18% of adults are at a **healthy weight**

19% of adults have **diabetes**

72% of adults are **smokers**

Thank you to everyone who participated!

How many households are harvesting traditional food?

62% of households harvested traditional food
44% hunted
41% fished
31% harvested wild plants

78% want more traditional food.

Top barriers to greater use are lack of:
a hunter in the household, time, equipment or transportation, and knowledge

What and how much traditional food are people eating?

94% of adults reported eating traditional food. **Moose, blueberry,** and **deer** 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 Saskatchewan 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

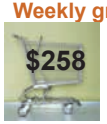
Inadequate amounts can lead to **nutrient deficiencies** and **poor health**.

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."

37% of households are **food insecure**
27% are **moderately** food insecure: families rely on lower quality/priced foods
10% 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 **$176** to **$479**.
Costs were calculated using the National Nutritious Food Basket (NNFB), which contains **a list of 67** foods. Foods requiring **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 wheat grains more often.
- Choose milk and milk products (such as cheese or yogurt) or beverages fortified with calcium and vitamin D (such as soy beverages) more often.
- Some lakes have fish advisories. Contact the Ministry of Environment for more information. The general enquiry line can also be reached at 1-800-567-4224.

Is the water safe to drink?

65% of households **drink** tap water while **90% cook** with tap water. The most common reasons for avoidance were **distrust of the quality/safety** and an **unpleasant taste.**

Testing of tap water was undertaken in **234** homes for metals that can affect **health** or have an **aesthetic objective/operational guidance** value.

Metals that can affect **health** were ***not within*** guidelines for **arsenic** (2 homes), **lead** (1 home), **selenium** (1 home) and **uranium** (2 homes).

Metals that can affect **colour, taste,** or **smell** were ***not within*** guidelines for **aluminum** (9 homes), **copper** (1 home), **iron** (12 homes), **manganese** (32 homes) and **sodium** (18 homes).

Are the levels of pharmaceuticals in the surface water safe?

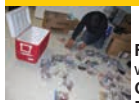
Low levels were found in surface water samples in **12** communities. These levels should not be harmful to human health.

17 pharmaceuticals were found: **acetaminophen** (pain med.), **atenolol** (heart med.), **bezafibrate** (lipid med.), **caffeine** (pain med./beverages), **carbamazepine** (mood/anti-convulsant), **cimetidine** (ulcer med.), **clarithromycin** (antibiotic), **clofibric acid** (lipid med.), **codeine** (pain med.), **cotinine** (nicotine metabolite), **gemfibrozil** (lipid med.), **ketoprofen** (arthritis/pain med.), **metformin** (diabetes med.), **metoprolol** (blood pressure med.), **naproxen** (inflammation/pain med.), **sulfamethoxazole** (antibiotic), and **trimethoprim** (antibiotic)

Are people being exposed to harmful levels of mercury?

Hair samples were collected from **555** adults. **Mercury** levels were within Health Canada's guideline normal acceptable range **except** for **7** adults (1.3% of participants). Letters were sent to these individuals with suggestions on how to reduce their exposure to mercury.

Is traditional food safe to eat?



49 traditional food species were collected

Fish: Lake trout, lake whitefish, longnose sucker, mariah, mooneye, northern pike, walleye, white sucker, yellow perch
Game: bear, beaver, caribou, deer, elk, moose, muskrat, rabbit
Birds: Canada goose, gadwall duck, mallard, northern pintail, northern shoveler, spruce grouse, teal duck, wigeon
Berries: blueberries, cranberries, pincherries, raspberries, Saskatoon berries
Plants: wild rice
Teas: licorice, mint, Labrador, rat root, rosehip, sage

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 can be harmful to health, especially to a child's brain development.

Saskatchewan 2015

Key Results For All Participating First Nations in Saskatchewan:

1. The diet of First Nations adults in Saskatchewan 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. Mercury exposure, as measured in hair samples and calculated through dietary estimates, is low and is not a serious health concern. Of all 555 Saskatchewan region samples, only 7 (1.3%) had mercury levels above Health Canada guidelines. However, exceedances among women of child-bearing age living in the Boreal Shield suggest that mercury risk communication should be focused on this population group and further community-based study of women of child-bearing age living in northern ecozones may be beneficial.
6. 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 low and is not a health concern.
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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